EU-H2020- SHARE-Decommissioning
On-line Workshop, December 1-3, 2020

Group A
Session 7: Environmental Remediation and Site Release

Session will start at 11:20 CET

Frederica PANCOTTI, SOGIN

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement nº 847626.

Group A
Session 7: Environmental Remediation and Site Release

Agenda

Dec 2d	**International initiatives**		
	11 :20	7A	IAEA Environet and NORM conference by Olena MYKOLAICHUK, IAEA *(10 min)*
	11:30	7B	IAEA Project on Completion of Decommissioning (COMDEC), by Patrice François, IRSN *(10min)*
	11:40	7C	NEA/CPD Report on Nuclear Site Remediation and Restoration during Decommissioning of Nuclear Installations, Rebecca Tadesse, NEA *(10 min)*
	11:50	7D	Presentation of first achievements from SHARE in this area + introduction to post it session, by Frederica Pancotti, SOGIN
	12:00- 13-00 Lunch Break		
	13:00- 16-50 Post it session by sub- thematic area		
	Link MURAL 62	62	Clearance of surfaces and structures (interiors and exteriors)
	Link MURAL 63	63	Characterization methods and technologies to identify subsurface contamination
	Break (10 min)		
	Link MURAL 64	64	Modelling and statistical tools to analyze contaminant transport in subsurface soil and groundwater
	Link MURAL 65	65	Soil remediation technologies (washing, bioremediation, contamination fixing)
Dec 3d	**9:00- 12-00 Post it session by sub- thematic area**		
	Link MURAL 66	66	Remediation of contaminated groundwater (radiological)
	Link MURAL 67	67	Methodologies and techniques for final release survey of the Site
	Break (10 min)		
	Link MURAL 68	68	Tools for statistical analysis and management of survey data for site release

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IAEA Environet and NORM2020 Conference

Horst Monken-Fernandes
EU-H2020- SHARE-Decommissioning
On-line Workshop,
December 1-3, 2020

Environmental Remediation - Vision

MS's will eventually have in place a proper infrastructure and technologies for managing their radioactive legacies and resolve all related issues in a timely, safe and cost-effective manner

Dounreay (Image: DSRL)

Environet Network

Networking - An association of individuals, having a common interest, formed to provide mutual assistance and helpful information

Environet - An international network dedicated to environmental management and the remediation of radiologically contaminated sites

https://nucleus.iaea.org/sites/connect/ENVIRONETpublic/Pages/default.aspx

“ENVIRONET” Objectives

- Coordinate support to organizations or Member States with less advanced programmes from Member States with experience in environmental remediation;
- Organise an expanded range of training and demonstration events disseminating proven methodologies, good practices and state-of-the art technologies;
- Facilitate information exchange and experience sharing amongst organizations with advanced programmes;
- Create a forum in which expert’s advice and technical guidance may be provided.

Relevant Resources

Tools and Materials

Webinar

Projects and Working Groups

The ENVIRONET supports the IAEA to identify, facilitate and deliver projects to meet Member States needs in the field of environmental management and remediation.

If you are interested in becoming involved in a project or working group please contact the ENVIRONET Scientific Secretary Mr. Horst Monken-Fernandes (H.Monken-Fernandes@iaea.org).

ENVIRONET Projects

Restricted-Access Technical Working Groups

Regional Working Groups (under development)

Shift to Targeted Projects

DERES Project

Determination of Environmental Remediation End-State

Interim End-State

LeTrench Project

Remediation of Sites Containing Legacy Waste in Trenches

Characterization of buried waste

NORM Project

Inventory

Policy and Strategy

Cost Estimate of Management Options

Characterization and sampling

Revalorization of Waste (Circular Economy)

Decommissioning of O&G offshore platforms

MAESTRI Project

Management Systems Supporting Environmental Remediation Projects

Social multi-criteria evaluation

Sustainable site management dimensions

Application, engagement and capacity building

Environet Resources

ER Technologies Database

Here you will find considerations regarding the applications, cost and infrastructure related to different environmental remediation technologies. This resource is yet not a comprehensive database of environmental remediation technologies. Instead is something under constant update and is intended to guide the reader to valuable literature on different topics.

