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Procedure Contains NMM REFLIB Forms: YES  NO

<b>Effective Date</b> 3/4/10	<b>Procedure Owner:</b> <b>Title:</b> <b>Site:</b>	Darren Deretz Acting Mngr, CA&A JAF	<b>Governance Owner:</b> <b>Title:</b> <b>Site:</b>	Alan Ettlinger Fleet Mgr OE&CA HQN
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Exception Date*	Site	Site Procedure Champion	Title
	ANO	John R. Eichenberger	Manager, CA&A
N/A	BRP	N/A	
	GGNS	Gerald Giles	Manager, CA&A
	IPEC	John N. Donnelly	Manager, CA&A
	JAF	Darren Deretz	Manager, CA&A
	PLP	Tim O'Leary	Manager, CA&A
	PNPS	James D. Keyes	Manager, CA&A
	RBS	ReNae Kowalewski	Manager, CA&A
	VY	Glen Lozier	Manager, CA&A
	W3	William McKinney	Manager, CA&A
N/A	NP	N/A	
	HQN	Richard Courtney	Manager, CA&A Projects

**Site and NMM Procedures Canceled or Superseded By This Revision**

**Process Applicability Exclusion:** All Sites:   
 Specific Sites: ANO  BRP  GGNS  IPEC  JAF  PLP  PNPS  RBS  VY  W3  NP

**Change Statement:** Revision 12 is to (no revision bars to allow reading in eB):

- Minor editorial corrections (typo's, missing quotes, missing underline, etc.)
- Replaced Analysis with Evaluation and RCA with RCE where appropriate
- Deleted 5.5.8.9.3 on documenting results of searches (repetitive step).
- Added Section 5.6 and Attachment 9.10, Item for Effectiveness Reviews
- Updated the reference in Attachment 9.6 from 5.5.8.6 to 5.5.8.7.
- Revise Attachment 9.6 to;
  - Added instructions in on documenting the Safety Culture Evaluation
  - Revised the attachment, from a table to a template to allow identification of causes.
  - Added Table 1 and Table 2 with titles in the template.
  - Made the template portion of Attachment 9.6 landscape

\*Requires justification for the exception

*Handwritten mark resembling 'A-1'*

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## 1.0 PURPOSE

- 1.1 The purpose of this procedure is to assist Entergy personnel in conducting an effective Root Cause Evaluation and in documenting the results of the analysis.
- 1.2 The regulatory basis for root cause analysis is described in 10CFR50 Appendix B, Criterion XVI[QAPM A.6.b.S2 and B.13.a.]:
- 1.2.1 “Measures shall be established to assure that conditions adverse to quality such as failures, malfunctions, deficiencies, defective material and equipment, and non-conformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. The identification of the significant condition adverse to quality, the cause of the condition and the corrective action taken shall be documented and reported to appropriate levels of management.”
- 1.3 This procedure also includes the general process guidance for performing a Root Cause Evaluation.
- 1.3.1 Attachment 9.1 describes the various techniques and tools which may be used (singly or in combination) to perform the analysis. Specific information on some analysis techniques is found in related progeny procedures (EN-LI-118-xx series).
- 1.3.2 It is not expected or required that all described techniques will be used in any particular Root Cause Evaluation. The specific combination of analysis techniques to be used should be determined by the Root Cause Evaluator.
- 1.3.3 Regardless of the selected technique(s) chosen for any particular Root Cause Evaluation, evaluation of the problem must use one or more systematic method to identify the root cause(s) and contributing cause(s).
- 1.3.4 It is expected that the report will have stand-alone quality by presenting facts and other data to clearly support the causes determined and that corrective actions will be provided to address the causes.

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## 2.0 REFERENCES

- 2.1 Root Cause Analysis, INPO Good Practice 90-004, OE-907, January 1990
- 2.2 INPO, Principles for Effective Self-Assessment and Corrective Action Programs
- 2.3 EN-HU-101, Human Performance Program
- 2.4 EN-HU-102, Human Performance Tools
- 2.5 EN-HU-103, Human Performance Error Reviews
- 2.6 EN-LI-102, Corrective Action Process
- 2.7 EN-LI-121, Entergy Trending Process
- 2.8 Entergy Quality Assurance Program Manual (QAPM)
- 2.9 NRC Regulatory Issue Summary 2006-13 "Information on the Changes made to the Reactor Oversight Process to More Fully Address Safety Culture"
- 2.10 NRC Inspection Procedure 95001 "Inspection For One Or Two White Inputs In A Strategic Performance Area"

## 3.0 DEFINITIONS

- 3.1 Causal Factor - A factor (typically an action or condition) that shaped the outcome of the situation; causal factors are symptoms of the more basic causes of the event.
- 3.2 Complete Picture (of the event) – an end-state of an investigation, when no action or condition exists (including conflicting information) that is not explained by facts.
- 3.3 Direct Cause – The action or condition that occurs immediately prior to the consequential event that is being investigated; may be considered as the "trigger" for the event.
- 3.4 Evaluator – An individual who has met the qualification requirements in Section 5.5.9 to perform a Root Cause Evaluation (RCE); the individual who signs as responsible for the RCE content.
- 3.5 Failure Agent – the factors which produce a failure mechanism, singly or in combination; these are typically Force, Reactive Environment, Time, and Temperature.
- 3.6 Failure Mechanism – the physical failure process that results from one or more failure agents acting on a material

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- 3.7 Failure Mode – the readily observable manner in which a human error, equipment failure, or organizational failure manifests itself; the failure mode is an observable symptom of the more basic underlying cause(s).
- 3.8 Immediate Actions (remedial actions) –actions taken after the event to place the plant in a safe condition, ensure personnel safety or otherwise address the adverse condition(s) resulting from the event
- 3.9 Independent Reviewer – Qualified RCE Evaluator who independently reviews the Root Cause Evaluation. This individual is not the RC Evaluator.
- 3.10 Key Personnel - personnel who may have pertinent knowledge or experience of the event and should be interviewed during the Root Cause Evaluation process. These could include:
- 3.10.1 Personnel present during the event at the event location.
  - 3.10.2 Personnel present during the event at another important location such as the Control Room or an RP control point.
  - 3.10.3 Personnel who responded to the event location after the event.
  - 3.10.4 Any additional key personnel (beyond the initial list) that may be identified during the investigation phase
- 3.11 Latent Organizational Weakness (LOW) – LOWs are deficiencies in our processes, procedures, or values (shared beliefs, attitudes, norms, and assumptions) that can provoke errors or degrade defenses (error prevention tools).
- 3.12 Organizational & Programmatic (O&P) Issues – causal factors that describe various types of LOWs, for the involved organizations and implementing programs (work processes)
- 3.13 Possible Cause - A postulated cause which may have been present during the event, but for which there is insufficient evidence to further confirm (or to eliminate) its presence. In the case of multiple “possible” causes, there is insufficient evidence to determine that one possible cause is significantly more likely to have been present than the others. Possible causes typically involve one or more assumptions about event conditions, for which there is little or no supporting or refuting objective evidence readily available.
- 3.14 Possible Failure Mode - A postulated failure mode which may have been present during the event, but for which there is insufficient evidence to further confirm (or to eliminate) its presence. In the case of multiple possible failure modes, there is insufficient evidence to determine that one was significantly more likely to have been present than the others.

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- 3.15 Probable Cause – A postulated cause which was likely present during the event, and for which there is an apparent preponderance of evidence which indicates that this cause was significantly more likely to have been present than other postulated causes. Probable causes typically involve fewer assumptions about event conditions than possible causes, but have insufficient objective evidence readily available to achieve certainty.
- 3.16 Probable Failure Mode – A postulated failure mode which was likely present during the event, and for which there is an apparent preponderance of evidence which indicates that it was significantly more likely to have been present than other postulated failure modes. As a result, they typically involve fewer assumptions about event conditions than with possible failure modes, but there is still insufficient objective evidence readily available to achieve certainty.
- 3.17 RCE Coordinator – Individual at the site assigned overall responsibility for ensuring the RCE process is followed and Root Cause Evaluators are qualified. This may be the site CA&A Manager or Fleet Manager OE & CA, or a person reporting to these individuals that has been given this responsibility.
- 3.18 Responsible Manager (RM) - As used in this procedure is the management position designated by the CRG to ensure the condition is evaluated in accordance with the requirements of this procedure. Also referred to as the RCE Owner in this procedure. The Responsible Manager may be a Superintendent or above position and is equal to the term "Owner" as used in this procedure.
- 3.19 Similar Event – a previous event consisting of the same specific or similar Problem AND one or more shared root causes as the event being evaluated.
- 3.20 Systems, Structures and Components (SSCs) – acronym used to refer to the various systems, structures and components in the plant.
- 3.21 Team Leader – an individual assigned by the RM to lead team efforts in accordance with this procedure.

#### 4.0 RESPONSIBILITIES

The following functional position titles provide the structure for process performance:

- 4.1 The Responsible Manager (RM) is responsible for:
- 4.1.1 Ensuring that the assigned root cause evaluator and/or team leader have an appropriate level of experience and training.
  - 4.1.2 Ensuring a qualified root cause evaluator is assigned to the Root Cause Evaluation effort.

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- 4.1.3 Ensuring that Operations, Engineering & Maintenance personnel are assigned as team members for all Root Cause Analyses related to equipment reliability or generation impact issues.
  - 4.1.4 Providing the necessary support to ensure the evaluation is completed within the time designated by the CRG.
  - 4.1.5 Providing sufficient leadership interaction with the evaluator or team to provide assistance and coaching for success.
  - 4.1.6 Ensuring evaluations are of high quality and provide Corrective Actions to Preclude Repetition (CAPRs).
  - 4.1.7 Ensuring an appropriate independent review of the evaluation process and findings are completed for significant technical issues (e.g., internal and/or external expertise).
  - 4.1.8 Ensuring revisions to the root cause evaluation are reviewed by Corrective Action Review Board (CARB).
- 4.2 The root cause Evaluator or Team Leader (as indicated) is responsible for:
- 4.2.1 Resolving conflict and obtaining the required resources. [Team Leader]
  - 4.2.2 Utilizing this procedure for conduct of the evaluation. [both]
  - 4.2.3 Developing an effective and efficient corrective action plan that will preclude repetition. [both]
  - 4.2.4 Gaining acceptance for corrective actions and due dates prior to a scheduled CARB meeting. [both]
  - 4.2.5 Completing the root cause evaluation report in ample time for the CARB review. [both]
  - 4.2.6 Preparing and delivering a CARB presentation. [both]
  - 4.2.7 Identifying individuals to be interviewed and working with the team lead to develop an interview schedule. [Evaluator]
  - 4.2.8 Identifying the appropriate analysis techniques to be used during the investigation. [Evaluator]
  - 4.2.9 Ensuring the root cause process is followed as outlined in this procedure. [both]
  - 4.2.10 Ensuring physical evidence is collected as needed to support the evaluation. [Evaluator]

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- 4.2.11 Working with the Team Leader, develop and assign corrective actions for the RCE corrective action plan, including immediate, interim and long term corrective actions, as appropriate. [Evaluator]
- 4.2.12 Ensuring that individuals signing as the RC Evaluator and the Independent Reviewer for a RC evaluation meet the current requirements for qualified RC Evaluator. [both]
- 4.2.13 Ensuring that all available and relevant information is acquired by interviews of involved personnel, examination of affected equipment, reviews of pertinent industry events, and review of applicable plant documents. [Evaluator]
- 4.2.14 Notifying plant management immediately of additional specific concerns or significant generic implications identified during the evaluation process, and ensuring all those identified are included in the Root Cause Evaluation documentation. [both]

4.3 Root Cause Evaluation Team Members are responsible for:

- 4.3.1 Providing the necessary support to complete the evaluation in the prescribed time.
- 4.3.2 Actively participating to ensure all the applicable information is collected, reviewed and evaluated to identify root and contributing causes.
- 4.3.3 Maintaining a questioning attitude looking for the most basic cause and most effective solutions.
- 4.3.4 Supporting the presentation of the root cause at CARB presentation.

4.4 Each site's Manager, Corrective Actions and Assessments or Manager CAA Projects is responsible for ensuring:

- 4.4.1 Appropriate interface with the evaluator or team at its inception to provide guidance on the root cause process.
- 4.4.2 Sufficient CA&A personnel contact with the evaluator or team to provide assistance and coaching for success.

4.5 The Fleet Manager OE&CA is responsible for maintenance of this procedure.

*RC*

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## 5.0 DETAILS

### 5.1 PRECAUTIONS AND LIMITATIONS

- 5.1.1 Necessary scene preservation activities should be coordinated as required with Operations and Industrial Safety to ensure that nuclear, industrial and radiological safety are not compromised during the investigation.
- 5.1.2 Potential Extent of Condition should be explored as early as practical in the investigation, particularly if the event involves:
- 5.1.2.1 A failure in a safety-related SSC, since such events may have common mode failure implications, **OR**.
  - 5.1.2.2 A failure in a SSC considered important to plant reliability (e.g. trip-critical or trip-sensitive, etc.) since such events may require initiation of Operational Decision Making Issue (ODMI) precautions.
- 5.1.3 Initiate the investigation with minimal delay to avoid the following problems:
- 5.1.3.1 Loss or misplacement of physical and/or documentary evidence (e.g. loss of the "as-found" condition of failed or broken hardware, strip charts, plant computer information etc.).
  - 5.1.3.2 First hand reports of event participants and witnesses may alter with time due to stress, rationalization, poor or inaccurate memory etc.
  - 5.1.3.3 Similar events may recur.
- 5.1.4 Maintain objectivity to prevent jumping to conclusions. It is important to validate facts and not to make assumptions.
- 5.1.4.1 For example, you can't assume that a technician used a procedure or that the procedure would work as written or that an alarm printed on an alarm recorder was heard by an operator.
  - 5.1.4.2 Likewise, you can't assume that instructions given over the phone were heard and understood by the receiver. Ensure all facts recorded have been validated and that assumptions have been clearly indicated.
  - 5.1.4.3 Keep in mind that all human performance events are caused by personnel error. Avoid labeling a root cause as personnel error if at all possible; seek the underlying cause of the error instead.

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## 5.2 GENERAL PROCESS OVERVIEW

- 5.2.1 Root cause investigation is the process used to reconstruct an event in order to determine its most basic cause(s) and to formulate corrective actions to preclude repetition. Since events typically occur only after multiple barriers failed or a sequence of inappropriate actions occurred, they can have multiple root causes. Root causes are addressed by Corrective Actions to Preclude Repetition (CAPR).
- 5.2.2 Contributing causes are often identified which contribute to the condition or event, but would not by themselves have caused the event to occur. Corrective actions taken to address contributing causes will not by themselves preclude repetition.
- 5.2.3 Adverse Conditions are the result of human performance problems, equipment failures or organizational and programmatic weaknesses, and experience has shown that these three factors are often intertwined. The root cause analysis process will lead the investigator to consider all issues.
- 5.2.4 The actions in this procedure do not necessarily need to be performed in the sequence listed. The sequence of the actions should be based on the specific conditions encountered during the evaluation.
- 5.2.5 All Root Cause Reports assigned by CRG require the following minimum sign-offs:
- 5.2.5.1 Evaluator: (Qualified RC Evaluator)
  - 5.2.5.2 Reviewer: (Qualified RC Evaluator Independent of the Evaluator)
  - 5.2.5.3 Responsible Manager
  - 5.2.5.4 CARB Chairperson

## 5.3 ROOT CAUSE EVALUATION PERFORMANCE

- 5.3.1 The root cause investigation process begins when the condition is designated as requiring a Root Cause Evaluation (RCE) and ends when the RCE Report has been approved by the Corrective Action Review Board (CARB), any changes required have been incorporated.
- 5.3.2 The RM designates the Qualified Root Cause Evaluator and team leader.
- 5.3.3 The Evaluator and the team leader will develop a problem statement and a list of team members for presentation to the CRG.

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- 5.3.4 Root Cause Evaluations for issues related to equipment reliability or generation impact are performed by teams. These teams include Operations, Engineering & Maintenance personnel as members.
- 5.3.5 The RM should determine what additional team members considered necessary to provide a complete analysis of the condition being addressed. Additional team members that should be considered include the following:
- 5.3.5.1 Human Performance Coordinator/Manager
  - 5.3.5.2 Subject matter expert (SME)
  - 5.3.5.3 Representatives from department(s) involved in the event
  - 5.3.5.4 Representatives from department(s) most likely to be affected by the corrective action plan
  - 5.3.5.5 A member of the training department where training opportunities are applicable
  - 5.3.5.6 CA&A contact member to function as a mentor
- 5.3.6 **IF** a team is deemed necessary for a Root Cause Evaluation on issues other than those related to equipment reliability or generation impact issues, **THEN** the RM should determine what team members are considered necessary to provide a complete analysis of the condition being addressed. Team members that should be considered include the following:
- 5.3.6.1 Human Performance Coordinator/Manager
  - 5.3.6.2 Subject matter expert (SME)
  - 5.3.6.3 Representatives from department(s) involved in the event
  - 5.3.6.4 Representatives from department(s) most likely to be affected by the corrective action plan
  - 5.3.6.5 A member of the training department where training opportunities are applicable
  - 5.3.6.6 CA&A contact member to function as a mentor
- 5.3.7 For technical issues, the RM should make an initial determination (based on the significance and/or complexity of the event) whether independent technical review will be needed for technical Root Cause Evaluation.

