Risk Management for Decommissioning – the IAEA DRiMa Project

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• Working mechanism and project activities
• Risk management methodology for decommissioning
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• Specificities of risk management at operational level
• Project output and outcomes, use of the project results
• Summary
Background

• Many countries with less developed nuclear programmes among the IAEA Member States
• Very often decommissioning is to be done by institutions, which lack experience in running engineering projects
• Feedback from missions and meetings – assistance needed in managing project risks
• Discussions at the 2011 Annual Forum of the International Decommissioning Network (IDN) identified project risk management as a priority issue
  – Experiences and good practices exist in some MS, sharing of experience is needed
• Proposal for an IDN project was developed by a group of experts
• Decommissioning Risk Management (DRiMa) project was implemented in 2012-2015
Project objective

- Collect existing experiences in Member States and identify good practices related to management of project risks – both general and decommissioning specific;
- Describe recommended risk management methodology;
- Provide recommendations on the application of that methodology for decommissioning;
- Illustrate the role of risk management in key decision making during planning and implementation / execution of decommissioning;
- Illustrate the risk treatment strategies to minimise threats and maximise opportunities during decommissioning;
- Enhance capabilities of Member States in this area and facilitate exchange of information among Member States.
Project scope

- **Scope**: risk management for decommissioning during planning & execution
  - **Risk ≠ Safety Risk** (as in most of the IAEA projects)
  - **ISO 31000**: “Risk is the effect of any uncertainty on objectives” – often negative, but could be positive
  - **Threats** and **opportunities** with respect to the **achievement** of project objectives
  - **Risk management** serves to **minimize threats** and maximize opportunities
  - Consider RM at **strategic and operational level**
  - Consider **existing risk management methodologies**
  - Explain **relation** between **RM** and **safety assessment**
Working mechanism and project activities

IAEA International Decommissioning Network (IDN)

Project Chairperson
J. Kaulard

IAEA Scientific Secretaries
V. Ljubenov, P. O’Sullivan

Coordinating Working Group (CWG)

Working Group on Risk Management at Strategic Level
P. Francois (CP), D. Skanatan (VCP)

Working Group on Risk Management at Operational Level
M. Pennington (CP), K. Schruder (VCP)

Base of the DRiMa Project
In total (November 2015): ~ 70 Experts from 30 IAEA Member States
Working mechanism and project activities

Start

12 Months

Draft No. 0

Continuous Elaboration and Drafting

Experience Collection

Continuous Experience Collection

“Practical Exercises”

Workshop

End

Final

Methods

Experience Collection

Project Report

Trail Application
Working mechanism and project activities

- 4 Annual Meetings in Vienna & Cologne (Q4)
- 3 Interim Meetings in Cologne, Zadar & Brussels (Q2)
- 3 Consultancy meetings of the Coordination Group
- Participation
  - Annual Meetings: 34 to 44 persons from 23 to 29 MS
  - Interim Meetings: 20 to 26 persons from 14 to 18 MS
  - in total ~70 persons involved in the DRiMa Project
- 38 presentations and 12 posters related to risk management presented by participants at Annual Meetings
- Experiences from other industries taken into account
Context of Risk Management

- **Risk management** serves to
  - identify **what is influencing the achievement** of the objectives & what/when to do
  - **compare different options / projects** to support a selection process

**typical objectives**: costs, schedule, safety, quality, ...

**influencing factors**: assumptions, strategic decisions, technical details, ...
Benefits from risk management

- Ensuring that all foreseeable risks to the decommissioning project objectives are managed proactively and effectively;
- Identifying critical areas for the project to address and to align the available resources;
- Supporting effective decision making under conditions of uncertainty;
- Improving the awareness and visibility of the risks within the organization;
- Aiding effective communication and transparency to external stakeholders.

- Relations to cost obvious!
Risk management methodology for decommissioning

- Initial thinking – address risks to a decommissioning project – strategic and operational
- Are there risks to the project before we have it in place (during early planning)? What does introduce such risks?

