D R A F T

ILRT Type A Test Interval Optimization Methodology
Expert Elicitation Input and Results

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1.0 INTRODUCTION

This report section provides a description of the expert elicitation input process and results. This document combined with the ILRT problem statement and the ILRT expert elicitation process provide a full description of the expert elicitation inputs, process, its application to the risk impact assessment of the ILRT test optimization. The ILRT problem statement and the ILRT expert elicitation process are discussed in previous report sections.

The expert elicitation input is provided to the experts in several stages. In the first stage the experts are provided the problem statement. The problem statement contains a statement of issues associated with the extension of the ILRT testing interval as well as information from the Significant Containment Leakage/Degraded Liner Events database.

In the second stage, the experts are brought together and the issues presented as well as the planned approach to the solicitation of their input.

In the third and final stage, the experts are presented with the final results of their collective input (i.e., “ILRT failure” probability) as well as the results as well as the results of the use of their input in the final assessment of the risk impact assessment of the ILRT Type A test interval optimization.

2.0 EXPERT ELICITATION RESULTS SUMMARY

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3.0 STAGE 1: EXPERT ELICITATION PREPARATION

In preparation for the expert elicitation meeting, the problem statement as well as the Significant Containment Leakage / Degraded Liner Events database are provided to the experts. As part of the transmittal, experts are request to provide input to revise the problem statement and focus their collective efforts on the problem. Specifically experts are asked:

1. "Does the problem state adequately address the factors and issues associated with the determination of ILRT failure[1] rate?"

2. "Do you have any suggestions for improvement to the problem statement?"

3. "Is the expert elicitation process adequately described?"

In preparation for stage 2, all input received from the experts is incorporated into the problem statements and expert elicitation process.

[1] The problem statement defines "ILRT Failure" as those ILRT tests in which containment leakage was identified above the acceptance criteria that would not be detected by a local leak rate test, containment inspections, or other alternate means.

4.0 STAGE 2: EXPERT ELICITATION MEETING

The following report sub-section describes the attributes and the detailed agenda of the expert elicitation meeting. The expert elicitation meeting has the following attributes:

- A two-day meeting is planned
- Conducted in a location remote to the experts to allow undistracted ILRT Optimization panel meeting
- The elicitation is integrator facilitates the meeting.

The planned two-day meeting is organized around the following agenda:

DAY 1 – Morning Session

Presentation of Problem Statement
Revision and Feedback Incorporation to the Problem Statement
Presentation of the Expert Elicitation Process

DAY 1 – Afternoon Session

Presentation of PRA Concepts
Presentation of the Application of PSA Concepts to ILRT Optimization
Presentation of the Significant Containment Leakage/Degraded Liner Events Database and other relevant data

DAY 2 – Morning Session

Presentation of the Expert Elicitation example
Expert Discussion of ILRT Issues
Individual Expert ILRT Input Development

DAY 2 – Afternoon Session

Expert Discussion of ILRT Failure Probability Results
Expert Discussion of ILRT Risk Impact Assessment Results

4.1 Expert Elicitation Meeting: Day 1 – Morning Session

In the Day 1 – morning session the topic presented includes a Presentation of Problem Statement, Revision and Feedback Incorporation to the Problem Statement, and Presentation of the Expert Elicitation Process. These three presentations are already familiar to the experts since they will have been provided as part of the expert elicitation preparation.

In the first presentation, the revised problem statement is presented with a focus on the changes that have been made as a result of the expert feedback.

The second presentation solicits any additional changes to the problem statement as a result of the previous discussion as well as expert panel discussions.

The third and final presentation of the Day 1 - morning session is a presentation on the expert panel elicitation process. No feedback is required on the process since the process has been used in previous successful solicitation of expert panel opinion. However, any feedback given is considered and incorporated in the expert elicitation process over the lunch break.

4.2 Expert Elicitation Meeting: Day 1 – Afternoon Session

In the Day 1 – afternoon session the topic presented include Presentation of PSA Concepts, Presentation of the Application of PSA Concepts to ILRT Optimization,

and Presentation of the Significant Containment Leakage/Degraded Liner Events Database and other relevant data. The afternoon session begins with the discussion of any changes identified to the expert elicitation process from the morning session.

The first presentation of the afternoon session is a presentation on PSA concepts. This presentation is relatively overview and presents the basic concepts of probabilistic safety assessment.

The second presentation of the afternoon session is on the application of the PSA concepts to the assessment of the risk impact associated with the optimization of ILRT intervals. Specifically, the methods employed to determine the risk impact as well as the role of the expert assessment are discussed. Feedback from the experts on the risk impact methods is solicited.

The third and final presentation of the afternoon session is the presentation of the Significant Containment Leakage/Degraded Liner Events Database and other relevant data. The process of the collection of the events, the availability of additional information and the preliminary sorting of the data is also discussed. Feedback on the data is solicited. The feedback is incorporated into the database and presented in the Day 2 – morning session.

4.3 Expert Elicitation Meeting: Day 2 – Morning Session

In the Day 2 – morning session the topic presented include Presentation of the Expert Elicitation example, Expert Discussion of ILRT Issues, and Individual Expert ILRT Input Development. The morning session begins with a discussion of any changes made to the Significant Containment Leakage/Degraded Liner Events Database.