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5.3.7.1 The RM may use available station or fleet resources (e.g. consultation with station or fleet Subject Matter Experts (SMEs) and station or fleet management) as required to make this determination.

5.3.7.1.1 **IF** the equipment failure involved a unique set of circumstances or uncommon failure mode from those seen and successfully corrected previously at the site, **THEN** independent technical review may be necessary.

5.3.7.1.2 **IF** the RM determines there is a limited ability to confirm the cause of the failure due to available technical resources at the site, **THEN** independent technical review may be necessary.

#### 5.4 CAUSE INVESTIGATION GUIDANCE

5.4.1 Root Cause Investigations are unique and the specific actions required from this section will vary from event to event, and should be considered as options.

5.4.2 Assemble the team (if required or designated) and Initiate the investigation with minimal delay.

5.4.3 Initiate coordinated scene preservation action as soon as practical, if possible. The specific combination of actions to accomplish this may vary, and may include, but are not limited to, the following:

5.4.3.1 Delay scene cleanup to allow recording the event scene

5.4.3.2 Promptly begin to capture relevant information before it is lost or eliminated by clean-up.

5.4.3.3 Photograph, videotape and/or sketch the scene.

5.4.3.4 Record as-found locations of significant accident-related materials

5.4.3.5 Record names and badge numbers of individuals who observed or participated in the event.

5.4.3.6 Collect individual recollections of the event or of activities the individuals were participating in, preferably before leaving work for the day.

5.4.3.7 Interview individuals as soon as practical, if possible before leaving work for the day.

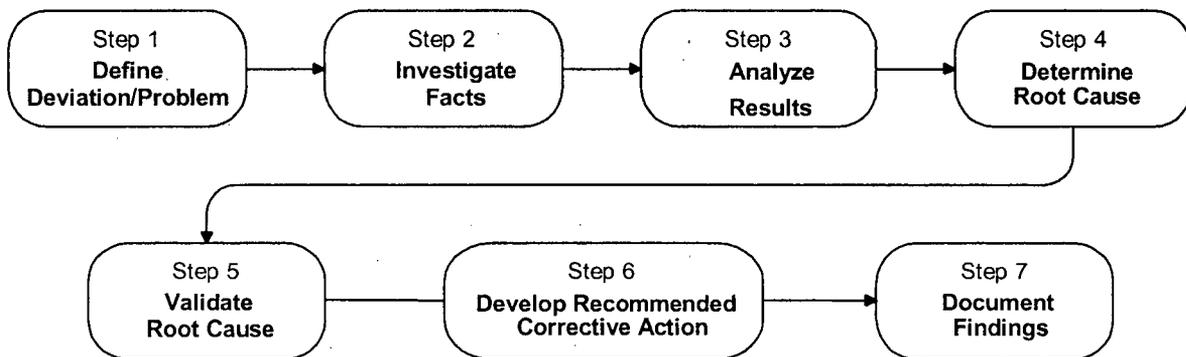
5.4.3.8 Take pre-tear down photos showing scale and orientation.

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- 5.4.4 Initiate physical evidence collection, if possible, as soon as practical. The specific combination of actions to accomplish this may vary, and may include, but are not limited to, the following:
- 5.4.4.1 Photograph successive stages of tear down, noting scratches, stains, dimensions, orientation, etc.
  - 5.4.4.2 Ensure symmetric failed components are marked to preserve orientation for analysis.
  - 5.4.4.3 Take appropriate precautions to avoid any alteration of the fracture surfaces, coatings, lubricants, etc.
  - 5.4.4.4 Do not unnecessarily decontaminate or otherwise clean failed components. Wear clean gloves if chemical analysis of the sample surfaces may be desired.
  - 5.4.4.5 Bag failed parts separately and identify the component name, number, date, etc.
  - 5.4.4.6 Move items to a controlled area to prevent tampering or loss
  - 5.4.4.7 Collect relevant samples (e.g., lubricants and coolants, paint and other coatings, ash or other degraded material, transferred material, such as smeared metal)
  - 5.4.4.8 Copy potentially relevant documents (e.g. work packages with signoffs, log books, plant computer data, strip charts, etc.)
- 5.4.5 Consider the need for laboratory tests to obtain destructive/non-destructive failure analysis and the use of on-site/off-site experts. Judgment should be used to assess cost vs. gain.

## 5.5 ENTERGY ROOT CAUSE PROCESS STEPS

5.5.1 The Entergy Nuclear process map for conducting a root cause evaluation is a 7-step process. The individual steps of the process are described below. Additional details are shown in Attachment 9.4 - Root Cause Evaluation Process Flowcharts.



**Figure 1**

5.5.2 Step One - Define the Problem - Purpose: To define the problem and the scope of the investigation.

5.5.2.1 Obtain preliminary information by discussing the event with key personnel to clarify the perceived PROBLEM and the resulting CONSEQUENCE(s) caused by the problem. The perceived problem may not always reflect the actual problem but may be a symptom of the actual problem.

5.5.2.2 Develop a problem statement (preferably one short sentence); use the object – deviation format if practical. Identify what is or went wrong.

5.5.2.2.1 Avoid stating “Whys” in the problem statement.

5.5.2.2.2 Identify the adverse effects or consequences of the stated PROBLEM and the severity of these consequences.

5.5.2.2.3 Ensure the problem statement contains only one problem.

5.5.2.2.4 Ensure the problem statement is not confused with the consequences or with corrective actions.

5.5.2.2.5 Use the problem statement to maintain focus during the investigation.

5.5.3 Step Two - Investigate Facts - Purpose: Conduct an investigation to gather relevant information to be used in the next step (“Analyze Results”).

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- 5.5.3.1 Conduct a data and document review. Refer to Attachment 9.2.
- 5.5.3.2 Ensure Human Performance Error Reviews (HPERs) are conducted as required. Refer to EN-HU-103.
- 5.5.3.3 Ensure a Related Conditions/Operating Experience search is initiated. Refer to Attachment 9.8.
- 5.5.3.4 Identify key pieces of evidence that need to be collected and key personnel that should be interviewed.
- 5.5.3.5 From the preliminary information available, develop questions to be asked during initial interviews.
- 5.5.3.6 Conduct initial interviews with key personnel (Attachment 9.3).
- 5.5.3.7 Statements by interviewees should be validated by multiple sources whenever possible.
- 5.5.3.8 From the preliminary information available and any guidance provided by the RM, the RCE Coordinator, or other management team members, establish key lines of inquiry to pursue.
- 5.5.3.9 The Evaluator (or team) should keep track of the sequence of all events, the source of all facts used as evidence, basis for all assumptions and the sources (documents) used.
- 5.5.4 Step 3 - Analyze Results - Purpose: Analyze results to integrate information and determine "why" the event occurred (using one or more recognized analysis techniques).
  - 5.5.4.1 The Evaluator should select the most appropriate cause analysis technique(s) from Attachment 9.1 OR select other industry recognized techniques.
  - 5.5.4.2 Use the applicable guidance in the appropriate procedure OR the supplied guidance for the recognized technique(s) to begin the analysis.
  - 5.5.4.3 Resolve any conflicting information between sources or documents (e.g. – logs, interview notes, HPER form, etc.).
  - 5.5.4.4 Verify that new information does not alter conclusions.
  - 5.5.4.5 The selected analysis techniques should be used to establish tightly linked, evidence based chains of cause and effect.

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- 5.5.4.6 Investigation and analysis is an iterative process and any new data and evidence must be integrated into the analysis to form a complete picture of the event.
- 5.5.4.7 Determine if more information is required by testing whether a complete picture of the event has been developed:
- 5.5.4.7.1 **IF** a complete picture exists, **THEN** continue with Step 4 – Determine Root Causes.
  - 5.5.4.7.2 **IF** a complete picture does not exist, **THEN** continue the investigation, **OR**
  - 5.5.4.7.3 **IF** a complete picture cannot be further developed, **THEN** document the bases for ending the investigation and analysis in the Root Cause Evaluation section of the report.
- 5.5.4.8 Review the PROBLEM/CONDITION for generic implications. Correcting generic problems can have a broad impact on plant safety and reliability since the corrective actions address whole classes of problems rather than just a specific incident.
- 5.5.4.9 Establish whether the Problem/Condition can affect other SSCs, organizations or work processes.
- 5.5.4.10 Use the two-part, two-step process in Attachment 9.7.
- 5.5.4.11 Substantiate conclusions that the problem is isolated or restricted in nature and that the corrective action(s) address the problem wherever it is identified.
- 5.5.4.12 If not already determined by CRG, document if an external OE will be needed to notify the rest of the industry, using the process defined in EN-OE-100.
- 5.5.5 Step 4 - Determine Root Causes - Purpose: Analyze results to determine "Why" the event happened.

**NOTE**

Industry data indicates that multiple root causes are common (typically about 80% of events have multiple root causes). Multiple root causes are those which are necessary and sufficient for the event to occur.

5.5.5.1 Using the selected analysis tool(s), the Evaluator (or team) should continue to ask "why" each causal factor occurred until all the "whys" have been satisfactorily explained.

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- 5.5.5.2 For all events, perform an evaluation for “LOCAL” Organizational & Programmatic issues – that is, those O&P issues (LOWs) which influenced the outcome of the event under investigation. See Attachment 9.5 for specific guidance.
- 5.5.5.3 Continue the analysis of the information collected until one or more of the following occur:
  - 5.5.5.3.1 Further information to develop a complete picture of the event is not available (see 5.5.4.7) **OR**
  - 5.5.5.3.2 The cause is outside the control of Entergy, **OR**
  - 5.5.5.3.3 There are no other causes that explain the effect being evaluated.
- 5.5.5.4 For all events, establish whether a weakness in any safety culture component was a root cause or significant contributing cause of the event or condition. See Attachment 9.6 for specific guidance.
  - 5.5.5.4.1 Additional information on Safety Culture components may be obtained from NRC Regulatory Issue Summary (RIS) 2006-13.
  - 5.5.5.4.2 The Evaluator (and/or team) should include station Licensing expertise as a resource during this evaluation.
  - ~~5.5.5.5 Perform an Extent of Cause evaluation by reviewing the individual Root and Contributing causes for generic implications.~~
  - 5.5.5.5.1 Establish whether the causes can affect other SSCs, organizations or work processes.
  - 5.5.5.5.2 Use the two-part, two-step process in accordance with Attachment 9.7.
  - 5.5.5.5.3 Substantiate conclusions that the causes are isolated or restricted in nature and that the corrective action(s) address the causes wherever they are identified.
- 5.5.5.6 If not already determined by CRG, document if an external OE will be needed to notify the rest of the industry, using the process defined in EN-OE-100.
- 5.5.5.7 Complete the Previous Occurrences evaluation.
  - 5.5.5.7.1 **IF** a Similar Event has previously occurred **THEN** evaluate why it was not prevented or evaluated. Refer to Attachment 9.8.

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5.5.5.7.2 **IF** there was a previous occurrence of the condition, **THEN** document the cause/contributing cause evaluation for recurrence.

5.5.5.7.3 **IF** the problem is recurring at the Unit or has occurred at other Entergy nuclear plants, **THEN** describe previous corrective actions taken **AND** document why previous corrective actions were not successful in preventing repetition.

5.5.5.7.4 Document the basis for any determinations made, including whether or not previous similar events were actually credible opportunities to have prevented this event (rather than missed opportunities).

5.5.5.7.5 Recurrence may indicate O&P causes (LOWs) as either root or contributing causes (e.g. recurrence may be attributed to "living with known problems" or "previous corrective actions inadequate or not implemented in a timely manner").

5.5.5.8 Review Entergy's response to any applicable SOER(s) to determine if a more robust response could have prevented or mitigated the event.

5.5.5.9 Utilize insights gained from this review as you develop the Corrective Action Plan for this CR (e.g. actions that previously failed may not be desired as part of the new corrective action plan).

5.5.5.10 Finalize the Root Cause method summary document (s). (e.g., E&CF Chart, KT analysis, etc.) used in the analysis.

5.5.5.11 Classify the root cause(s) and contributing cause(s). Cause codes and categories are listed in EN-LI-121.

5.5.5.12 **IF** the root cause(s) (**OR** the Failure modes, as applicable) of the event or condition is (are) indeterminate **THEN**:

5.5.5.12.1 Explain the basis for not determining the Root Cause(s) (**OR** the Failure modes, as applicable) **AND** identify either the possible causes **OR** the possible failure modes.

5.5.5.12.2 Provide documentation to support the stated possible cause(s) (**OR** the possible Failure modes, as applicable).

5.5.5.12.3 Describe the unavailable information that is needed to determine the Root Cause(s) **AND** what further actions would be necessary to determine the Root Cause(s)

5.5.6 Step 5 – Validate Root Causes - Purpose: Verify that the real root cause(s) of the problem was identified.

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5.5.6.1 Validate causes identified using the following criteria:

5.5.6.1.1 The problem would not have occurred had the root cause(s) not been present.

5.5.6.1.2 Correction or elimination of the cause(s) will ensure the problem will not recur due to the same causal factors.

5.5.6.1.3 Correction or elimination of the causes(s) will preclude repetition of the specific problem or of similar problems.

5.5.6.2 Ensure that each of the root cause(s) and contributing cause(s) are assigned a "causal code" from EN-LI-121.

5.5.6.3 **IF** determined necessary by the RM, **THEN** ensure independent technical review of the evaluation process and findings is performed for significant technical issues (e.g., internal and/or external expertise). Refer to 5.3.7 for additional information.

5.5.6.3.1 Evaluate the need for verification of the root cause for technical issues by mockup or infield testing.

5.5.6.3.2 **IF** this additional level of testing is not required, **THEN** document the basis for the conclusion.

5.5.7 Step 6 - Develop Recommended Corrective Actions - Purpose: Propose actions to address the cause(s) of the problem and preclude repetition.

5.5.7.1 Ensure recommended corrective actions are viable according to the guidelines presented in Corrective Action Plan development, Attachment 9.9.

5.5.7.2 Recommend corrective actions to correct each identified root cause, contributing cause and generic implication (Extent of Condition or Extent of Cause issues).

5.5.7.3 **IF** no corrective actions are recommended for an identified cause or generic implication, **THEN** document the basis for each recommendation of "no action", **AND** include an evaluation of the risk of taking no action.

5.5.7.4 Identify which cause(s) or generic implication(s) each recommended corrective action is intended to correct/address.

5.5.7.5 Identify which corrective actions are intended as CAPRs for the event.

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- 5.5.7.6 Identify which corrective actions would be Long Term Corrective Actions (LTCAs) as described in EN-LI-102.
- 5.5.7.7 Recommend actions to measure effectiveness of the recommended corrective actions using the guidance in Attachment 9.10.
- 5.5.7.8 If CARB determines that there is a Fleet Learning from the RCE, a corrective action to the OE Coordinator is issued per EN-LI-102, Attachment 9.5. (For Cat. A CR with RCEs not sent for CARB approval, the Manager approving the RCE makes the fleet learning determination and presents that determination to CRG for approval. If approved, a CA is issued to the OE Coordinator per EN-LI-102, Attachment 9.5.) Guidance for determining what constitutes a Fleet learning is provided in EN-LI-102, Attachment 9.5.
- 5.5.8 Step 7 - Document Findings - Purpose: Document findings to provide a permanent, auditable record and to provide retrievable information for subsequent trending, problem solving and corrective action review.
  - 5.5.8.1 Obtain and use a standard Entergy RCE report template from the Electronic Document Management system. Attachment 9.11 shows a sample of this form.
  - 5.5.8.2 The Root Cause Evaluation Report consists of the following sections:
    - 5.5.8.2.1 Cover Page
    - 5.5.8.2.2 Problem Statement
    - 5.5.8.2.3 Event Narrative
    - 5.5.8.2.4 Root Cause Evaluation
    - 5.5.8.2.5 Generic Implications
    - 5.5.8.2.6 Previous Occurrence Evaluation
    - 5.5.8.2.7 Safety Significance Evaluation
    - 5.5.8.2.8 Corrective Action Plan
    - 5.5.8.2.9 Effectiveness Review Plan
    - 5.5.8.2.10References
    - 5.5.8.2.11Attachments

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5.5.8.3 Cover Page - Type Written Names on the cover page are considered to be an acceptable alternative to physical signatures. Authentication of the names on the report cover sheet is accomplished as follows.