Technology Selection

The remediation of contaminated sites may suffer from a series of problems, such as a long recovery cycle, high costs, and secondary pollution, all of which could affect land redevelopment and reuse. Therefore, the selection of an appropriate technology is crucial for contaminated sites. The selection process should combine economic indicator, environmental indicator, and technical indicator

Cost

One of the most significant problems with developing cost information is that costs reported under a set of conditions at one site are very difficult to extrapolate to other sites. A second problem is that technology vendors may report costs using a variety of different metrics that cannot be compared directly. A third problem is that often technology providers do not report the variable costs, such as permitting, mobilization of equipment to the contaminated site, treatability studies to prove the technology or obtain permits, and system design or modification for site conditions. A fourth problem is inconsistencies in the way costs are derived. A final problem is that for in situ technologies, cost information is often developed by geotechnical consultants rather than technology providers and is rarely compiled for general reference by the private user

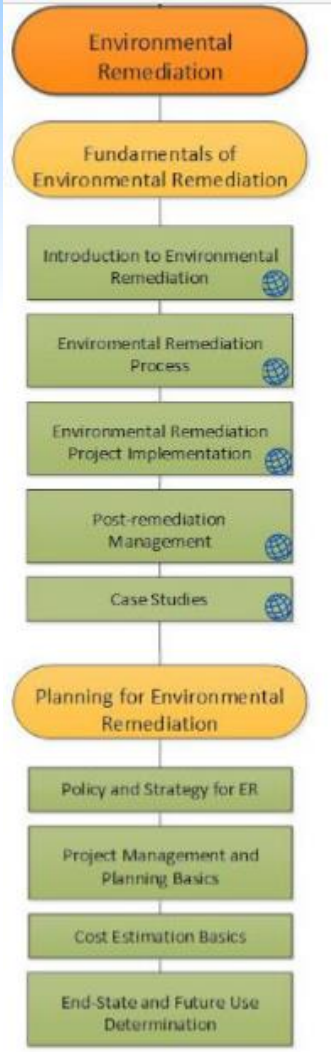
Stakeholder Issues

The choice of technologies used to remediate contaminated environments are increasingly made via engagement with affected local residents. Direct engagement with residents about remediation technologies can provide knowledge that improves remediation technology decisions.

Below you will find links that will take you to relevant literature on different aspects of environmental remediation including general technologies

Uranium Mining and Milling Sites | Site Characteriza -tion | Applicable Technologies | Long-Term Stewardship

eLearning



NORM2020 Conference

- 1st 2-week Virtual Conference of the IAEA
- Built upon the structure of the Environet NORM Project
- Over 700 attendees, 2500 registrants for workshops from 104 Member states
- Focus on the Industry aiming at sharing good practices, demonstrating availability of solutions; fostering partnership and establishing path forward to overcoming existing challenges

Outcomes

Foster the adoption of circular economy principles: Wastes x Residues – critical analysis

Need for Structured Approaches to Manage NORM

Attention to Decommissioning of NORM Facilities (Especially O&G Offshore Platforms)

Policy and Strategies

(attention to the need to establish disposal routes and to transportation withing a country and transboundary movements)

Inventory

(crucial to have a constructive dialogue with industry)

- Capacity Building
- Characterization and sampling,
- Cost estimate,
- Adoption of graded approach to regulations;
- Structured communication

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Overview of the IAEA International Project on the Completion of Decommissioning (COMDEC)

EU-H2020-SHARE WORSHOP
Break-out Session: Environmental Remediation and Site Release
Group A

Jack D. Parrott, US Nuclear Regulatory Commission
COMDEC Project Chair
Patrice François, IRSN, Working group leader on end-state delivery
On-line meeting
2 December 2020

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Introduction

- **IAEA Safety Guide WS-G-5.1, "Release of Sites from Regulatory Control on Termination of Practices," 2006.**

- **Since publication, a significant number of decommissioning projects have been completed.**

- **The experience gained can provide valuable input to the revision of the safety guide.**

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Objective of the COMDEC Project

To collect, analyze, and exchange experiences on the completion of decommissioning and release of sites from regulatory controls.