<table>
<thead>
<tr>
<th>Phase of Planning</th>
<th>Phase of Execution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>key assumptions</strong></td>
<td><strong>strategic decisions</strong></td>
</tr>
<tr>
<td>Initial Decommissioning Plan (IDP)</td>
<td>Final Decommissioning Plan (FDP)</td>
</tr>
</tbody>
</table>

- project details

FDP  Final Decommissioning Plan
IDP  Initial Decommissioning Plan

• Initial thinking – address risks to a decommissioning project – strategic and operational
• Are there risks to the project before we have it in place (during early planning)? What does introduce such risks?
Risk management methodology for decommissioning

Assumption Management vs. Operational Level Risk Management

**Assumption Management**
- management of assumptions, facts, strategic decisions and the related uncertainties
- more of qualitative nature
- covering aspect of the evolution of assumptions towards strategic decisions

**Operational Level Risk Management**
- management of risks associated with the project details of the decommissioning work to be performed and the related / still existing uncertainties
- more of quantitative nature
- covering aspects of risk escalation and de-escalation (operational / project risk becoming strategic risk and vice versa)
Risk management methodology for decommissioning

Core of the risk management process

- Risk assessment (populating a risk register)
  - identification – which risks? (➔ promters)
  - analysis – what probability & impact (➔ consider controls)?
  - evaluation – focus on relevant risks
- Risk treatment
  - exploit (➔ avoid)
  - share (➔ transfer)
  - enhance (➔ mitigate)
  - ignore (➔ accept)
- Monitor and review
  - existing (registered) and new risks
  - re-assess risks (probabilities & impact)
Risk management methodology for decommissioning

- Risk evaluation – risk matrix
  - typically: probability and consequence
  - qualitative or quantitative evaluation
- Linked to the “risk appetite” of an organization (how much risk is acceptable), there is no universal matrix for all organizations and situations

<table>
<thead>
<tr>
<th>Probability</th>
<th>Threats</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>low</td>
<td>very low</td>
<td>very low</td>
</tr>
<tr>
<td>low</td>
<td>low</td>
<td>low</td>
</tr>
<tr>
<td>medium</td>
<td>medium</td>
<td>medium</td>
</tr>
<tr>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>very high</td>
<td>very high</td>
<td>very high</td>
</tr>
</tbody>
</table>

area of negative impact (qualitative scale)  area of positive impact (qualitative scale)
Risk management methodology for decommissioning

**Proposed tools** *(may be adjusted to the individual needs)*

- **Risk Families (set of prompters)**
  - 10 topical areas
  - Serve to **identify assumptions and risks**
  - For assumptions: help to understand interdependencies & impact if they fail

- **Registers**
  - Tool to document and manage assumptions / strategic decisions / risks
  - **Assumption Register** (also for strategic decisions)
    - purely qualitative, judgement of expected uncertainties
    - in addition: optional quantitative register in those cases which require more detailed/quantitative analysis of assumptions
    - follows the risk register methodology
  - **Risk Register**
    - quantitative nature
Risk Families

• Tool for systematic identification of relevant risks
• Specification of three-level hierarchy for a risk family
• Initially developed independently by two WGs for SL and OL
• Similar lists produced, consolidated in a single set of risk families

• Top level risk families

1. Initial conditions of installations
2. End state of installations
3. Waste & materials management
4. Organization resources
5. Finance
6. Interface with contractors & suppliers
7. Strategy & technology
8. Legal & regulatory framework
9. Safety
10. Interested parties

→ Relevance of different risk families is case-by-case specific (depends on facility type, project details, purpose of the risk management - assumption vs. risk, etc.)
Specificities of risk management at strategic level

• During early planning
  – Plan introduces assumptions with their uncertainties → associated risks to the future project
  – Could we do something? Who? When? Treat the risk? Treatment strategy? Just monitor and wait? Change the plan?