5.5.8.3.1 Electronic signatures on the corrective action in PCRS that completes and attaches the RCE shall indicate review and approval of the root cause Evaluation and confirmation that the names appearing on the cover sheet for "Evaluator," "Reviewer" and the "Approvers" (typically RM and CARB Chairman) are correct.

5.5.8.3.2 Enter the following plant-specific information for the event in the RCE template:

5.5.8.3.2.1 Nuclear Plant/Unit (i.e. ANO – Unit 1, Waterford 3, etc.)

5.5.8.3.2.2 Event Description (title) and date of event

5.5.8.3.2.3 Report Number (if applicable), Report Revision number, and date of the report

5.5.8.3.2.4 Names of the Evaluator, the Reviewer, and Approvers (i.e. the RM and CARB Chairman)

5.5.8.4 Problem Statement section:

5.5.8.4.1 Provide a brief description of the problem and its consequences.

5.5.8.5 Event Narrative section:

5.5.8.5.1 Include factual information providing a chronological description of the events and conditions that led to the problem, HOW the problem occurred, and the consequences of the event.

5.5.8.5.2 Use the completed analysis tool(s) as a guide. Describe the plant or equipment response during the event (when applicable).

5.5.8.5.3 Describe the actions taken to stabilize conditions (remedial actions).

5.5.8.5.4 Describe the equipment, human performance, and O&P problems (LOWs) and their effects (consequences).

5.5.8.5.5 Describe the activities of the key personnel prior to, during, and subsequent to the event.

5.5.8.5.6 Describe the related plant activities prior to, during, and subsequent to the event.

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5.5.8.5.7 Describe the investigative activities following the event and their results.

5.5.8.6 Root Cause Evaluation section:

5.5.8.6.1 This section may include an event scenario (when applicable to the event) describing equipment failure modes and failure mechanisms, internal and external behavioral factors (drivers) for inappropriate action(s), or how O&P problems (LOWs) occurred or developed.

5.5.8.6.2 Document “How and Why” each equipment failure, inappropriate action, or O&P issue occurred as identified during the investigation.

5.5.8.6.3 Summarize the chain of cause and effect for each identified root cause, explaining HOW the problem resulted from the identified cause(s)

5.5.8.6.4 Summarize the chain of cause and effect for each identified contributing cause, explaining HOW the problem and its consequences were affected by the identified cause(s).

5.5.8.6.5 **IF** the event root cause(s) is/are indeterminate despite rigorous investigation, **THEN**:

5.5.8.6.5.1 State the probable cause(s), **OR**

5.5.8.6.5.2 State the possible cause(s), **OR**

5.5.8.6.5.3 State the probable or possible failure modes.

5.5.8.6.6 Provide a summary of the results of the O&P Evaluation performed using Attachment 9.5.

5.5.8.6.7 Clearly identify which (if any) of the defined causes (e.g. RC-1, CC-2, etc) describe or bound the O&P causal factor/cause being discussed.

5.5.8.6.8 Describe any identified O&P issues (LOWs) that **did not** appear to have a “cause & effect” relationship to the investigated event – **AND** whether a new CR or a Learning Organization (LO) document was initiated.

5.5.8.7 Safety Culture Evaluation

5.5.8.7.1 Provide a summary of the results of the Safety Culture evaluation performed using Attachment 9.6.

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- 5.5.8.8 Generic Implications section (Extent of Condition and Cause) - Document the results of the review from Attachment 9.7. Include the following items in the write-up (relative to both the problem/condition and the cause(s)):
- 5.5.8.8.1 Effect(s) on equipment. (Is this problem/cause limited to this component/equipment, or does it apply to others as well?) (N/A for non-equipment related Conditions)
  - 5.5.8.8.2 Effects upon processes/programs. (Is this problem/cause limited to this specific process/program, or does it apply to others as well?) (N/A for non-process/program related Conditions)
  - 5.5.8.8.3 Effects upon human performance. (Is this problem/cause limited to this specific occurrence, or are there related HU Traps/Latent Organizational Weaknesses (LOWs) that apply to others as well?) (N/A for non-HU-related Conditions)
  - 5.5.8.8.4 Existing broader (generic/common mode) considerations (if any)
  - 5.5.8.8.5 Level of risk (high, medium, or low) and the basis for the conclusion.
- 5.5.8.9 Previous Occurrence Evaluation
- 5.5.8.9.1 Document the results of the internal and external OE reviews in this section.
  - 5.5.8.9.2 The results should include: the search criteria (keywords) used, time period searched, and databases searched. State whether any similar site or fleet events were identified.
- 5.5.8.10 Safety Significance Evaluation
- 5.5.8.10.1 Document any impact to the general safety of the public, nuclear safety, industrial safety and radiological safety.
  - 5.5.8.10.2 In this section, clearly state the actual (or potential) safety significance of the event or condition and, **IF** long term corrective actions are to be delayed, **THEN** what impact on safety the delay will cause.
  - 5.5.8.10.3 The evaluation process and the conclusions reached should be easily understood. (There may be occasions when the evaluator must obtain assistance from outside sources such as Engineering to further support the safety significance evaluation).

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5.5.8.10.4 **IF** there is a negative impact on safety significance, **THEN** state whether additional corrective actions or implementation of compensatory measures will be required.

5.5.8.11 Corrective Action Plan

5.5.8.11.1 Document the remedial (Immediate) actions taken to mitigate and/or resolve the problem.

5.5.8.11.2 Document any interim actions required while long-term actions are completed **AND** identify which long-term action must be completed before each interim action can be stopped.

5.5.8.11.3 Document proposed corrective actions and due dates, and responsible groups to address each identified root cause, contributing cause, and valid generic implication;

5.5.8.11.4 Ensure that the corrective action plan includes corrective actions to address O&P issues (LOWs).

5.5.8.11.5 Clearly identify those which are "CAPRs" and those which are "Long-Term Actions" per guidance in EN-LI-102.

5.5.8.11.6 **IF** no corrective action is recommended for an identified cause or valid generic implication, **THEN** document the basis for this conclusion **AND** any risks or consequences identified as a result of taking no action.

5.5.8.12 Effectiveness Review Plan

5.5.8.12.1 Document the Effectiveness Review plan developed using Attachment 9.10.

5.5.8.12.2 Specify the MAST criteria, the responsible department, and the due date for each MAST criteria set developed.

5.5.8.13 References

5.5.8.13.1 Provide a list of reference documents. These may include (but are not limited to) procedures, memos, work orders, etc used in the investigation, to support the root cause conclusions.

5.5.8.13.2 List the personnel involved in the evaluation(s) including team members (when a team is used) and personnel interviewed or contacted during the event investigation.

5.5.8.14 Attachments

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5.5.8.14.1 Provide E & CF Charts, K-T forms, simplified system diagrams or schematics, sketches of equipment arrangement or configuration, special test results, external laboratory reports, or other documents which are not otherwise retrievable plant records that support the investigation

#### 5.5.9 ROOT CAUSE EVALUATOR QUALIFICATION AND TRAINING REQUIREMENTS

- 5.5.9.1 The site RCE Coordinator schedules initial as well as any required classroom refresher training.
- 5.5.9.2 Individual stations may conduct position-specific continuing training as needed to communicate fleet or station lessons learned in Root Cause process execution, to add to Evaluator experience, or for performance improvement.
- 5.5.9.3 Qualified instructors, SME instructors, or approved vendors may conduct Root Cause classroom training.
- 5.5.9.4 Completed Root Cause classroom training is documented and entered into records per applicable TQ-series procedures.
- 5.5.9.5 The qualified Root Cause Evaluator list resides in the fleet electronic Learning Management System.
- 5.5.9.6 Individual site departments are responsible for maintaining an appropriate number of qualified Evaluators, as established by individual station management.
- 5.5.9.7 Personnel qualify as Evaluators in accordance with Qualification Card FQC-CAA-ROOTCA.

#### 5.6 EFFECTIVENESS REVIEWS

- [1] An Effectiveness Review that reaches a conclusion that Corrective Actions / CAPRs were ineffective should result in the initiation of a new CR to determine the need to revise the cause determination, corrective action plan, effectiveness review plan and the need for additional CARB reviews. Also, consider an additional CR to explore the potential Corrective Action Program failure.

### 6.0 INTERFACES

- 6.1 EN-HU-103, Human Performance Error Reviews
- 6.2 EN-LI-102, Corrective Action Process

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- 6.3 EN-LI-118-01, Event and Causal Factor Charting
- 6.4 EN-LI-118-02, Change Analysis
- 6.5 EN-LI-118-03, Barrier Analysis
- 6.6 EN-LI-118-04, Task Analysis
- 6.7 EN-LI-118-05, Fault Tree Analysis
- 6.8 EN-LI-118-06, Common Cause Analysis
- 6.9 EN-LI-104, Self-Assessment Process
- 6.10 EN-LI-121, Entergy Trending Process
- 6.11 EN-OE-100, Operating Experience Program
- 6.12 EN-OP-104, Operability Determinations

**7.0 RECORDS**

- 7.1 Root Cause Evaluators or the RM attach CARB approved Root Cause Reports to the appropriate corrective action item in PCRS.
- 7.2 CA&A transmits closed Condition Reports to Administrative Services for retention in accordance with applicable procedures.

**8.0 SITE SPECIFIC COMMITMENTS**

Step	Site	Document	Commitment Number or Reference
[2]	RBS	Commitment 7958	commitment number or reference
[3]	RBS	CR 2003-3203	commitment number or reference
[4]	RBS	Commitment P-13364	
[5]	ANO	Commitment P-7818	
[6]	ALL	10CFR50 Appendix B	Criterion XVI
[7]	IPEC	COM-00-00009	Resp to IER 88-200
[8]	IPEC	COM-94-05146	IPN-94-091
[9]	IPEC	NL-97-084-C07	NL-97-084
[10]	IPEC	NL-97-084-C13	NL-97-084
[11]	IPEC	NL-97-084-C15	NL-97-084
[12]	IPEC	NL-97-084-C16	NL-97-084
[13]	VY	Commitment	SOER 92-01
[14]	VY	Commitment	NCR9224
[15]	VY	Commitment	ER2002 – 1897 01

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## 9.0 ATTACHMENTS

- 9.1 DATA COLLECTION AND ANALYSIS TECHNIQUES
- 9.2 DATA AND DOCUMENT REVIEWS
- 9.3 INTERVIEWING TECHNIQUES
- 9.4 ROOT CAUSE EVALUATION PROCESS FLOWCHARTS
- 9.5 EVALUATION FOR ORGANIZATIONAL & PROGRAMMATIC ISSUES
- 9.6 SAFETY CULTURE EVALUATION
- 9.7 GENERIC IMPLICATIONS: EXTENT OF CONDITION/EXTENT OF CAUSE
- 9.8 PREVIOUS OCCURRENCE EVALUATION/OPERATING EXPERIENCE
- 9.9 CORRECTIVE ACTION PLAN
- 9.10 EFFECTIVENESS REVIEW PLAN
- 9.11 REPORT FORMAT
- 9.12 ROOT CAUSE EVALUATION QUALITY CHECKLIST/SCORE SHEET

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**ATTACHMENT 9.1**

**DATA COLLECTION AND ANALYSIS TECHNIQUES**

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## INTRODUCTION

Some of the common tools used to gather and evaluate information during a root cause investigation are summarized in this attachment.

A comparison of the various data collection and analysis techniques is provided in Table 9.1.1 and 9.1.2.

### Data Collection Techniques

- Data & Document Review (Attachment 9.2)
- Interviewing (Attachment 9.3)
- Human Performance Review (See EN-HU-103)

### Analysis Techniques

Table 9.1.1 describes analysis techniques taught in the Entergy Root Cause Analysis Initial Training course:

- Event and Causal Factor (E&CF) Charting – see EN-LI-118-01
- Change Analysis see - EN-LI-118-02
- Barrier Analysis - see EN-LI-118-03
- Task Analysis - see EN-LI-118-04
- Fault Tree Analysis - see EN-LI-118-05
- Common Cause Analysis – see EN-LI-118-06

Specific instructions on performing these techniques are found in their respective progeny procedures.

Table 9.1.2 describes other analysis techniques (such as PII tools, TapRoot, etc.) that may require the assistance of a site peer or a vendor familiar with that technique, should you have a need to use them.

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ATTACHMENT 9.1

DATA COLLECTION AND ANALYSIS TECHNIQUES

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METHOD	USE	ADVANTAGES	LIMITATIONS
<b>EVENT &amp; CAUSAL FACTOR (E&amp;CF) CHARTING</b>	Organizes information to show exact sequence of events including causal factors, other conditions that influenced the event and assumptions made.	Organizes data by time of occurrence and cause/effect. Develops investigation and provides a cause oriented explanation. Provides a concise story of what happened and how it happened.	Requires up-front information to start and can be time consuming to develop.
<b>CHANGE ANALYSIS</b>	Used when causes of the problem are obscure and when change is suspected. Used to compare an activity that's been successfully performed to the same activity when performed unsuccessfully.	Good starting point for an investigation because it focuses on what is different about this situation vs. other times. Can be used to develop questions for interviewing.	Gradual changes and compounding of changes can be overlooked. Changes can be incorrectly defined.
<b>TASK ANALYSIS</b>	Used to break a task into sub tasks. Identify what should have happened and can be used to identify deficiencies in training, procedures or procedure adherence.	Familiarizes the investigator with the task and helps to identify where problems occurred from accepted methods.	Walk-through task analysis may be time consuming and is most effective if performed with the personnel normally responsible for the task which may be difficult to arrange.
<b>BARRIER ANALYSIS</b>	Used to identify physical and administrative barriers to prevent inappropriate actions that are either in place or missing.	Barriers can be reviewed for effectiveness to determine what caused them to fail which helps identify causal factors and corrective actions.	All barriers may not be recognized if the investigator is not familiar with the process.
<b>FAULT TREE ANALYSIS</b>	Easy to use technique that is applicable to both Equipment and Human problems. Excellent for displaying the possible causes of an event or condition in a logic tree that is easily understood.	Requires little prior training. All possible causes can be displayed in a logic tree form that is easily understood. Aids in the elimination of cause(s) and the confirmation of true cause(s). Can be used individually or with a team.	<u>Equipment problem</u> : Requires the input of experts to list all possible causes. <u>Human performance problem</u> : May only get to general area of cause. Most likely will require further analysis to establish exact cause.

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**ATTACHMENT 9.1**
**DATA COLLECTION AND ANALYSIS TECHNIQUES**

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<b>Table 9.1.2</b>			
<b>METHOD</b>	<b>USE</b>	<b>ADVANTAGES</b>	<b>LIMITATIONS</b>
KEPNER-TREGOE SITUATION APPRAISAL	Use to: Clarify, separate and sort concerns; Determine priorities for corrective actions.	Aids in breaking complex problems into solvable portions.	Requires individual trained in K-T techniques; may be used for all types of events (equipment, programmatic and personnel).
KEPNER-TREGOE DECISION ANALYSIS	Use for making decisions between alternative choices, e.g., corrective actions; or evaluating previous decision-making.	Provides for making objectives decisions between alternatives.	Requires individual trained in K-T techniques; may be used for all types of events (equipment, programmatic and personnel).
KEPNER-TREGOE PROBLEM ANALYSIS	Use for determining cause based on identified deviations/distinctions from normal.	Provides for an objective, systematic approach to explaining reasons for deviation.	Requires individual trained in K-T techniques; may be used for all types of events (equipment, programmatic and personnel).
KEPNER-TREGOE POTENTIAL PROBLEM ANALYSIS	Use for evaluating potential effects of proposed corrective actions.	Provides for an objective, systematic approach to evaluating potential adverse effects.	Requires individual trained in K-T techniques; may be used for all types of events (equipment, programmatic and personnel).
PII ORGANIZATION AND PROGRAM INTERFACE CHART	Use for evaluating program and procedure interface problems.	Provides a graphical representation of number of interfaces, allowing for assessment of quantity of interfaces.	Requires knowledge of departmental functions and responsibilities.
PII STREAM ANALYSIS	Use for determining root cause(s) from list of symptoms; may also be used for equipment problems.	Looks at big picture and assesses all aspects of problem.	Requires specific knowledge of the system or process.
PII WORK PROCESS INTERFACES ASSESSMENT	Use for assessing specific attributes of a program.	Provides clear guidance as to good characteristics of specific attribute.	Requires specific knowledge of the system or process.
PII STRUCTURE/ FUNCTION ASSESSMENT	Use for assessing specific attributes of a program.	Provides clear guidance as to good characteristics of a specific attribute.	Requires specific knowledge of process.
PII ORGANIZATIONAL CULTURE ASSESSMENT	Use for assessing specific attributes of an organization.	Provides clear guidance as to good characteristics of a specific attribute.	Requires specific knowledge of process.