- **This includes those sites released with restrictions, i.e., when institutional controls of the site are needed at the completion of decommissioning.**

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Objective of the COMDEC Project, cont'd

The overall objective of the project is to produce a systematic overview of experiences worldwide

- **In defining the decommissioning end-state, including quantitative end-state objectives.**
- **In performing clean-up activities needed to achieve the end-state.**
- **In demonstrating compliance with the end-state objectives.**
- **In defining and implementing continuous measures and controls after completion of decommissioning, when needed.**

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Objectives of the COMDEC Project, cont'd

This project also aims to:

- **Identify good practices.**
- **Provide practical guidance.**
- **Illustrate decision making, conduct of activities and associated regulatory activities.**
- **Enhance capacities in Member States and improve communication and exchange of information and lessons learned.**

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Scope of the project

- **Focuses on the final stages of decommissioning after dismantlement of the structures, systems and components.**
- **Looks at facilities that were shut down under normal conditions.**
- **Off-site remediation is not the subject of the project, unless related to on-site components or systems.**

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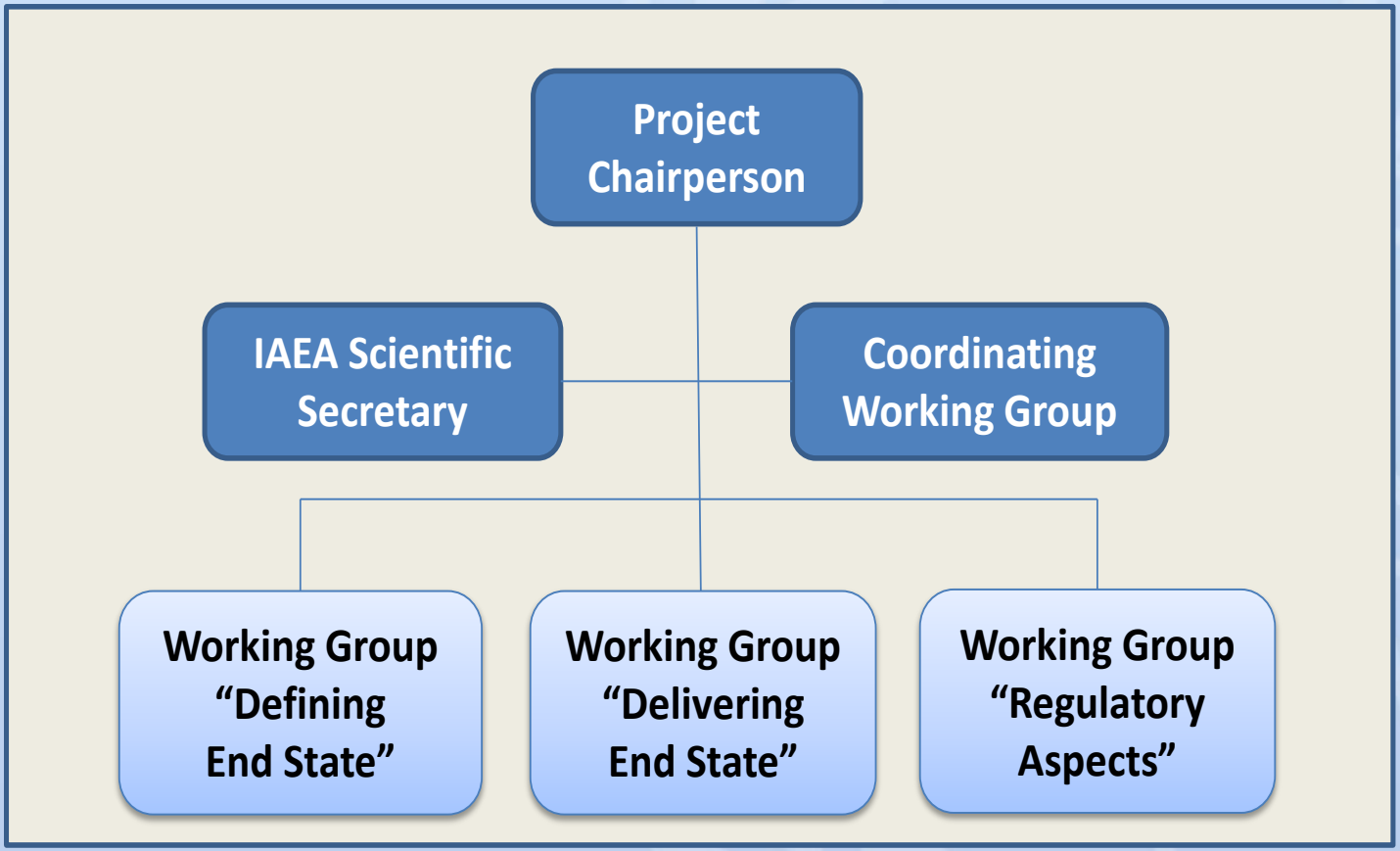
COMDEC Project Structure: 3-year duration