The first presentation is the expert elicitation example. In this example, the use of the expert elicitation gathered information is demonstrated. This demonstration includes the assessment of the ILRT failure probability and the result of that failure probability on the assessment of the risk impact associated with the optimization of the ILRT Type A testing intervals.

The second presentation of the morning session is the discussion of ILRT issues. This discussion includes, but is not limited to, discussion of the potential containment failures modes and causes. The failure modes include those that have been experienced in the data as well as those potential failure modes that have not yet been experienced.

The last presentation of the morning session is the solicitation of the experts individual opinions. The expert solicitation is performed using the form contained in attachment 1 to this report. Following the collection of the expert opinion, the individual expert opinions are shared and discussed. The session ends with the submission of the final individual expert opinions. The expert individual opinions are combined to produce the common community distribution after the final presentation to the experts. The community distribution is developed by the technical integrator. The community distribution is presented to the experts in the afternoon session.

4.4 Expert Elicitation Meeting: Day 2 – Afternoon Session

The afternoon session begins the presentation of the community distribution to the experts. The community distribution is discussed in detail including the significant contributors to the distribution and the resulting risk impact associated with the ILRT Testing Interval Optimization.

During the discussion of the community distribution and risk impact assessment results, feedback from the experts is solicited. Any changes to the community

distribution and the resulting impacts on the ILRT Testing Interval Optimization are presented to the experts.

Experts are finally asked for “buy in” to their personnel input, the resulting community distribution and the resulting risk impact assessment from the optimization of ILRT testing intervals.

5.0 STEERING COMMITTEE REVIEW

Following completion of the expert elicitation, the NEI ILRT task force is given the results of the expert elicitation and the results of the risk impact assessment of the ILRT testing optimization for review. The purpose of this review is to independently verify that the results of the expert elicitation considered the widest range of potential containment failure modes impacted by the optimization of ILRT optimization and to verify the risk impact assessment of ILRT testing optimization results.

ATTACHMENT 1:
EXPERT ELICITATION INPUT FORM

The attached expert elicitation input table presents the form and type of input requested from the experts. The input from the experts is requested in tabular format. The table is described in detail in the following report sub-sections.

In summary, the experts are asked to complete the table based on 1000 hypothetical tests. The experts are requested to augment the table with additional failure modes that may not appear on the table. Special attention to the affects of aging on potential containment failure modes is emphasized.

Factions as well as whole numbers can be used in the table entries. For example, a fraction of 0.1 indicates that this failure mode would be expected once per 10,000 tests. A faction of 0.01 indicates that this failure mode would be experienced once per 100,000 tests.

From the ILRT database, an initial attempt is made to complete the table. Since only small ILRT degradations have occurred, the entries on the table are limited. Experts are asked to augment the current small containment leakage columns.

Summary of Expert Elicitation Input Table Description

Column 1 of the table, “No.”, is the numerical entry number.

Column 2 of the form, “Containment Degradation of Failure Mode”, presents a potential failure mode of the ILRT. The majority of entries in this column are taken from the ILRT database representing previous linear degradations or leakage pathways. Other potential ILRT failure modes or containment degradation modes are also listed whether they have been experienced in the data or not. Blank lines are provided for experts to add additional containment degradation mechanisms not listed in the table. These additional failure modes or containment degradation events are discussed among the experts during the various expert elicitation discussion sessions.

Column 3, “Notes / Comments”, provides a space for the experts to provide a basis for the assigned values. Due to space limitations on the table, experts are asked to number their notes and comments and provide them on a separate lined form.

Column 4, “Small Leakage Pathway”, is comprised of three sub-columns (4a, 4b, and 4c). These sub-columns are described in detail below.

Column 4a, “Small Leakage Pathway – No. or fraction of 1000 ILRTs”, presents the number or fraction of ILRT events, from the ILRT database, for each containment degradation or containment leakage pathway that has resulted in a small leakage pathway. The number of events from the ILRT database are then ratioed to represent 1000 tests. A small leakage pathway is defined as a leakage pathway that would result in an La of 2 or greater and less than 10 La. Experts are asked to augment column 2 with any additional failure modes or containment degradations that may not have appear in the ILRT database.

Column 4b, “Small Leakage Pathways – Detected by Alternative Means”, presents the fraction of ILRT events, from the ILRT database for each containment degradation or containment leakage pathway that has resulted in a small leakage pathway and has been discovered by alternate means. These alternate means include other inspections, normal operation, or other tests such as a local leak rate test. This column can include a fraction that is thought would be detected. The experts are asked to complete or change this column. As with the other columns in this table, it is to be based on 1000 ILRTs performed and entries can be in fractional form.

Column 4c, “Small Leakage Pathway – Total Undetected Events” is calculated based on the number of events minus those events detected by alternate means

(i.e., column 4a – column 4b). This value is used in the estimation of the risk impact associated with the optimization of ILRT testing intervals.

Column 5, "Medium Leakage Pathways" is comprised of three sub-columns (5a, 5b, and 5c). These three sub-columns are described in detail below.