**Root Cause Analysis Process**

**ATTACHMENT 9.1**

**DATA COLLECTION AND ANALYSIS TECHNIQUES**

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<b>Table 9.1.2</b>			
<b>METHOD</b>	<b>USE</b>	<b>ADVANTAGES</b>	<b>LIMITATIONS</b>
PII PROGRAM IMPLEMENTATION ASSESSMENT	Use for assessing specific attributes of a program.	Provides clear guidance as to good characteristics of specific attribute.	Requires specific knowledge of process.
PII PROGRAM DESIGN ASSESSMENT	Use for assessing specific attributes of a program.	Provides clear guidance as to good characteristics of specific attribute.	Requires specific knowledge of process.
ISHIKAWA DIAGRAM ("FISHBONE" DIAGRAM)	Use to categorize all possible causes into root and/or contributing causes	Provides graphical overview of causes; can be used in group environment.	Not structured; more useful for categorizing causes than determining causes.
SYSTEM IMPROVEMENTS, INC., TAPROOT	Use as an event investigation process to identify both programmatic and human performance weaknesses.	Systematic evaluation process that identifies causal factors and potential root causes quickly.	Requires specific training on TapRoot method; not limited to specific type of problem.
PII O&P TECHNOLOGY FOR COMMON CAUSE ANALYSIS	Process for testing for, and evaluating, both Organizational and Programmatic common causes.	Allows flexible coding of data, includes use of Skill, Rule & Knowledge-based errors. Uses conservative practices to determine statistically significant causes.	Requires specific training on PII method. Data collection & coding may be time-consuming.
PII FAILURE MODES ANALYSIS TECHNOLOGY (FMA) AND HAND BOOK FOR EQUIPMENT FAILURES	Process for evaluating all possible causes of an equipment failure as compiled from industry and station experience.  The possible causes are evaluated by comparing refuting and supporting evidence that is gathered during the course of the investigation.	Provides a rigorous review of all possible causes and validates the root and contributing causes with supporting evidence and by eliminating unsupported possible causes.	Requires specific training on PII method. May be time-consuming and resource-intensive

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The following is a list of resources which should be available to the investigator during an event investigation:

1. Plant monitoring systems for pre, during and post failure information such as chart recordings, plant computer, etc.
2. Plant documentation (i.e. procedures, correspondence, operating logs, turnover documents, work packages, LERs, Assessment Reports, etc.)
3. Vendor manuals
4. Maintenance & surveillance history
5. Design basis information, drawings and specifications, historical or current modification packages, engineering evaluations etc.
6. Evidence - i.e., visual inspection, non-destructive and destructive testing, additional monitoring of equipment and data collection, including experimentation may be required to validate assumptions
7. Equipment Performance and Information Exchange System (EPIX) and/or archived Nuclear Plant Reliability Data System (NPRDS) data to determine if industry operating experience exists for similar components at other plants. Personnel can perform searches of INPO & NRC databases, identification of pertinent SOERs, SERs, SENs and NRC Bulletins and Notices, or may contact other nuclear sites.
8. Vendor input/consultations to determine if the problem has been previously addressed and to obtain literature and expertise. NSSS vendors have failure analysis capabilities. Water treatment vendors can analyze corrosion related failures on non-radioactive piping as part of their chemical treatment product support.
9. Trending reports available upon request by the investigator
10. Interviews with personnel involved in the event, preliminary event reports or notifications and written statements by those involved in the event
11. Systems Training Manuals
12. Training and qualification reports, job performance measures.
13. Site HPE Coordinator for expertise in human performance problems
14. Materials management database; material specifications and purchase order logs to identify where a particular component has been used. MP&C personnel can assist with this information
15. Subject matter experts such as System/Design Engineers, Trainers, etc.

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**INTERVIEWING**

Interviewing is probably the most often used tool to identify behavioral factors and many causal factors.

**Guidelines** - Interviews must be timely to be effective as facts become less clear as the time between the event and the interview increases. Interviewees may not be able to recall all details or may recall them incorrectly. Although preparing for the interview is important, it should not delay prompt contact with the participants and witnesses.

The following guidelines are applicable:

1. Seek facts -- not blame.
2. Make appointments with interviewees through management channels.
3. Select interview setting carefully so that the interviewee will be comfortable and where the least amount of distraction is present.
4. Plan questions ahead of time to help keep the interview on track.
5. Be at ease so that interviewee will relax.
6. Maintain eye contact.
7. Develop personal shorthand to assist in note taking.
8. Time note taking to prevent distracting the interviewee.
9. Note both positive and negative comments and allow time between interviews to reconstruct notes.
10. Note vocabulary and degree of formality being used and use the same language as interviewee.
11. Do not let the mood get too serious; however, avoid jokes as they interrupt interviewee.
12. Use systematic approach to determine what happened, when, who was involved, etc.
13. Summarize and clarify as needed to ensure you understand all concerns interviewee might have.
14. Consider a "walk-through" as part of the interview.
15. Use diagrams and photos to help the interviewee.
16. If an interviewee becomes defensive due to either a perceived threat or distrust of the interviewer, the interviewer should ease this defensiveness by being supportive. Reiterate the purpose and importance of the interview to curb defensiveness. If the interviewee remains defensive, terminate or reschedule the interview. Never argue with the interviewee.
17. Don't jump to conclusions and listen to the complete answer before making judgments. Be objective and evaluate every response for accuracy.
18. Use silence and interrupt only if you do not understand. Ask one question then wait for the answer.
19. Let people use their own words.
20. To maintain an open atmosphere, the use of video and audio equipment during interviewing is not recommended.

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**COMMUNICATION PROCESS**

1. The sender encodes messages, uses words, voice and body language while the receiver decodes or interprets the messages sent.
2. Listening is the most important aspect of the process. Research indicates that only one in four messages gets through as intended. People tend to hear only what they want to hear.
3. Be sensitive to feedback which is the primary way to determine how an interview is progressing. Body language is the most obvious feedback mechanism and provides an indication of the degree of like or dislike, agreement or disagreement, comfort with the topic, level of assertiveness and degree of interest in the discussion. An abrupt change in body language could indicate that a sensitive topic has been broached. Be sensitive to the following:
  - A. voice: pitch - rate - volume
  - B. body: facial expression - gestures – posture
  - C. signals to observe:
    - looking away - out of here (try to involve or reschedule interview)
    - crossed arms or ankles - defensive
    - chin rubbing - thinking about it (give interviewee time)
    - floor kicking - anger
    - hands on hips - mind is made up
    - feet on desk - owns the place
    - leaning forward - open
    - leaning backward - keeping a distance
    - slouching in chair - not interested

**PITFALLS**

1. Over talkative interviewer: Plan questions ahead of time and stick to them. Try to concentrate on listening to the answers and taking notes.
2. Over talkative interviewee: Try to redirect the interviewee by using a closed question. If this does not work, then state “excuse me, but we only have 20 minutes for this interview and I have more questions. It would really help if you kept your answers short and to the point.”

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**INTERVIEW PREPARATION**

1. Review all pertinent documentation.
2. Consider construction of a preliminary events & causal factor chart to ensure understanding of the event.
3. From the chart, develop a list of interviewees.
4. Develop a set of topics and/or questions for each interviewee.
5. If more than one interviewee is involved, develop a preferred sequence. Begin with friendly interviewees rather than those who may be hostile. If the Supervisor was present during the event, begin with him/her. Conduct individual rather than group interviews.
6. During the interviews, try to determine the following:
  - what happened vs. expectations
  - changes/differences between successful and unsuccessful activity
  - barriers that are present to keep undesirable event from happening

**INTRODUCTORY PHASE OF THE INTERVIEW**

The purpose of this phase is to set the interviewee at ease.

1. Greet the interviewee and exchange small talk.
2. Explain that the purpose of the investigation is to determine the root cause so that recurrence can be prevented. If the interviewee has already been interviewed then explain that the root cause investigation is independent from other investigations and thus there may be duplicity of questions. Provide the following information:
  - overview of material to be covered
  - direct answers to questions (no opinions)
  - If answers are not known then offer to provide the answer later. The interviewer should demonstrate interest in the interviewee and should establish a pattern of the interviewee speaking and the interviewer actively listening.
3. Obtain permission to take notes.
4. Be prepared to answer the following questions if asked by the interviewee:
  - Why do you want to talk to me?
  - How long will this take?
  - What will you do with what I tell you?
  - Will my name be used?

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### QUESTION/ANSWER PHASE OF THE INTERVIEW

The purpose of this phase is to obtain the interviewee's recollection of the perception he had at the time of the event.

Note that the person's present understanding of the conditions that led to the event may differ from the perceptions of those conditions when he experienced them. During this phase, the interviewer should determine how the worker's behavior in the task of interest was influenced and if the interviewee is aware of any changes related to the task of interest.

1. There are several types of questions which can be used during the interview:

- Exploratory questions provide comprehensive and in-depth information and can be used to open a questioning sequence. Example: "Tell me the sequence of events as you recall" or "What can you tell me about ....?"
- Open questions are broad and begin with "what", "when", "describe", etc., and may only specify the topic, i.e. "What do you know about this event?"

#### Advantages

- allows the interviewee freedom in answering and encourages discussions
- lets the interviewee do the talking
- communicates interest and trust
- easy to answer
- allows interviewee to volunteer information (which should be followed-up by the interviewer using a secondary question)

#### Disadvantages

- time consuming
- may not get to needed information
- difficult to record the complete answer

**Closed** questions are narrow and require a specific response which may require follow up questions to get a complete answer, i.e. "would being more familiar with the tag-out procedure have prevented this event" vs. "How familiar are you with the tag-out procedure."

#### Advantages

- interviewer retains control
- takes less time
- less effort for the interviewee to respond

#### Disadvantages

- too little information is communicated
- may restrict interviewee response
- could have negative impact leaving the interviewee with a feeling of interrogation

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**Primary** questions introduce a topic which stands alone, i.e., what takes up most of your time?

**Secondary** questions are used to follow up obtain more information on the same subject and should be used extensively to obtain unbiased information, i.e. "tell me more about....", "what do you mean by....", "why do you feel that way?"

**Neutral** questions allow the interviewee to choose the answer freely, i.e., how do you feel about the number of engineers on staff?

**Leading** questions provide a preconceived answer in the question, i.e., "you didn't know that the work had been rescheduled, did you?" or "what did you do to trace the cables, walk the entire length?" This type of question should not be used because they put words into the interviewee's mouth.

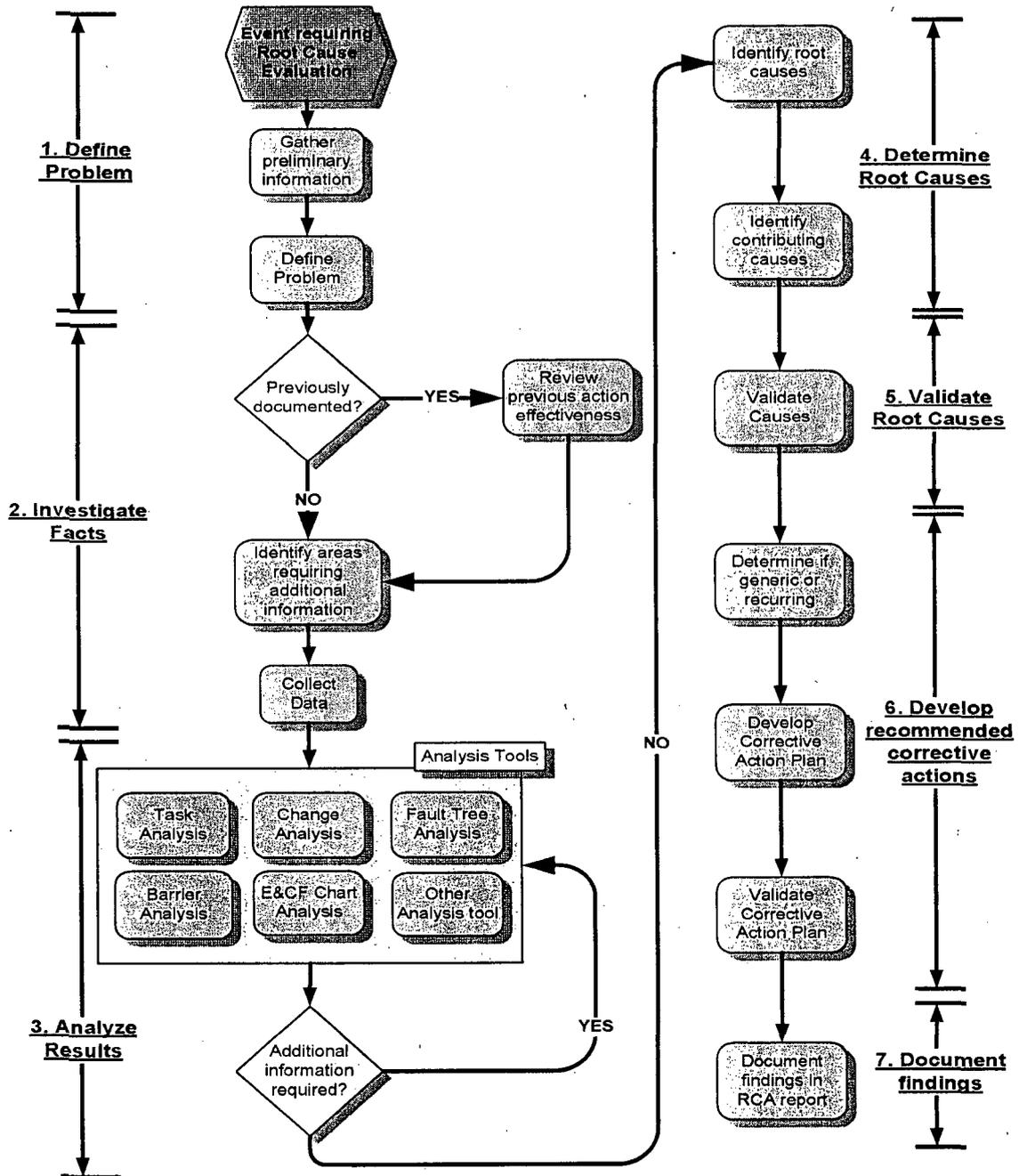
2. Questioning techniques:

- Funnel - gradually narrow the scope of the questions to focus on specific facts and details such that the questioning progresses from open to closed, i.e., tell me about ... how does ... do you ...
  - Inverted Funnel - expands upon details to get the big picture, i.e., do you ... how does ...tell me more about ...
  - Tunnel - gathers a large amount of information of the same type. Once the interviewee is answering freely, this method gets maximum information.
  - Two step probe - begins with an exploratory question and then uses follow-up questions.
3. Plan and use secondary questions extensively and avoid using leading questions as they bias the response.
  4. Use closed questions to regain control of the interview if necessary.
  5. Do not interrupt; use slight (10 sec) pauses to draw out interviewee.
  6. Listen carefully and follow up on information using secondary questions.
  7. Do not use multiple choice questions.
  8. Do not argue or show surprise at anything the interviewee says. Do not appear to cross examine. Try to show understanding (empathy) even if you disagree.
  9. Determine if the person's behavior in the task of interest was influenced.
  10. Determine if the person is aware of any changes related to the task of interest.
  11. Brief interruptions can provide the interviewer with an opportunity to review the progress of the interview, however major or frequent interruptions may require that the interview be rescheduled.
  12. The interviewer must maintain control and can use a previously prepared list of questions to keep the interview on track.