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Preliminary discussions and results

- **End-state definition (Physical, Radiological, Chemicals)**
- **End-state delivery**

	Decontamination & dismantling of SSCs	**Clean-up and Demolition of buildings**	**Site Clean-up**	**Site Restoration**
Main actions	Decontamination, Removal of Structures, systems and components	Clean-up of buildings Demolition of structures and underground structures	Clean-up of contaminated land (on-site, off site)	Backfilling with appropriate materials
Objectives	Removal of radioactive waste Removal of hazardous materials from the site	Conventional Demolition of concrete buildings	Removal, excavation of contaminated soils, monitoring of ground water	Assurance that no contaminated materials are re-introduced in the site
Termination of authorization	After dismantling	After clean-up of buildings or demolition	After site clean-up	After restoration

Clean-up strategy and approaches

Starting points of the clean-up strategy

Approach based on fundamental principles:

- No right for pollution
- Removal of hazardous materials and waste
- Based on 10 µSv concept (10 µSv/y)
- Iterative process (additional clean-up, change of end-state)
- Compatible for all uses (existing use, foreseen use, possible uses)

NEW SITES (design, good practices during operation) or **EXISTING SITES** when possible (NPPs)

Approach based optimization of Radiation protection

- up to 300 µSv/y
- Iterative process

Approach based on overall optimization

- RP + Environment, Economic, Societal
- Multicriteria analysis
- "Overall optimum" option shared with all interested parties

COMPLEX SITUATIONS (Research facilities, Fuel cycle facilities, Multi-facility sites, historical pollutions)

End-state delivery

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Potential processes that could benefit from further research and cooperation would be

1. **Methodologies for how clean-up of a site should be factored into the overall optimization process: Graded approach, multi-criteria analysis**

2. **Methodologies for implementing the restricted release of sites using institutional controls and the range of institutional controls that could be used**

3. **Methodologies for how best to include "interested parties" in the decision making process for the release of sites especially where restricted release is used**

Work Plan

Project Activity	Planned Meetings	Scheduled Dates
Preparation of the projects' Terms of Reference	Preparatory consultancy meeting to develop of the Terms of Reference for the project	9-13 July 2018
1st year activities	Coordinating Working Group meeting and First Technical Meeting	24-28 September 2018
	Interim Coordinated Working Group meeting and Working Group meetings	12-14 June 2019
2nd year activities COVID19	Coordinating Working Group meeting and Second Technical Meeting	23-27 September 2019
	Interim Coordinated Working Group meeting, working groups meetings and site visit – Trawsfynydd, Wales U.K.	~~June 2020~~ postponed
3rd year activities	Third Technical Meeting – virtual?	Oct 2020
	Interim Coordinated Working Group and Working Group meetings – site visit?	May-June 2021
	Fourth Technical Meeting	Sep-Oct 2021
	Submission of the project report for publication	2022 Extension one

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Platforms for sharing information

Supporting information and practical examples drawn from Member States' national experience is made available via electronic media.

- **Connecting the Network of Networks for Enhanced Communication and Training (CONNECT) system – a gateway to IAEA's professional networks**

- **IAEA's International Decommissioning Network (IDN)**

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Thank you!

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COMDEC Project Chair
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NEA report: *Nuclear Site Remediation and Restoration during Decommissioning of Nuclear Installations*