Column 5a, "Medium Leakage Pathway – No. or Fraction of 1000 ILRTs", presents the number or fraction of ILRT events for each containment degradation or containment leakage pathway that has resulted in a medium leakage pathway. A medium pathway is defined as a leakage pathway that would result in an La of 10 or greater and less than 50 La. Experts are asked to complete column 5a with any additional failure modes or containment degradations and assign a number of ILRT degradations, failures or containment leakage events that would result in a leakage rate of this magnitude out of 1000 hypothetical ILRTs performed.

Column 5b, "Medium Leakage Pathways – Detected by Alternative Means", presents the fraction of ILRT events for each containment degradation or containment leakage pathway that has resulted in a medium leakage pathway and has been discovered by alternate means. These alternate means include other inspections, normal operation, or other tests such as a local leak rate test. The experts are asked to complete this column. As with the other columns in this table, it is to be based on 1000 ILRTs hypothetical test performed and entries can be in fractional form.

Column 5c, "Medium Leakage Pathway – Total Undetected Events" is calculated based on the No. or Fraction of 1000 ILRTs minus the Detected by Other Means columns (i.e., 5a – 5b). This value is used to estimate the risk impact associated with the optimization of ILRT testing intervals.

Column 6, "Large Leakage Pathway" is comprised of three sub-columns (6a, 6b, and 6c). The three sub-columns are described in detail below.

Column 6a, "Large Leakage Pathway – No. or Fraction of 1000 ILRTs", presents the number or fraction of ILRT events for each containment degradation or containment leakage pathway that has resulted in a large leakage pathway. A large pathway is defined as a leakage pathway that would result in an La of greater than 50 greater. Experts are asked to complete column 6a with any additional failure modes or containment degradations and assign a number of ILRT degradations, failures or containment leakage events that would result in a leakage rate of this magnitude out of 1000 hypothetical ILRTs performed.

Column 6b, "Large Leakage Pathways – Detected by Alternative Means", presents the fraction of ILRT events for each containment degradation or containment leakage pathway that has resulted in a large leakage pathway and has been discovered by alternate means. These alternate means include other inspections, normal operation, or other tests such as a local leak rate test. The experts are asked to complete this column. As with the other columns in this table, it is to be based on 1000 ILRTs hypothetical test performed and entries can be in fractional form.

Column 6c, "Large Leakage Pathway – Total Undetected Events" is calculated based on the No. or Fraction of 1000 ILRTs minus the Detected by Other Means columns (i.e., 6a – 6b). This value is used to estimate the risk impact associated with the optimization of ILRT testing intervals.

Summary of Expert Elicitation Input Table Rows

The rows in the expert elicitation input table as sequentially numbered. Each numbered entry represents a containment failure mode that can result in a containment leakage event. Some failure modes have been experienced in the

ILRT database and these appear on the table. Other containment failure modes have not been experienced and are hypothetical. Experts are encouraged based on their experience, to augment the table with additional failure modes. Special consideration should be given to those failure modes that are age related and may appear in the current ILRT testing data.

A summary row is provided in the table. In this summary row, the contributions to small, medium and large containment degradations or failure modes are summed. In addition, those failure modes detected by alternate means are also summed for the leakage classes of small, medium and large. Lastly, the contributions to the small, medium and large leakage pathways total undetected are also summed.

No.	Failure Mode or degradation Description	Notes / Comments	Small Leakage Pathway (< 2La)			Medium Leakage Pathway (2 - 10 La)			Large Leakage Pathway (> 10 La)		
			No. or fraction of 1000 ILRTs	Detected by Alternate Means	Total Undetected Events	No. or fraction of 1000 ILRTs	Detected by Alternate Means	Total Undetected Events	No. or fraction of 1000 ILRTs	Detected by Alternate Means	Total Undetected Events
1	Original containment design deficiency										
2	Construction error or deficiency (e.g., construction debris in concrete)										
3	Human error associated with testing or maintenance of containment (e.g., testing equipment left on containment penetration, not replacing caps on containment pressure instruments, improper mechanical alignment of valve components, use of improper components such as o-rings, washers in mechanical joints)										
4	Human error, design error or other deficiency associated with modifications (e.g., purge valves installed in wrong direction, spare pipes not capped, debris left in isolation valve, etc.)										
5	Erosion										

No.	Failure Mode or degradation Description	Notes / Comments	Small Leakage Pathway (< 2La)			Medium Leakage Pathway (2 - 10 La)			Large Leakage Pathway (> 10 La)		
			No. or fraction of 1000 ILRTs	Detected by Alternate Means	Total Undetected Events	No. or fraction of 1000 ILRTs	Detected by Alternate Means	Total Undetected Events	No. or fraction of 1000 ILRTs	Detected by Alternate Means	Total Undetected Events
6	Corrosion (e.g., corrosion near water interface in bilges, corrosion of expansion bellows, corrosion of pipe caps, etc.)										
7	Fatigue failures (e.g., bellows fatigue failure)										
8	Others										
9											
	TOTALS										

ATTACHMENT 2:
EXPERT ELICITATION PRESENTATIONS