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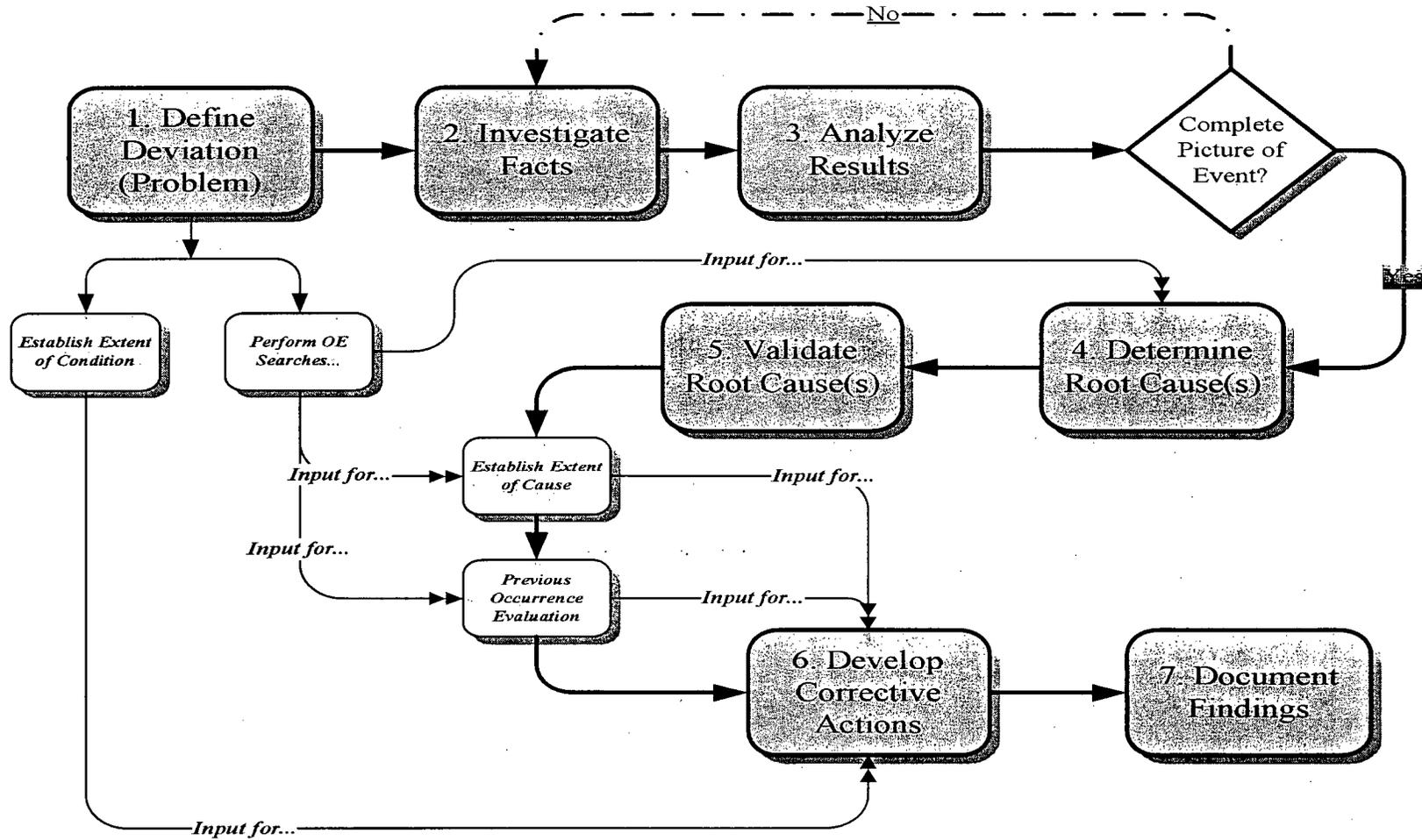
**INTERVIEW CLOSE-OUT**

1. Provide a preview to alert the interviewee that the interview is almost over, i.e., I'm almost to the end of my list of questions....
2. Briefly review the information to verify accuracy and indicate what will be done with the information.
3. Thank the interviewee for their help.
4. Explain that further discussion may be necessary.





Root Cause Analysis Process



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**General Guidance**

It is not the intent of this activity to perform a “global” (i.e. site- or system-wide) search for O&P issues (LOWs). The scope of this activity should be limited to the event being investigated.

The questions below are intended to guide an evaluation for “local” O&P issues (LOWs) – that is, those O&P issues (LOWs) *which influenced the outcome of the event under investigation*. They represent the failure modes of the involved Organizations and implementing Programs (i.e. work processes).

The identified O&P factors may be either Root or Contributing Causes.

- The organization is not usually aware of their potential for influencing an event.
- They are typically EXTERNAL to the observed behaviors.

Since root cause investigation is a discovery process (a strongly knowledge-based activity, i.e. “you don’t know what you don’t know”), this step serves as a valuable “sanity check” for the Evaluator (or team), and as a check that the breadth or depth of the investigation is reasonable.

This evaluation should typically be performed AFTER the “Investigate & Analyze” steps of the process and the Evaluator has a “complete picture” of the event being investigated.

For this process to be most effective, it is important that all the organizations and programs (work processes) which interacted during the event are known.

A list of sample corrective actions for each O&P area is provided in this section as an aide in establishing or evaluating corrective action plan items for O&P issues.

The root cause evaluator (or team) should then perform each of the following steps:

1. **Screen** each IDENTIFIED causal factor using the O&P questions below, to identify whether any causal factor indicates the presence of organizational or programmatic weaknesses.
2. **Review** the overall event information vs. the O&P failure mode questions, to identify whether any O&P causal factors exist which were PREVIOUSLY UNIDENTIFIED by the root cause process, AND have a clear “CAUSE & EFFECT” relationship with the outcome of the event under investigation. The most appropriate method to perform this evaluation is to address each potential O&P issue listed as a question to be asked.
  - a. For instance, under the Organization to Organization section, the first question posed under this section is “Does there appear to be inadequate interface among organizations?”
  - b. If the answer to this question is “YES”, then ensure the corrective action plan includes a corrective action item to resolve the O&P issue.
  - c. This situation would be typical for each question posed when doing the O&P evaluation. A “NO” answer simply moves the evaluator on to the new question.
  - d. Note that there is some overlap among the five (5) sections due to similarities between one O&P weakness and another. When reviewing each question, refer to the definitions section in this procedure for clarification if a better understanding is needed of what the question means.

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3. **Initiate** documentation for any identified O&P issues (LOWs) that DO NOT APPEAR TO HAVE A "CAUSE & EFFECT" RELATIONSHIP to the investigated event – initiate a new CR.
4. **Document** the results of this evaluation (including a brief summary of supporting facts) as specific causes in the "Root Cause Evaluation" section of the report.
  - a. If appropriate, clearly identify which of the defined causes (e.g. RC-1, CC-2, etc) describe or bound the O&P causal factor/cause being discussed.
  - b. These causes should typically be identified using the defined O&P cause codes and descriptions in EN-LI-121.
5. **Evaluate** the identified O&P causes for Extent of Cause in the Generic Implications section of the report.
6. **Establish** appropriate corrective actions for the identified O&P issues (LOWs) and ensure they are included in the corrective action plan.
  - a. Since Organizational causes (behaviors) are more difficult to correct, corrective actions for these types of causes should avoid "single-shot" actions (e.g. All-hands meetings, site memos, Stand Downs). Industry experience shows that these actions influence organizational behaviors for only a relatively limited period (weeks or months) – and do not produce sustained change.
  - b. Therefore, selected actions should typically include both:
    - i. a description of the new standards or behavior and
    - ii. a clearly defined period of active coaching or other active reinforcement actions, which are intended to produce – and also monitor for progress towards - a sustained change in organizational behaviors.

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**Potential O&P Failure Modes (Causal Factors)**

**1) OP1X - Organization to Organization Interface Weaknesses**

- a) OP1A - Does there appear to be evidence of inadequate interface among organizations?
- b) OP1B – Is there evidence of excessive or lack of overlap functions between organizations?
- c) OP1C – Is there evidence that the required notifications were not made when the job was begun, interrupted or completed?
- d) OP1D – Is there evidence that appropriate personnel and departmental interactions were not fully considered when new processes were created during the implementation phases of the change?
- e) OP1E – Is there evidence that planning was not coordinated with inputs from walk-downs and task analysis?

**2) OP2X - Organization to Program Interface Weaknesses**

- a) OP2A – Is there evidence of a lack of commitment to program implementation?
- b) OP2B – Is there evidence of inadequate program monitoring or inadequate management skills?
- c) OP2C – Is there evidence of a lack of a program evaluation process?
- d) OP2D – Is there evidence of a lack of organizational authority for program implementation?
- e) OP2E – Is there evidence of unclear or complex wording or grammar in program implementation documents?
- f) OP2F – Is there evidence of an omission of relevant information in program implementation documents that would have prevented an event from occurring (e.g.insufficient information in graphs, tables or illustration; lack of instructions or data sheet documentation requirements, etc.)
- g) OP2G – Is there evidence of the lack of a procedure that should have been written but does not exist?
- h) OP2H – Is there evidence that policy guidance or management expectations were not well defined or understood by personnel involved in performing the task?
- i) OP2I – Is there evidence that job standards were not adequately defined or communicated?
- j) OP2J – Is there evidence that personnel exhibited insufficient awareness of the impact of actions on safety and reliability?
- k) OP2K – Is there evidence that management follow-up or monitoring of activities was ineffective in identifying shortcomings in implementation?
- l) OP2L – Is there evidence that causes of a previous event or known problem were not determined?
- m) OP2M – Is there evidence that the effects of changes on planned schedules were not adequately addressed prior to implementation?

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- n) OP2N – Is there evidence that the job scoping process did not properly identify potential task interruptions or environment stress?
  - o) OP2O – Is there evidence that the job scoping process did not identify special circumstances or conditions that may be impacted or dependent on other circumstances or conditions?
  - p) OP2P – Is there evidence that the field walk down input to design was less than adequate?
- 3) **OP3X - Program to Program Interface Weaknesses**
- a) OP3A – Is there evidence of a lack of interface requirements between two or more programs that are required to interface in that details necessary to ensure a consistent standard are not adequately covered in programmatic implementing documents?
  - b) OP3B – Is there evidence of conflicting program requirements where one program has different actions from another program for the same issue?
  - c) OP3C – Is there evidence of inadequate interface requirements in that one program specifies actions different from another program for the same issue?
- 4) **OP4X – Programmatic Deficiencies**
- a) OP4A – Is there evidence that there are insufficient details in a procedure to perform the task?
  - b) OP4B – Is there evidence of inadequate job scope (omission of necessary functions) in an implementing procedure because of an inadequate program design or inadequate feedback from the field?
  - c) OP4C – Is there evidence of excessive implementation requirements that result in portions of the program being ignored by the staff due to overload?
  - d) OP4D – Is there evidence of an inadequate verification process (single human error, high program failure rate, poor procedure quality or inadequate program design)?
  - e) OP4E – Is there evidence that there is a lack of responsibility by personnel because it is not well defined or personnel are not being held accountable?
  - f) OP4F – Is there evidence that a response to a known or repetitive problem was untimely?
  - g) OP4G – Is there evidence that needed changes to the plant were not approved or funded which resulted in a plant issue?
  - h) OP4H – Is there evidence that there was not a means or process to ensure procedures and documents were of adequate quality and up to date?
  - i) OP4I – Is there evidence that duties were not well distributed among personnel that contributed to a problem?
  - j) OP4J – Is there evidence that too few workers are assigned to perform a task that contributed to an issue?
  - k) OP4K – Is there evidence that an insufficient number of training or experienced workers were assigned to a task?

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- l) OP4L – Is there evidence that there is a problem in perform repetitive tasks and sub tasks which contributed to a problem?
  - m) OP4M – Is there evidence that there was a less than adequate process for a configuration change to a design document?
  - n) OP4N – Is there evidence that personnel exhibited insufficient awareness of the impact of actions on safety reliability because management failed to provide direction regarding safeguards against non-conservative actions by personnel concerning nuclear safety or reliability?
  - o) OP4O – Is there evidence that the planning process was not coordinated with inputs from walk downs and task analysis?
  - p) OP4P – Is there evidence that previous industry or in-house operating experience was not effectively used to prevent problems and an event occurred because the information was not properly assimilated by the organization (missed opportunity)?
- 5) **OP5X - Organizational Weaknesses**
- a) OP5A – Is there evidence of inadequate functions or structure which results in work not being performed due to a lack of organizational planning or inadequate staffing?
  - b) OP5B – Is there evidence of inadequate attention to emerging problems?
  - c) OP5C – Is there evidence of an inadequate work prioritization process?
  - d) OP5D – Is there evidence of inadequate communication within the organization?
  - e) OP5E – Is there evidence of inadequate job skills, work practices or decision making?
  - f) OP5F – Is there evidence that corrective actions for previously identified problems or event was not adequate to prevent recurrence (failed to take meaningful corrective actions for consequential or non-consequential events)?
  - g) OP5G – Is there evidence the a supervisor was not properly notified of a suspected problem?
  - h) OP5H – Is there evidence of that pertinent information is not being properly transmitted verbally between the transmitter and the listener and vice versa?
  - i) OP5I – Is there evidence that there are too many administrative duties assigned to supervisory staff to properly perform supervisory activities?
  - j) OP5J – Is there evidence that there is insufficient supervisory resources to provide the needed supervision to plant personnel?
  - k) OP5K – Is there evidence that there is insufficient manpower to support the identified goals and objectives of the plant?
  - l) OP5L – Is there evidence that sufficient resources are not provided to ensure adequate training is provided and maintained?

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- m) OP5M – Is there evidence that there is not adequate availability of appropriate materials and tools to do the job?
- n) OP5N – Is there evidence that there is not a means provided for ensuring adequate equipment and quality/reliability/operability for personnel equipment?
- o) OP5O – Is there evidence that personnel selection did not ensure an appropriate match to ensure a motivation for the worker?
- p) OP5P – Is there evidence that tasks and individual accountability were not made clear to the worker?
- q) OP5Q – Is there evidence that the progress and status of task is not adequately tracked by supervision?
- r) OP5R – Is there evidence that there is not an appropriate level of in-task supervision planned prior to the task being performed?
- s) OP5S – Is there evidence that direct supervisory involvement in the task interfered with the overview role of supervision?
- t) OP5T – Is there evidence that emphasis on the schedule had an impact on doing a quality job and accepted standards were not met as a result of this emphasis?
- u) OP5U – Is there evidence that job performance and self checking standards were not properly communicated to the organization performing the work prior to the job being performed?
- v) OP5V – Is there evidence that too many concurrent tasks were assigned to the worker that were beyond the individual's abilities?
- w) OP5W – Is there evidence that there is frequent job or task shuffling without adequate time to shift attention away from the previous task?
- x) OP5X – Is there evidence that supervision did not consider the worker's need to use a higher order of skills that consider the workers talents and strengths?
- y) OP5Y – Is there evidence that worker assignments did not consider the worker's previous task?
- z) OP5Z – Is there evidence that a workers assignment did not consider the worker's ingrained work patterns and necessary work patterns for successful completion of the current task?
- aa) OP5AA – Is there evidence that there is too an infrequent contact with the workers to detect work habit and attitude changes?
- bb) OP5AB – Is there evidence that supervision provides feedback on negative performance of an individual but not on positive performance?
- cc) OP5AC – Is there evidence of a lack of teamwork as a result of inadequate training content?

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- dd) OP5AD – Is there evidence of a lack of evaluation of risk and consequences prior to making a change that would have an adverse impact as a result of the change?
- ee) OP5AE – Is there evidence that personnel exhibited insufficient awareness of the impact of actions on safety and reliability?
- ff) OP5AF – Is there evidence that causes of a previous event or known problem were not determined?
- gg) OP5AG – Is there evidence that a response to a known or repetitive problem was untimely?
- hh) OP5AH – Is there evidence that needed changes were not approved or funded that resulted in a plant problem?
- ii) OP5AI – Is there evidence that a means was not provided to ensure procedures and documents are of adequate quality and up to date?
- jj) OP5AJ – Is there evidence that planning was not coordinated with inputs from walk downs and task analysis?

**Possible Corrective Actions to Address O&P Causal Factors**

The following corrective actions are provided solely as an aid to developing corrective actions for O&P issues (LOWs) and their use is optional at the discretion of the evaluator (or team leader). These potential corrective actions do not necessarily lineup directly with the O&P questions but can be used as a tool to consider when developing the corrective action plan.