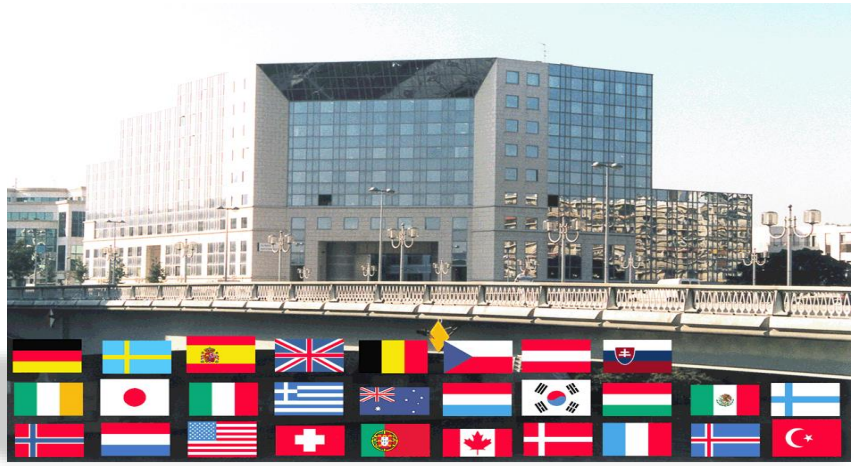
Rebecca TADESSE, NEA RWMD Head of Division

EU-H2020- SHARE-Decommissioning

Virtual Workshop, 1-3 December 2020

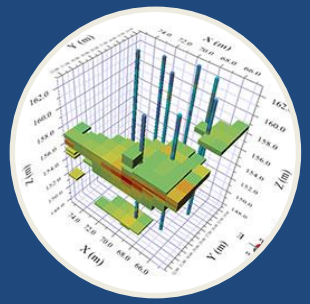
Background

The NEA Co-Operative Programme on Decommissioning (CPD) established the Task Group on **Nuclear Site Remediation** (TGNSR):



- March 2012-April 2014
- Objective to **review experience** in OECD member countries and produce a report on **practical conclusions and recommendations** useful to current and future practitioners
- in collaboration with the NEA Working Party on Decommissioning and Dismantling (WPDD) and the IAEA

Project scope



Collating evidence for analysis

Observations and recommendations for good practice

Regulatory and other strategic issues

Working with international partners

Case studies (Task Group Members)
Questionnaires, national and project level (targeted country experts)

Project approach

- case study questionnaires from 2012-2013
- 9 national responses and 23 from sites or projects
- Wide range of case studies ensured technical report was supported by evidence of experience
- report written from 2013-2014
- Integration with IAEA
- Strategic issues separate but supported by knowledge of technical issues

What is a Site Restoration project?

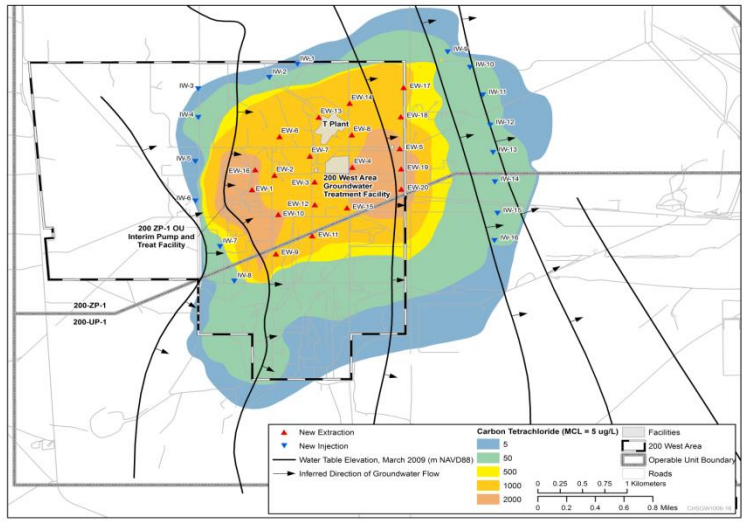
- Any project leading to the site being released for re-use excluding decommissioning of site facilities.
- Projects are predominantly about land quality
- Projects for study were:
  - nuclear sites that had been restored
  - sites where early remediation had occurred
  - sites where early remediation was being considered

Case study examples

- Large scale remediation: USA, Hanford West Area
- Complex characterisation: UK, Sellafield
- Small scale remediation:
  - Spain, Madrid
  - France, Brennilis