• Strategic aspects of a project during execution
  – Managed using the same methodology and tools as operational level risks, just by different entity
  – What is “strategic” at your level may be considered “operational” at a higher level within or outside of your organization
Specificities of risk management at strategic level

<table>
<thead>
<tr>
<th>N°</th>
<th>Assumptions description</th>
<th>Risk family</th>
<th>Assumption origin (regulatory-technical)</th>
<th>Comments</th>
<th>Assumptions Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>RW decommissioning takes place in accordance with a decommissioning plan</td>
<td></td>
<td></td>
<td></td>
<td>Perodicity, comments, outcomes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Every 5 years</td>
</tr>
</tbody>
</table>

**Uncertainty assessment**

- Level of uncertainty (low, medium, high)
- Comments
- Actions description
- Actions status

**Actions**

- Monitor adoption and implementation of the National RW management programme
- Open

**Assumptions register**

- Uncertainty assessment
- Assumptions Monitoring
## Specificities of risk management at operational level

<table>
<thead>
<tr>
<th>Risk ID</th>
<th>Risk Description</th>
<th>Status</th>
<th>Risk Owner</th>
<th>Activities risk can impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Waste content is unknown and during research material is discovered that does not meet acceptance criteria which causes delays and additional costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Contractors are not available as planned to support the work which results in delays to the project</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>During the cutting of material contamination is discovered</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Response/Treatment

<table>
<thead>
<tr>
<th>Action</th>
<th>Cost of treatment strategy</th>
<th>Probability Scale (1 to 5)</th>
<th>Impact Scale (1 to 5)</th>
<th>Risk Score (P x I)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify packages that can be used for non-conforming wastes</td>
<td>$50k</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Ensure execution schedule is agreed with contractor</td>
<td>$2k</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Ensure adequate containment is established for all cutting activities</td>
<td>$30k</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

### Assessment Prior to Treatment

<table>
<thead>
<tr>
<th>Calculate Risk Score (P x I)</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Assessment After Treatment

<table>
<thead>
<tr>
<th>Calculate Risk Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

### Monitoring & Control

<table>
<thead>
<tr>
<th>Actual Outcome / Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>
Specificities of risk management at operational level

• Is the risk still valid, i.e. has it expired, has it occurred?
• Is the correct owner identified?
• Are the risk treatment actions progressing as planned?
• Does the risk still adequately describe the situation?
• Are the mitigation measures effective?
• Are there any new risks?

• Operational risks can be managed within the project
• Risks that can’t be managed within the project are “escalated” to a higher level (strategic) to be managed there
Application of the methodology – AM / RM workshops

“Assumption management” workshops

Risk management workshops
Project output and outcomes

Structure of the DRiMa Report

Foreword
1. Introduction
2. Overview on Risk Management for Decommissioning
3. Risk Management at the Strategic Level
4. Risk Management at the Operational Level
5. Interfaces between RMSL and RMOL
6. Summary
7. References

ANNEXES
Annex A  Risk Families
Annex B  Example of a risk register for risk management at operational level
Annex C  Examples on Assumption Management
Annex D  Examples on Operational Risk Management
Project output and outcomes

• Direct output – DRiMa project report (to be made available as an IAEA TECDOC publication)

• Project had a significant networking and training component – many examples provided and discussed, several risk workshops performed

• Project results will be used as a basis for organizing future training events under the IAEA TC Programme
Summary

- Risk management for decommissioning can be based on the existing general risk management methodology
- DRiMa project discussed specificities of the methodology when applied to decommissioning
- Two levels of risk management analyzed – strategic and operational
- Concepts of “risk escalation” and “de-escalation” explained
- The same methodology applies, slightly different tools proposed
- Tools:
  - Risk families developed to support a systematic identification of
    - assumptions / strategic decisions and their related uncertainties
    - project risks
  - Risk matrix – for risk evaluation
Summary

• Tools:
  – **Assumption register** – used for planning assumptions / strategic decisions
  – **Risk register** – used for operational risks, applicable for strategic decisions

• Risk management is not mandatory (by IAEA safety standards and also by national regulations in general), but it’s considered a good practice

• When implemented within an organization, should be part of the integrated management system

• Safety, cost, schedule and quality are typically the main factors to be considered when doing risk management - strong safety culture within an organization is important for successful risk management
Acknowledgement:

• **Members of the Coordinating Group:**
  • J. Kaulard (Germany) – project chairman
  • P. Francois (France) and M. Pennington (UK) – leaders of the project WGs
  • D. Skanata (Croatia), K. Schruder (Canada) – deputy leaders of the WGs
• **IDN Scientific Secretary - P. O’Sullivan (IAEA)**
• **All the participants of the DRiMa project**
Thank you!