- 1) Organization to Organization Interface Weaknesses
  - a) Supervisor skills assessment and reassignment
  - b) Supervisory human error reduction training
  - c) Supervisory workload reduction
  - d) Questioning attitude with QV&V
  - e) Repeat backs and clarifying questions
  - f) Increased trust between organizations
  - g) Daily integration meetings
- 2) Organization to Program Interface Weaknesses
  - a) Behavior based expectations
  - b) Increased supervisory involvement
  - c) Improved supervisory quality (accountability)
  - d) Coaching program
  - e) Progressive discipline accountability system

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- f) Comprehensive performance monitoring and trending
- g) Root Cause Evaluation for significant events
- h) Periodic common cause analysis
- i) Human error prevention training
- j) Lower problem reporting threshold
- k) Decrease corrective action cycle time
- 3) Program to Program Interface Weaknesses
  - a) Procedure writer technology training
  - b) Procedure upgrade projects
  - c) "Fix as you go" upgrade projects
  - d) Reduce procedure change cycle time
  - e) Administrative burden reduction
  - f) Regulatory commitment reduction
  - g) Review and verification reduction
  - h) Multi-skill
  - i) Business process re-engineering
- 4) Programmatic Weaknesses
  - a) Knowledge and skills assessment and reassignment
  - b) Job specific qualification
  - c) Supervisory task assignment
  - d) Work specialization
  - e) Remedial training
  - f) Administrative burden reduction
  - g) Regulatory commitment reduction
  - h) Evaluation of "true" commitments
  - i) Procedure / process simplification
  - j) Procedure writer technology training
  - k) Procedure upgrade projects
  - l) "Fix as you go" upgrade projects
  - m) Reduce procedure change cycle time

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- n) Administrative burden reduction
- o) Regulatory commitment reduction
- p) Review and verification reduction
- q) Multi-skill
- r) Business process re-engineering
- 5) Organizational Weaknesses
  - a) Supervisor skills assessment and reassignment
  - b) Supervisory human error reduction training
  - c) Supervisory workload reduction
  - d) Behavior based expectations
  - e) Accountability system
  - f) Work prioritization system
  - g) Team building
  - h) Work process simplification
  - i) Questioning attitude with QV&V
  - j) Repeat backs and clarifying questions
  - k) Increased trust between organizations
  - l) Daily integration meetings
  - m) Humanistic leadership style
  - n) Skip level communication meetings
  - o) Employee retention program
  - p) Workload reduction
  - q) Administrative burden reduction
  - r) Regulatory commitment reduction
  - s) Evaluation of "true" commitments
  - t) Procedure / process simplification
  - u) Administrative burden reduction
  - v) Regulatory commitment reduction
  - w) Review and verification reduction
  - x) Multi-skill
  - y) Business process re-engineering

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**SAFETY CULTURE EVALUATION**

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The Root Cause Evaluation should include a proper consideration of whether a weakness in any safety culture component was a root cause or significant contributing cause of the event. This activity should be performed only after the Root and Contributing causes have been established. Additional guidance is provided in NRC RIS 2006-13, and NRC IP-95001.

**NOTE**

- **IF** the cause evaluated does not indicate a weakness in any component, **THEN** the evaluation should **NOT** continue to the aspect level.

1. Screen each identified root cause to determine if it is indicative of a weakness in any of the Safety Culture components listed in Table 1 – Safety Culture Comparison.
  - a. **IF** Table 2 is not used (e.g., an event that obviously has no safety culture implications) **THEN** document the reason for not using the template in the Root Cause Evaluation.
  - b. **IF** the root cause evaluated indicates a weakness in a component, **THEN** continue the safety culture evaluation in Table 2 – Detailed Safety Culture Component Review, for that cause to determine which aspect of the safety culture component is the area of concern.
  - c. Document the basis for the conclusions reached in the Notes section after Table 1 for the evaluated root cause as required per step 5.5.8.7.
  - d. Document in the last column of Table 1 and Table 2 the applicable root cause that had indication of weakness and provide a reference to the Note that documents the basis for the conclusions reached.
  - e. Repeat Steps b and d for each identified root cause of the event.
2. Screen each identified contributing cause to determine if it is indicative of a weakness in any of the Safety Culture components listed in the table below.
  - a. First, determine whether the contributing cause being screened was a significant contributor to the event.
  - b. **IF** the contributing cause being screened is considered to be **NOT** a significant contributor to the event, **THEN** no further screening of that cause is required.
    - i. Document the basis for the conclusions reached for the evaluated contributing cause as required per step 5.5.8.7.
  - c. Screen each contributing cause identified as a significant contributor to the event to determine if it is indicative of a weakness in any of the Safety Culture components listed in Table 1 – Safety Culture Comparison.
  - d. **IF** the significant contributing cause evaluated indicates a weakness in a component, **THEN** continue the safety culture evaluation in Table 2 – Detailed Safety Culture Component Review, for that cause to determine which aspect of the safety culture component is the area of concern.
  - e. Document the basis for the conclusions reached in the Notes section after Table 1 for the evaluated contributing cause as required per step 5.5.8.7.

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**SAFETY CULTURE EVALUATION**

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- f. Document in the last column of Table 1 and Table 2 the applicable significant contributing cause that had indication of weakness and provide a reference to the Note that documents the basis for the conclusions reached.
  - g. Repeat Steps a – f for each contributing cause identified as a significant contributor to the event.
3. A summary of this evaluation is documented in the Root Cause Evaluation section of the final report.
  - a. The summary should include the planned actions to address any identified safety culture issues (whether at the component or aspect level).
4. Table 1, Table 2, and the Notes sections should be included in the final Root Cause Evaluation report as an attachment.

**TABLE 1 – SAFETY CULTURE COMPARISON**

SAFETY CULTURE COMPONENT	DESCRIPTION	CR-XXX-YYYY-#### – Title
<b>1. Decision-Making</b>	Licensee decisions demonstrate that nuclear safety is an overriding priority.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>2. Resources</b>	The licensee ensures that personnel, equipment, procedures, and other resources are available and adequate to assure nuclear safety.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>3. Work Control</b>	The licensee plans and coordinates work activities, consistent with nuclear safety:	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>4. Work Practices</b>	Personnel work practices support human performance.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>5. Corrective Action Program</b>	The licensee ensures that issues potentially impacting nuclear safety are promptly identified, fully evaluated, and that actions are taken to address safety issues in a timely manner, commensurate with their significance.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>6. Operating experience</b>	The licensee uses operating experience (OE) information, including vendor recommendations and internally generated lessons learned, to support plant safety.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>7. Self- and Independent Assessments</b>	The licensee conducts self- and independent assessments of their activities and practices, as appropriate, to assess performance and identify areas for improvement.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -

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**SAFETY CULTURE EVALUATION**

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SAFETY CULTURE COMPONENT	DESCRIPTION	CR-XXX-YYYY-#### - Title
<b>8. Environment For Raising Concerns</b>	An environment exists in which employees feel free to raise concerns both to their management and/or the NRC without fear of retaliation and employees are encouraged to raise such concerns.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>9. Preventing, Detecting, and Mitigating Perceptions of Retaliation</b>	A policy for prohibiting harassment and retaliation for raising nuclear safety concerns exists and is consistently enforced.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>10. Accountability</b>	Management defines the line of authority and responsibility for nuclear safety.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>11. Continuous learning environment</b>	The licensee ensures that a learning environment exists.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>12. Organizational change management</b>	Management uses a systematic process for planning, coordinating, and evaluating the safety impacts of decisions related to major changes in organizational structures and functions, leadership, policies, programs, procedures, and resources. Management effectively communicates such changes to affected personnel.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>13. Safety policies</b>	Safety policies and related training establish and reinforce that nuclear safety is an overriding priority in that:	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -

**Notes**

1	
2	
3	
4	

**TABLE 2 – DETAILED SAFETY CULTURE COMPONENT REVIEW**

		Description	CR-XXX-YYYY-#### - Title
<b>1. Decision-Making</b>		<b>Licensee decisions demonstrate that nuclear safety is an overriding priority. Specifically (as applicable):</b>	
<b>DM</b>	H.1(a)	The licensee makes safety-significant or risk-significant decisions using a systematic process, especially when faced with uncertain or unexpected plant conditions, to ensure safety is maintained. This includes formally defining the authority and roles for decisions affecting nuclear safety, communicating these roles to applicable personnel, and implementing these roles and authorities as designed and obtaining interdisciplinary input and reviews on safety-significant or risk-significant decisions.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>DM</b>	H.1(b)	The licensee uses conservative assumptions in decision making and adopts a requirement to demonstrate that the proposed action is safe in order to proceed rather than a requirement to demonstrate that it is unsafe in order to disapprove the action. The licensee conducts effectiveness reviews of safety-significant decisions to verify the validity of the underlying assumptions, identify possible unintended consequences, and determine how to improve future decisions.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>DM</b>	H.1(c)	The licensee communicates decisions and the basis for decisions to personnel who have a need to know the information in order to perform work safely, in a timely manner.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>2. Resources</b>		<b>The licensee ensures that personnel, equipment, procedures, and other resources are available and adequate to assure nuclear safety. Specifically, those necessary for:</b>	
<b>RES</b>	H.2(a)	Maintaining long term plant safety by maintenance of design margins, minimization of long-standing equipment issues, minimizing preventative maintenance deferrals, and ensuring maintenance and engineering backlogs which are low enough to support safety.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>RES</b>	H.2(b)	Training of personnel and sufficient qualified personnel to maintain work hours within working hours guidelines.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>RES</b>	H.2(c)	Complete, accurate and up-to-date design documentation, procedures, and work packages, and correct labeling of components.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>RES</b>	H.2(d)	Adequate and available facilities and equipment, including physical improvements, simulator fidelity and emergency facilities and equipment.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -



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		Description	CR-XXX-YYYY-#### - Title
<b>3. Work Control</b>		<b>The licensee plans and coordinates work activities, consistent with nuclear safety. Specifically (as applicable):</b>	
WC	H.3(a)	The licensee appropriately plans work activities by incorporating • risk insights; • job site conditions, including environmental conditions which may impact human performance; plant structures, systems, and components; human-system interface; or radiological safety; and • the need for planned contingencies, compensatory actions, and abort criteria.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
WC	H.3(b)	The licensee appropriately coordinates work activities by incorporating actions to address:   • the impact of changes to the work scope or activity on the plant and human performance. • the impact of the work on different job activities, and the need for work groups to maintain interfaces with offsite organizations, and communicate, coordinate, and cooperate with each other during activities in which interdepartmental coordination is necessary to assure plant and human performance. • The need to keep personnel apprised of work status, the operational impact of work activities, and plant conditions that may affect work activities. • The licensee plans work activities to support long-term equipment reliability by limiting temporary modifications, operator work-arounds, safety systems unavailability, and reliance on manual actions. Maintenance scheduling is more preventative than reactive.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>4. Work Practices</b>		<b>Personnel work practices support human performance. Specifically (as applicable):</b>	
WP	H.4(a)	The licensee communicates human error prevention techniques, such as holding pre-job briefings, self and peer checking, and proper documentation of activities. These techniques are used commensurate with the risk of the assigned task, such that work activities are performed safely. Personnel are fit for duty. In addition, personnel do not proceed in the face of uncertainty or unexpected circumstances.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
WP	H.4(b)	The licensee defines and effectively communicates expectations regarding procedural compliance and personnel follow procedures	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
WP	H.4(c)	The licensee ensures supervisory and management oversight of work activities, including contractors, such that nuclear safety is supported.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>5. Corrective Action Program</b>		<b>The licensee ensures that issues potentially impacting nuclear safety are promptly identified, fully evaluated, and that actions are taken to address safety issues in a timely manner, commensurate with their significance. Specifically (as applicable):</b>	
CAP	P.1(a)	The licensee implements a corrective action program with a low threshold for identifying issues. The licensee identifies such issues completely, accurately, and in a timely manner commensurate with their safety significance.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -

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**SAFETY CULTURE EVALUATION**

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		Description	CR-XXX-YYYY-#### - Title
CAP	P.1(b)	The licensee periodically trends and assesses information from the CAP and other assessments in the aggregate to identify programmatic and common cause problems. The licensee communicates the results of the trending to applicable personnel.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
CAP	P.1(c)	The licensee thoroughly evaluates problems such that the resolutions address causes and extent of conditions, as necessary. This includes properly classifying, prioritizing, and evaluating for operability and reportability conditions adverse to quality. This also includes, for significant problems, conducting effectiveness reviews of corrective actions to ensure that the problems are resolved.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
CAP	P.1(d)	The licensee takes appropriate corrective actions to address safety issues and adverse trends in a timely manner, commensurate with their safety significance and complexity.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
CAP	P.1(e)	If an alternative process (i.e., a process for raising concerns that is an alternate to the licensee's corrective action program or line management) for raising safety concerns exists, then it results in appropriate and timely resolutions of identified problems.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>6. Operating Experience</b>		<b>The licensee uses operating experience (OE) information, including vendor recommendations and internally generated lessons learned, to support plant safety. Specifically (as applicable):</b>	
OE	P.2(a)	The licensee systematically collects, evaluates, and communicates to affected internal stakeholders in a timely manner relevant internal and external OE.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
OE	P.2(b)	The licensee implements and institutionalizes OE through changes to station processes, procedures, equipment, and training programs.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -

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		Description	CR-XXX-YYYY-#### - Title
<b>7. Self- and Independent Assessments</b>		<b>The licensee conducts self- and independent assessments of their activities and practices, as appropriate, to assess performance and identify areas for improvement. Specifically (as applicable):</b>	
<b>SA</b>	P.3(a)	The licensee conducts self-assessments at an appropriate frequency; such assessments are of sufficient depth, are comprehensive, are appropriately objective, and are self-critical. The licensee periodically assesses the effectiveness of oversight groups and programs such as CAP, and policies.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>SA</b>	P.3(b)	The licensee tracks and trends safety indicators which provide an accurate representation of performance.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>SA</b>	P.3(c)	The licensee coordinates and communicates results from assessments to affected personnel, and takes corrective actions to address issues commensurate with their significance.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>8. Environment For Raising Concerns</b>		<b>An environment exists in which employees feel free to raise concerns both to their management and/or the NRC without fear of retaliation and employees are encouraged to raise such concerns. Specifically (as applicable):</b>	
<b>ERC</b>	S.1(a)	Behaviors and interactions encourage free flow of information related to raising nuclear safety issues, differing professional opinions, and identifying issues in the CAP and through self assessments. Such behaviors include supervisors responding to employee safety concerns in an open, honest, and non-defensive manner and providing complete, accurate, and forthright information to oversight, audit, and regulatory organizations. Past behaviors, actions, or interactions that may reasonably discourage the raising of such issues are actively mitigated. As a result, personnel freely and openly communicate in a clear manner conditions or behaviors, such as fitness for duty issues that may impact safety and personnel raise nuclear safety issues without fear of retaliation.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>ERC</b>	S.1(b)	If alternative processes (i.e., a process for raising concerns or resolving differing professional opinions that are alternates to the licensee's corrective action program or line management) for raising safety concerns or resolving differing professional opinions exists, then they are communicated; accessible, have an option to raise issues in confidence, and are independent, in the sense that the program does not report to line management (i.e., those who would in the normal course of activities be responsible for addressing the issue raised).	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -

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		Description	CR-XXX-YYYY-#### - Title
<b>9. Preventing, Detecting, and Mitigating Perceptions of Retaliation</b>		<b>A policy for prohibiting harassment and retaliation for raising nuclear safety concerns exists and is consistently enforced in that:</b>	
<b>PDR</b>	S.2(a)	All personnel are effectively trained that harassment and retaliation for raising safety concerns is a violation of law and policy and will not be tolerated	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>PDR</b>	S.2(b)	Claims of discrimination are investigated consistent with the content of the regulations regarding employee protection and any necessary corrective actions are taken in a timely manner, including actions to mitigate any potential chilling effect on others due to the personnel action under investigation.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>PDR</b>	S.2(c)	The potential chilling effects of disciplinary actions and other potentially adverse personnel actions (e.g., reductions, outsourcing, and reorganizations) are considered and compensatory actions are taken when appropriate.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>10. Accountability</b>		<b>Management defines the line of authority and responsibility for nuclear safety. Specifically (as applicable):</b>	
<b>ACC</b>	A.1(a)	(a) Accountability is maintained for important safety decisions in that the system of rewards and sanctions is aligned with nuclear safety policies and reinforces behaviors and outcomes which reflect safety as an overriding priority.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>ACC</b>	A.1(b)	(b) Management reinforces safety standards and displays behaviors that reflect safety as an overriding priority.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>ACC</b>	A.1(c)	(c) The workforce demonstrates a proper safety focus and reinforces safety principles among their peers.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -

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		Description	CR-XXX-YYYY-#### - Title
<b>11. Continuous learning environment</b>		<b>The licensee ensures that a learning environment exists. Specifically (as applicable):</b>	
<b>CLE</b>	C.2(a)	(a) The licensee provides adequate training and knowledge transfer to all personnel on site to ensure technical competency.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>CLE</b>	C.2(b)	(b) Personnel continuously strive to improve their knowledge, skills, and safety performance through activities such as benchmarking, being receptive to feedback, and setting performance goals. The licensee effectively communicates information learned from internal and external sources about industry and plant issues.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>12. Organizational change management</b>			
<b>OCM</b>	<b>12. Organizational change management</b>	<b>Management uses a systematic process for planning, coordinating, and evaluating the safety impacts of decisions related to major changes in organizational structures and functions, leadership, policies, programs, procedures, and resources. Management effectively communicates such changes to affected personnel.</b>	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>13. Safety policies</b>		<b>Safety policies and related training establish and reinforce that nuclear safety is an overriding priority in that:</b>	
<b>SP</b>	SP.4(a)	(a) These policies require and reinforce that individuals have the right and responsibility to raise nuclear safety issues through available means, including avenues outside their organizational chain of command and to external agencies, and obtain feedback on the resolution of such issues.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>SP</b>	SP.4(b)	(b) Personnel are effectively trained on these policies.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>SP</b>	SP.4(c)	(c) Organizational decisions and actions at all levels of the organization are consistent with the policies. Production, cost and schedule goals are developed, communicated, and implemented in a manner that reinforces the importance of nuclear safety.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -
<b>SP</b>	SP.4(d)	(d) Senior managers and corporate personnel periodically communicate and reinforce nuclear safety such that personnel understand that safety is of the highest priority.	RC <sub>1</sub> - RC <sub>2</sub> - CC <sub>1</sub> - CC <sub>2</sub> -

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ATTACHMENT 9.7

GENERIC IMPLICATIONS

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## PURPOSE

This Evaluation is used to identify and evaluate both the Extent of Condition (problem) AND the Extent Of Cause for a given Condition. It also provides guidance for qualitatively assessing risk.