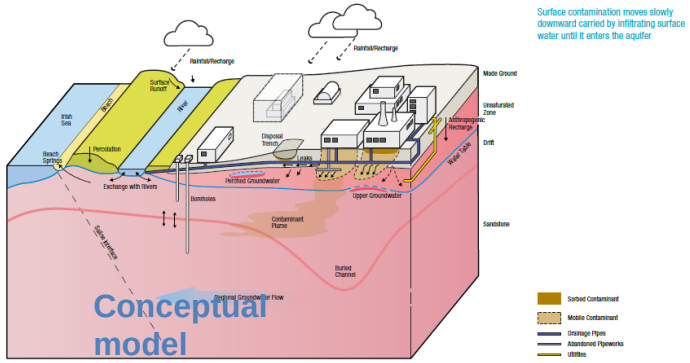
USA, Hanford West

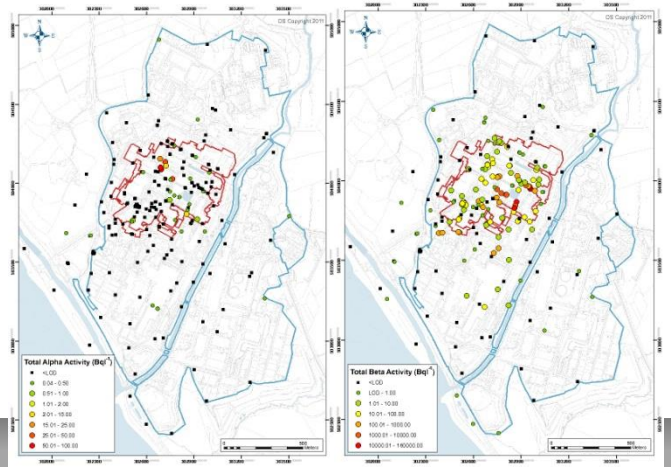
- Waste management facilities and former irradiated fuel-reprocessing facilities
- Several groundwater contamination plumes that cover an area of approximately 13 km^2 (CCl4)
- 1998-2008 : interim remedial measure by pumping and treatment
  - 3.7 million m^3 groundwater extracted = 11 T CCl4 removed
- 2008-2133
  - Pump and treat system (25 years =>mass reduction by a minimum of 95%)
  - Natural attenuation processes (100 years => acceptable levels)



UK, Sellafield

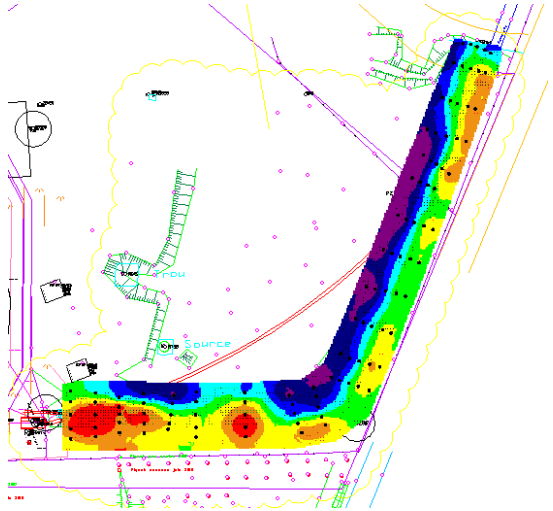
- Power stations, MOX fuel fabrication, waste treatment. Operation start: 1945. Reprocessing ongoing.
- Site size: 6 km^2, Intensively developed
- Contaminated land: >1,000,000 m^3
  Cs-137 and Sr-90 predominant
- Contaminated groundwater: >1,000,000 m^3
  H-3, Tc-99, Sr-90 predominant
- Large groundwater monitoring program
  - Controlled by a Contaminated Land Safety Case with Best Available Technique (BAT) assessments being conducted to optimise near term management and Land Remediation integrated with decommissioning planning over a timescale running to 2120





France, Brennilis

- Ditch (130 m long) created in 1967 to lead the effluents coming from the treatment station to the Ellez river, through a pipe laid on the bottom of the channel