During both parts of the process, the Evaluator considers three specific areas:

- Human Performance
- Equipment
- Process/Programmatic/Organizational Issues

## DISCUSSION

The evaluation is a two-part two-step process to determine "where else" the Problem/Condition exists and the Identified Causes that may have impact and what are the associated risks. Part 1 evaluates the Problem/Condition and Part 2 evaluates the Identified Causes. In Part 1, Step-1 utilizes up-front information that is known about the problem (e.g., what failed, the associated consequences, etc.). Utilizing this information, the Evaluator determines the extent to which similar failures/consequences (problems) have occurred. Step-2 considers the risk of the known problem. Once the cause(s) of the Condition have been determined, Part 2 performs Step-1 and Step-2 to determine the potential impact of and the risk involved in the identified cause(s).

Step 1 of Part 1 (Extent of Condition) is intended to determine if the same condition that proved consequential in this instance (failed valve, inadequate procedure, improper human action, etc.) or a similar condition currently exists in other plant equipment, processes or human performance.

Step 1 of Part 2 (Extent of Cause) is intended to determine if the identified causes also may have affected the performance of other individuals or work groups, the quality of other programs or processes, and/or the reliability of other types of equipment.

Risk consequence is formally considered in Step-2, but should be evaluated throughout the process as information about the Condition is discovered and causes are determined.

An evaluation of risk includes the possibility of radiological release, radiological spill, injury, loss of production (negative effects upon efficient plant operation), and impact(s) upon Maintenance Rule Structures, Systems, and Components (SSCs).

This part of the Evaluation includes a determination of any potential impact(s) to the operability/functionality of similar components, equipment, systems, human performance related issues, or organizational processes.

While this guidance describes discrete steps, an assessment should be continuously performed as more information is gathered and cause(s) determined.

Perform notification of identified concerns to other parts of the organization in accordance with EN-OP-104, Operability Determinations.

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**A. PROCESS**

The evaluation is a two-part, two-step process. The parts and steps are as follows:

Part one: Based on what is known about the Condition, complete Step-one and Step-two below.

- (a) Step One: Determine whether the occurrence/consequence (problem) is isolated, or whether it has broader (generic or common mode) implications. Achieve this by asking the following questions:
- Could this happen to equipment that has the same model number, that is similar in function, design, or service conditions? Example: could a problem identified with a specific relay occur in other relays of the same (or similar) type? (The investigator may need to consult a subject matter expert to make this determination.)
  - Could this happen to equipment of a different type? Example: a deficiency in the lubrication program could affect different types of equipment.
  - Could this happen to a group of components? Example: components of the same construction or materials could be similarly affected by one Condition.
  - Could this happen in other plant processes that are similar to the process involved in the Condition being investigated? This should include a broad (global) consideration of processes; however, the consideration should then narrow to those processes that could reasonably be involved in a similar Condition. For example, for a Condition that involved repair of a pump, the first consideration might be all mechanical maintenance procedures. This consideration might then quickly narrow to only those procedures involving pumps, and might then be narrowed to only those involving centrifugal pumps, etc. A balance is to be achieved by taking advantage of the obvious opportunities for improvement without attempting to solve all potential problems with one Condition Report. Managing investigation scope may require supervisory input.
  - Could this cause a similar human performance Condition during another activity? The same factors that affected human performance during the Condition being investigated can be (and often are) present in other plant activities. The intent is not to evaluate the absence of a common barrier on a global basis. For example, a lack of self-checking is often the final barrier to an inappropriate act, and is present in many human performance related Conditions. The intent of this evaluation is to consider contributing aspects of this Condition (HU Error Traps, Latent Organizational Weaknesses, etc.) that might contribute to the creation of additional human error. Examples could include poor labeling, too many tasks assigned, procedural ambiguity, fatigue, etc.

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- Could this have happened in other tasks that the involved individual performed?  
Example: if non-safety related parts were installed in a safety related system, a review of other instances of similar work performed by the same individual should be considered to validate that this was an isolated event.
- Could this Condition recur if a different person were to perform the same task (e.g., a different individual uses the same flawed procedure)?

Step Two: Assess the Risk Significance associated with the occurrence/consequence (problem) and document the results.  
Consider the following:

- Risk is considered to be the product of frequency of occurrence (probability of occurrence) multiplied by the consequence(s) of the Condition. The lower the frequency of occurrence OR the less significant the consequences, the lower the risk. A similar approach is reflected in EN-LI-102, Attachment 9.1.
- What factors influence the frequency of occurrence and consequences? For equipment problems, after completing the Equipment Failure Checklist, address surveillance history, equipment maintenance history, equipment operating performance history etc.
- Is the frequency of Condition occurrence high (almost certain to occur), medium (50-50 chance) or low (almost certain not to occur)?
- Consider the following relative to significance/potential significance of consequences:
  - nuclear safety/safety of the public
  - personnel/industrial safety/radiological safety
  - loss of production
  - cost of operation
- Are the consequences of the Condition high (unacceptable), medium (can be managed with some effort), or low (a nuisance)?
- Consider the following relative to significance/potential significance of consequences:
  - nuclear safety/safety of the public
  - personnel/industrial safety/radiological safety
  - loss of production
  - cost of operation

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**ATTACHMENT 9.7**

**GENERIC IMPLICATIONS**

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Step Two (cont):

- Are the consequences of the Condition HIGH (unacceptable), MEDIUM (can be managed with some effort), or LOW (a nuisance)?
- Based on a combination of probability and consequence, is the overall risk of the Condition HIGH, MEDIUM OR LOW?
- If quantitative risk assessment is desired then contact appropriate site personnel and or appropriate procedures.
- Is there a need to contact the Operations Department due to an operability/reportability concern? Refer to EN-OP-104.
- Are other Entergy plants potentially affected? Request the station OE coordinator to obtain feedback from other stations during the regular OE screening call.

Part Two: Based on what is known about the Condition, complete Step-one and Step-two below.

- (b) Based on the determined cause(s) of the Condition, repeat the considerations outlined in Step One and Step Two above.
- (c) The NRC defines "Extent of Cause" as the extent to which the root causes of an identified problem have impacted other plant processes, equipment, or human performance. Nonetheless, identified contributing causes should be evaluated for impact as well.
- (d) Consider "latent" issues. For example, for an out of tolerance SSC, was it due to a process deficiency that could affect other SSCs?
- (e) In evaluating a cause for risk, it is helpful to consider the risk involved for conditions the cause could result in.
  - (1) nuclear safety/safety of the public
  - (2) personnel/industrial safety/radiological safety
  - (3) loss of production
  - (4) cost of operation

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**ATTACHMENT 9.7**

**GENERIC IMPLICATIONS**

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Part Two (cont):

Document the results of the above considerations. Include the following items in the write-up (relative to both the problem/condition and the cause):

- (f) Generic Implications
  - Effect(s) on equipment. (Is this problem/cause limited to this component/equipment, or does it apply to others as well?) (N/A for non-equipment related Conditions)
  - Effects upon processes/programs. (Is this problem/cause limited to this specific process/program, or does it apply to others as well?) (N/A for non-process/program related Conditions)
  - Effects upon human performance. (Is this problem/cause limited to this specific occurrence, or are there related HU Traps/Latent Organizational Weaknesses (LOWs) that apply to others as well?) (N/A for non-HU-related Conditions)
- (g) Existing broader (generic/common mode) considerations (if any)
- (h) Level of risk (high, medium, or low) and the basis for the conclusion

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ATTACHMENT 9.8

PREVIOUS OCCURRENCE EVALUATION/OPERATING EXPERIENCE

Sheet 1 of 5

**PURPOSE** - The purpose of this search is to determine whether the same or similar Conditions have occurred, either at your site or within the industry, and if so, why associated corrective actions for Conditions having the same causes were unsuccessful in preventing occurrence of this Condition.

If previous corrective actions for the same/similar Conditions were unsuccessful at preventing recurrence (whether at your site or externally), the same corrective action would not be used again and new corrective actions would be needed. Likewise, if corrective actions for the same or similar Condition elsewhere in the industry have proven successful to prevent recurrence, such information might be helpful in determining corrective actions at your site.

## PROCESS

Note: The assigned evaluator/Team Leader may establish a longer recommended search period. The reason for this should be indicated in the Root Cause Evaluation report.

- 1.0 Search internal Operating Experience (OE) data to determine if the same or similar Conditions have previously occurred at your site.
  - 1.1 Search for/review previous Conditions documented in CRs, LERs, INs, RSs and GLs etc., to determine if this is a repeat or similar Condition
    - (a) **IF** the Condition is reportable to the NRC through the Licensee Event Report (LER) process, **THEN** the recommended search period is the previous 5 years data.
    - (b) **IF** the Condition does not require a LER, **THEN** the recommended search period is the previous 3 years data.
  - 1.2 Assess any repeat or similar Conditions for causes similar to those identified in the present CR.
    - (a) **IF** the same or similar causes existed, **THEN** assess why previous corrective actions failed to preclude the present Condition.

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- 1.4 Search external OE data to determine if the same or similar Conditions have previously occurred elsewhere in the industry. The recommended search is the previous 3 years data, except as noted in 1.4(a). Consider the following sources:
- (a) Search for/review previous Conditions documented in SOERs, SENs and SERs to determine if this is a repeat or similar Condition. There should be no limit on the search period for SOERs, SENs and SERs.
  - (b) Search the applicable INPO databases (i.e., EPIX, Events Database for OE entries coded "S" or "N", OE/See-In Library) for items that may be applicable to the Condition at your site.
  - (c) Consider searching other external databases that may contain relevant data (e.g. DOE, OSHA, Chemical Safety Review Board, National Transportation Safety Board, etc.)
- 1.5 Review the PCRS database for other Entergy plants to identify information reported to your site and the corresponding site evaluation/response. If the Condition had previously been evaluated as OE:
- (a) Indicate how your site dispositioned the OE. Example: for an NRC Information Notice that was evaluated for applicability to your site, identify whether the issue was determined to be applicable to your site and if so, the actions that were taken.
  - (b) For items determined applicable to your site, determine why your site corrective actions (if any) for the OE issue failed to prevent this Condition from occurring.
- 1.6 Document how the searches were performed (this can be included in an attachment, if lengthy and summarized in the report).
- (a) What databases were searched?
  - (b) What "keywords" (or combinations or keywords) were used?
  - (c) What was the number of "hits" and the number of relevant similar items?

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**ATTACHMENT 9.8**
**PREVIOUS OCCURRENCE EVALUATION/OPERATING EXPERIENCE**

Sheet 3 of 5

- 1.7 Utilize the "Operating Experience Guideline" below when performing the Operating Experience Review portion of the root cause Evaluation. This guideline will provide additional consistency when performing OE searches and documenting the evaluation.
- (a) **IF** Operating Experience exists that was not found, **OR** was reviewed and considered not applicable, **AND** an event occurs, **THEN** this is considered to be a "**MISSED OPPORTUNITY**".
- (b) These missed opportunities should be identified during the OE search and appropriate action taken as necessary to identify these missed opportunities within the CR process.
- 1.8 **IF** there are missed opportunities as a result of the review, **THEN** these should be identified as Causal Factor(s) in the root cause Evaluation.
- 1.9 In today's world of information technology the NRC and INPO have made available an immense amount of data based on equipment issues, process issues, human performance issues, industrial safety issues, and others that the industry as a whole have experienced.
- (a) This data provides information on industry events that spans nearly 25 years of operation. Information that was reported in the early 1980s is not as technical or detailed as the same type of information being shared in today's industry.
- (b) Although current event information is more detailed and timely, facts may have been intentionally obscured by the author to prevent unintentional liability of a vendor or to ensure that the tone of the information is not inflammatory to the utility reporting the information.
- (c) When reviewing industry and in-house information to determine if a missed opportunity has occurred, the following databases should be considered:

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INPO Databases:	Vendor Databases:	In-House Databases:
INPO OE Search	Autonomy	PCRS
INPO Plant Events	eB	OE Database

- (d) Root Cause and Apparent Cause Evaluations may also be considered when making a missed opportunity determination since many of these documents provide additional precursor information.

**Criterion 1:** Did a similar or same event or condition previously occur in the industry? **IF** the answer to Criteria 1 is yes, **THEN** a possible missed opportunity has occurred.

**Some things to consider are:**

1. Has a condition or event previously occurred in the industry that is exactly like the condition or event that is currently being reviewed? This would entail specific details relating to a particular component, process, design, or other factor associated with the condition or event being reviewed. For example:
  - i. A pump of certain type and model has experienced a failure that is exactly like a previously reported failure by another plant with the same type and model of pump.
  - ii. A tag out error has occurred as the result of a software deficiency that is exactly like a previously reported tag out error caused by the same software at another plant.
2. Has a condition or event previously occurred in the industry that is similar to the condition or event that is currently being reviewed? This would entail generic details that may be applicable to a similar component, process, design, or other factor associated with the condition or event being reviewed. For example:
  - i. A deficiency is identified in a component that is similar in design to a component manufactured by a different vendor that previously reported the same type of deficiency in a Part 21 notification.
  - ii. An error occurred in reading the oil level in a sight glass on a motor and is similar to a deficiency that was previously reported concerning improper calculation of level bands on sight glass indicators at another plant.

**Criterion 2:** If a similar or same event or condition has occurred previously in the industry, has it been evaluated? **IF** the answer to Criteria 2 is no, **THEN** a possible missed opportunity has occurred.

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ATTACHMENT 9.8

PREVIOUS OCCURRENCE EVALUATION/OPERATING EXPERIENCE

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**Some things to consider are:**

1. Was the initial event or condition screened for applicability
2. Was the initial event or condition distributed for review and comment
3. Was the distribution appropriate for the initial event or condition
4. Was a condition report generated
5. For a repeat occurrence, was the original search broad enough?

**Criterion 3:** If a similar or same event or condition, which has previously occurred in the industry, has been evaluated, then did the evaluation result in taking actions to address the issues identified?

**IF** the answer to Criterion 3 is no, **THEN** a possible missed opportunity has occurred.

**IF** the answer to Criterion 3 is yes, **THEN** ineffective corrective actions may have occurred.

**Some things to consider are:**

1. Did the evaluation of the previous industry condition or event identify and reasonable address the issues or concerns
2. If the conclusion of the evaluation resulted in no action being taken, then was there adequate justification for no action

After reviewing the industry information and it has been determined that a missed opportunity has been identified, then integrate that information into the analysis tool(s) and determine what type of causal factor is indicated in the root cause Evaluation.

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## A. GENERAL GUIDANCE

1. The relative effectiveness of corrective actions in decreasing order is defined as follows:
  - a. Preclude Repetition: Eliminate the root causes of the problem(s) using physical and/or administrative process change(s) (most effective).
  - b. Reduce Recurrence: Control the problem by strengthening existing physical or process barriers.
  - c. Minimize Consequences:
    - Make system or process more fault tolerant by installing automatic safety devices to deal with the problem or automatic warning devices to alert operations personnel to the development of the problem, or
    - Use manual contingent actions with recognized initiating conditions (triggers) when the problem occurs through use of procedures and/or training.
  - d. Take No Action: Identify and accept risks of taking no action (least effective – this is only acceptable when the risk is judged to be not significant).
2. The intent of a corrective action plan is to provide a high level of confidence that the Corrective Actions to Preclude Repetition (CAPRs) for the root causes of significant events will:
  - a. Eliminate the causes of the significant event so that the same or similar events are not repeated, **OR**
  - b. Mitigate the consequences of a repeat event, where the root causes of the event have not been positively established, and if feasible, **OR**
  - c. Significantly reduce the probability of occurrence of similar events of lower significance.
3. Ensure the CAPR will clearly result in long-term correction. The following actions are typically NOT appropriate for a CAPR:
  - Evaluating or reviewing a procedure, process, design, etc.
  - Request to review, evaluate, or obtain approval.
  - Discipline, coaching, or counseling of individuals.
  - Short term actions such as tailgate meetings, stand downs, memos.
  - Training (unless done systematically – such as an addition to continuing training).
  - Reinforcing or clarifying expectations (unless done systematically).
  - Reviewing “extent of condition”.

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4. The corrective action plan should:

- a. Correct the problem, correct all identified causes and failed barriers and preclude repetition of identical and similar problems. For example, if the cause of a valve failure was the result of poor configuration control of a previous change in design, then corrective actions would have to include:
  - repairing the valve by installing the correct parts (remedial action to correct the problem)
  - revising the drawings to show the correct configuration (corrective action to preclude repetition)
  - upgrading the configuration control process on sub component changes (generic/recurring considerations)
- b. Ensure that actions for equipment problems are considered to enable breaker to breaker runs.
- c. Be implemented in a timely manner - it should contain interim corrective actions if comprehensive corrective actions cannot be readily/economically implemented.
- d. Be consistent with other goals or constraints (e.g. ALARA) and should take into consideration interrelationships between work groups. The Responsible Manager will implement actions deemed necessary to correct the problems identified, however, actions should have prior concurrence of other affected Managers if possible.
- e. Consider training requirements.
- f. Avoid correcting only the symptoms instead of eliminating the cause(s). For example, corrective actions should not be limited to only repairing a leaky valve (symptom) but should also correct reasons (cause) for improper design, installation, maintenance, operation etc.
- g. In addition to the above guidance, the corrective action plan should also be validated by considering the following criteria:
  - Specific (It can be clearly determined what is needed to complete the action).
  - Actionable (revise, implement, install – not review, develop, consider).
  - Measurable (effectiveness can be determined).
  - Timely.
  - Necessary (will correct the problem and/or prevent recurrence, and is commensurate to the safety significance of the event).
  - Cost Effective.
  - Compatible (with other programs, licensing basis, and/or other regulatory commitments).
  - Within the capability of management to implement.
  - Addresses the cause, without creating another undesirable situation.

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5. **IF** it is not feasible to preclude repetition of an undesirable event or problem or actions are developed in response to a probable cause, **THEN** actions should be directed to:
- a. Reduce the likelihood of recurrence, **OR**
  - b. Minimize the consequences of recurrence **OR**
    - Example: If lightning induced electromagnetic interference (EMI) in the reactor protection system caused the plant to trip, but the exact cause of the EMI could not be determined, then actions should be implemented to permit detection of lightning and to reduce reactor power to increase the margin to the reactor protection system trip set point when lightning is in the vicinity.
  - c. Improve the ability to investigate future events
    - In the example given above, a plan should be developed and implemented to improve diagnostic capabilities, such as installing appropriate reactor protection system monitoring instrumentation.

**B. VIABILITY**

Apply the following criteria to the proposed corrective actions to ensure they are viable:

1. Will the corrective actions preclude repetition of the problem?  
 Example: Will revising the preventative maintenance performed on the valve prevent it from leaking again?
2. Are the corrective actions within the capability of the utility to implement?  
 Example: Is revision to the preventative maintenance of the valve within the capability of the plant to implement?
3. Are the corrective actions consistent with organizational goals and objectives such that the likelihood of implementing the action is high?  
 Example: Will revising the preventative maintenance task support the safe and reliable production of power?  
 Example: Do the groups responsible for implementing the preventive maintenance agree with the changes proposed?
4. Have assumed risks been clearly stated?  
 Example: What new problems could revising the preventative maintenance procedure create? What are the risks of not revising the procedure?

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Effectiveness Review Plan

1. The plan developed in the Root Cause Evaluation should include:
  - Specific actions
  - Responsible work groups
  - Estimated completion dates
2. The CA&A group may issue a "Learning Organization (LO)" document (included in the parent CR reference items) to track completion of Effectiveness Review actions.
3. Results of Effectiveness Reviews should be documented in the LO action:
  - Perform the prescribed review actions and document the results.
  - Evaluate if there is an acceptable level of repetition. CAPRs are deemed effective (in part) when performance has achieved an acceptable level of repetition. An acceptable level of repetition does not necessarily mean zero repetition. In cases of high safety significance (nuclear, industrial and radiological safety), zero may be the only acceptable level of repetition. In many other cases, zero may not be realistic.
  - Consider if change in performance has been sustained for sufficient duration to exclude a statistical anomaly.
  - Formulate a conclusion concerning effectiveness. Is the original adverse condition fixed or made acceptable without any additional actions? Initiate a CR if the review concludes that corrective actions have not been effective.
  - In addition to the above discussion on the effectiveness review process, additional guidance is also provided below to assist in the performance of a high quality effectiveness review:
4. Effectiveness reviews verify that the intended or expected results were achieved after implementation of corrective actions, and confirm that new problems or unintended consequences were not introduced by implementation of the actions. Effectiveness Reviews are performed after actions have been in place for a specified period of time.
5. This review is required for CAPRs for significant CRs as described in EN-LI-102 "Corrective Action Process."
6. An Effectiveness Review that reaches a conclusion that Corrective Actions / CAPRs were ineffective should result in the initiation of a new CR, see Section 5.6 for condition report initiation guidance.

The Root Cause Evaluation (RCE) should contain an Effectiveness Review Plan which includes the following:

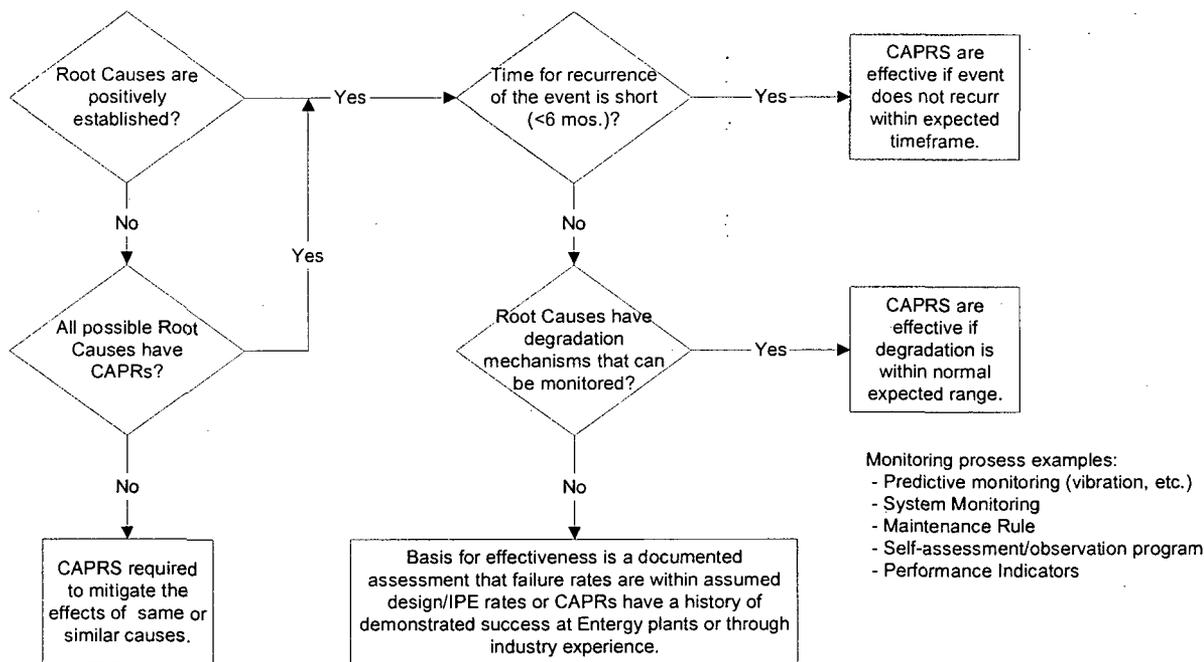
**Method** – Describe the method that will be used to verify that the actions taken had the desired outcome. Methods could include performance of a self-assessment, walkthrough, mock-up or simulation, document review, performance indicator monitoring, etc.

**Attributes** – Describe the particular process attributes to be monitored or evaluated for effectiveness (e.g. process timeliness, component alignment or position, system performance, etc.).

**Success** – Establish the acceptance criteria for the attributes to be monitored or evaluated.

**Timeliness** – Define the optimum time to perform the Effectiveness Review. The timing of the review should allow sufficient time for the CAPR(s) to be effective, but should also be performed as early as practicable to verify effectiveness before barriers implemented by the CAPR(s) are required to preclude repetition of the original significant condition or event.

FIGURE 9.12.1



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7. When performing an Effectiveness Review, use the following template (obtained as a form from the Electronic Document Management system) to document the evaluation of the effectiveness of actions taken to preclude repetition. The below listed attributes are to be included in the effectiveness review as a minimum.

<b>Condition Report Number:</b>	<b>Assigned Department:</b>
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**Effectiveness Review Criteria should be based on the following questions:**

1. Has sufficient time elapsed for the result of implementation to be assessed?
2. Is the current set of Corrective Actions to Preclude Repetition the same as in the originally approved root cause evaluation? If not, is there evidence of approval to deviate from the originally approved corrective action plan?
3. Have the Corrective Action (s) to Preclude Repetition (CAPRs) been completed? If these are not met, THEN do not proceed with the review.

**Additional Considerations:**

4. Are appropriate measures in place to institutionalize corrective actions to prevent recurrence of the event?
5. Based on a review of CAP data and history, has the event recurred again?
6. Overall, are the Corrective Actions to Prevent Recurrence considered effective such that no further actions are required to prevent recurrence?

Note: The above six criteria are not required to be answered in this section. These criteria should be addressed in the applicable section of the template.

**SECTION 1: - PROBLEM STATEMENT:** – (As specified in the CRG approved Problem Statement, not the CR description).

**SECTION 2: - ROOT CAUSE & CAPR IDENTIFICATION & APPROVED MAST MODEL:**

Identify each of the Causes and their respective CAPRs listed in the approved RCE in this section of the evaluation. The information can be cut and pasted from the approved RCE. Identify the CAPRs by number. Note: All CAPRs being evaluated should be listed in this section (i.e. CAPR #1, CAPR#2, etc). Cut and paste the approved Effectiveness Review strategy from the RCE in this section also. This is the basis for the effectiveness review (i.e. Method, Attributes, Success and Timeliness) that is approved by the CARB. The effectiveness review should be performed based on the approved MAST model in the RCE.

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**SECTION 3: CAPR EFFECTIVENESS EVALUATION:** In this section, provide the basis for why the CAPRs identified in Section 2 above have been effective in preventing recurrence.

**SECTION 4: TIMELINESS EVALUATION:** State in this section the basis for timeliness of the Effectiveness Review. Explain why the evaluator believes that sufficient time has elapsed to perform the effectiveness review. *Sufficient time must have elapsed for the corrective actions to have taken full affect and been effectively implemented.*

**SECTION 5: EFFECTIVENESS EVALUATION CONCLUSION:** Utilizing the criteria establish on page 1 of this template, provide objective evidence in the form of a conclusion as to why the overall corrective action plan and identified CAPRs have been effective in preventing recurrence. Each CAPR does not require individually addressing, however an overall "roll-up" of the CAPRs is recommended to be included in the final conclusion. The overall corrective action plan, exclusive of the CAPRs should also be considered in the final conclusion statement. An Effectiveness Review that reaches a conclusion that Corrective Actions / CAPRs were ineffective should result in the initiation of a new CR (see Section 5.6 of EN-LI-118 for condition report initiation guidance).

**SECTION 6: UNINTENDED CONSEQUENCES:** Are there any unintended consequences as a result of implementing the CAPR(s) or Corrective Action Plan? (i.e. increased overtime, increased spending, poor reception by staff, or process breakdowns). Describe in this section, the answer to these questions

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ATTACHMENT 9.11

REPORT FORMAT

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Entergy Operations, {UNIT NAME/NUMBER}

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## Root Cause Evaluation Report

{Event TITLE}

CR-Unit-yyyy-xxxx; Event Date: mm-dd-yyyy

**REPORT DATE: mm-dd-yyyy, Rev x**

Position	Name	Date
Evaluator		
Reviewer		
Responsible Manager		
CARB Chairperson		

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**ATTACHMENT 9.11**

**REPORT FORMAT**

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## **Problem Statement**

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**ATTACHMENT 9.11**

**REPORT FORMAT**

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## Event Narrative

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**ATTACHMENT 9.11**

**REPORT FORMAT**

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## Root Cause Evaluation

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### Event Scenario (Optional)

### Root Causes:

### Contributing Causes:

### Organizational and Programmatic Weakness Evaluation:

### Safety Culture Evaluation:

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## **Generic Implications: Extent of Condition and Extent of Cause**

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**Extent of Problem/Condition:**

**Extent of Cause:**

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**ATTACHMENT 9.11**

**REPORT FORMAT**

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## Previous Occurrence Evaluation

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## Safety Significance Evaluation

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## Corrective Action Plan

All root and contributing causes, and generic implications must have corrective actions or a documented basis why no action is recommended.

Identified Cause	Corrective Actions	Responsible Dept.	Due Date
	<b>Immediate Actions</b>		
	<b>Interim Actions</b>		
	<b>Short &amp; Long Term Actions</b>		
<b>Example:</b> <u>RC-1</u> Operation not Compatible with Design	<u>CAPR</u> : Evaluate system operating and testing modes and develop or revise operating procedures to be compatible with existing design.	Operations	10/10/05

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## Effectiveness Review Plan

This section should contain an Effectiveness Review strategy that includes the following:

**Method** – Describe the method that will be used to verify that the actions taken had the desired outcome.

**Attributes** – Describe the process attributes to be monitored or evaluated.

**Success** – Establish the acceptance criteria for the attributes to be monitored or evaluated.

**Timeliness** – Define the optimum time to perform the effectiveness review.}

1. Effectiveness review actions are required for all CAPRs.

CAPR:			
	Action	Resp. Dept	Due Date
<b>Method:</b>			
<b>Attributes:</b>			
<b>Success:</b>			
<b>Timeliness:</b>			

- Repeat the above for each CAPR, as required.
- Similar MAST criteria may also be shown for other important corrective actions.

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**References**

Documents Reviewed:

Personnel Contacted:

Team Members:

Analysis Methods Used:

**Attachments**

1.

**Root Cause Evaluation Quality Checklist/Score Sheet**

CR # \_\_\_\_\_ Root Cause Dept./Evaluator \_\_\_\_\_

Date RCE Completed \_\_\_\_\_

Score \_\_\_\_\_ out of 25 Reviewer(s) \_\_\_\_\_

Date Reviewed \_\_\_\_\_

Criteria	Scoring	Reviewer Comments
<b>1. Problem Statement</b> > States the object and deviation (describes the equipment malfunction / inappropriate behavior / process deficiency)  <b>2. Event Narrative</b> > Provides brief timeline (and process description, as applicable). > Describes what activities were being performed and individuals involved (by title) with the activity. > Clearly identifies deviations from process expectations, failed barriers, and malfunctions. > Evaluation method is identified and evaluation is attached.	0 (does not address criteria) to 4 (addresses all criteria)          SCORE = _____ out of 4	
<b>3. Root/Contributing Causes/ O &amp; P Weaknesses / Safety Culture Evaluation</b> > Root/contributing causes are clearly derived from the information in the previous section. > Specific failure mechanism(s) are identified with a brief explanation of HOW the cause created the problem. > Identifies cause of the inappropriate action or malfunction by ruling out reasonably possible causes by testing against the facts (destructive test). > Discusses the results of the Safety Culture Evaluation and any intended site actions	0 (does not address criteria) to 7 (addresses all criteria)          SCORE = _____ out of 7	
<b>4. Generic Implications</b> > Extends the problem and extends the Cause through evaluation of similar components, processes, or procedures to identify areas of vulnerability.  <b>5. Safety Significance Evaluation</b> > Discuss any likely impact on nuclear, radiological or industrial safety. Provide justification for no impact.	0 (does not address criteria) to 4 (addresses all criteria)          SCORE = _____ out of 4	
<b>6. Previous Occurrence Evaluation (Site/External)</b> > Identifies what databases and sources were used and how the OE search was performed. > Identifies how applicable lessons learned are applied to the current problem.	0 (does not address criteria) to 3 (addresses all criteria)          SCORE = _____ out of 3	