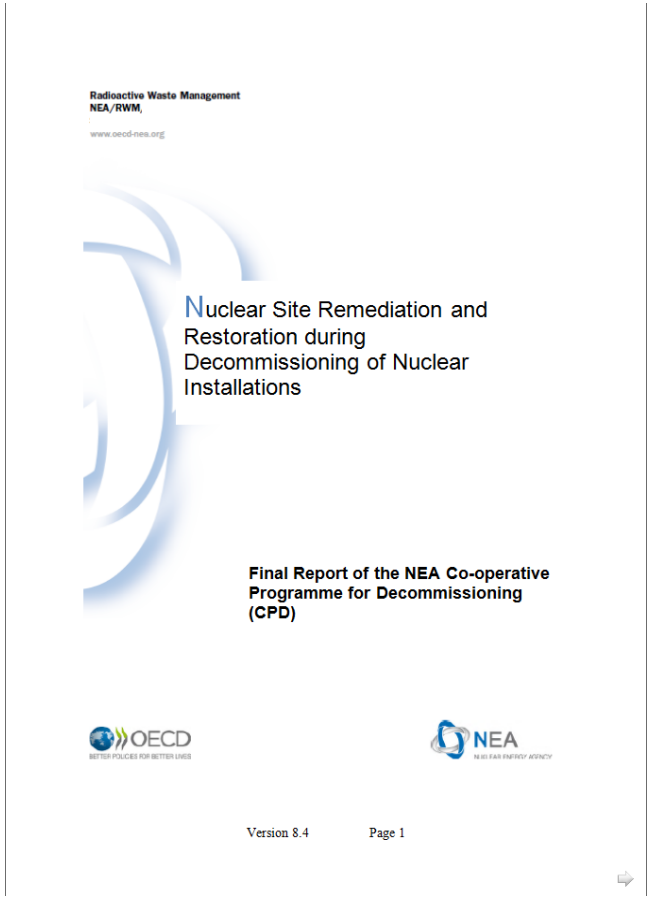
- Media issue :
  - Radiological measures carried out by nuclear opponents with publication in local press
  - Demand of the public enquiry
- Cs-137 predominant (max. 1.7 Bq/g, mean 0.9 Bq/g)
- Environmental constraints
  - Species' protection, wetland, Ellez river protection
- 1,600 tons VLL Waste

Spain, CIEMAT Madrid

- Pipe leak in the 1970s (Sr-90 and Cs-137 mainly) - Excavation completed:
- 66 % Released Material (1,878 tons)
- 34 % Radioactive waste (968 tons)
  - VLLW (961 tons)
  - LILW (7 tons)
- Final radiological survey results:
  - Soil and subsurface:
    - The top 15 cm: below release levels
    - No residual activity at depth.
  - Walls: residual activity below clearance levels for reuse.
- Release from radiological requirements
- Filling performed as conventional work

Outcome of CPD project

- lessons learned
- value of long-term planning and parallel remediation
- three most important barriers and obstacles to remediation were ongoing operations, regulations and lack of disposal routes
- issues include poor problem definition, lack of stakeholder engagement (including regulatory bodies) and inadequate characterisation
- clear consensus on clean-up goals or end states is essential so every action taken is directed toward this goal
- background or pre-operational conditions: social and economic factors need to be considered, as well as burdens left to future generations
- holistic approach to onsite disposals and residual contamination left on the site should be considered


Radioactive Waste Management
NEA/RWM,

www.oecd-nea.org

Nuclear Site Remediation and Restoration during Decommissioning of Nuclear Installations

Final Report of the NEA Co-operative Programme for Decommissioning (CPD)

OECD BETTER POLICIES FOR BETTER LIVES

NEA NUCLEAR ENERGY AGENCY

Version 8.4 Page 1

Continuation of the work

- CPD report completed early 2014
- WPDD established a similar task group to develop a report dedicated to strategic issues (approaches, constraints) of site remediation
- November 2013 – December 2015
- ***Value of this work***: supporting on-going and new projects achieving value for money, safety of workers, protection of the environment and improvements in land quality management consistent with best practice and which enable the timely delivery of site interim and end-state targets

Example of strategic questions

- Avoiding site restoration problems (design of new plant/systems, asset management, monitoring)
- Prompt remediation: minimising expanding contaminate land and groundwater clean up
- Determining site end use and end state (involvement of stakeholders and agreement from regulators)
- Flexibility with final site remediation and approach to off-site contamination
- Conceptual models and tools (e.g. statistical techniques) for determining remediation approaches and long-term stewardship monitoring
- Knowledge management (including sharing of lessons learn and good practice)
- Programme / project management (estimating and waste disposition)

Links to both reports

Nuclear Site Remediation and Restoration during Decommissioning of Nuclear Installations [NEA 7192]

Strategic Considerations for the Sustainable Remediation of Nuclear Installations [NEA 7290]