IAEA 60 Years
Atoms for Peace and Development

ELINDER Launch Event
2 December 2016, STU Bratislava

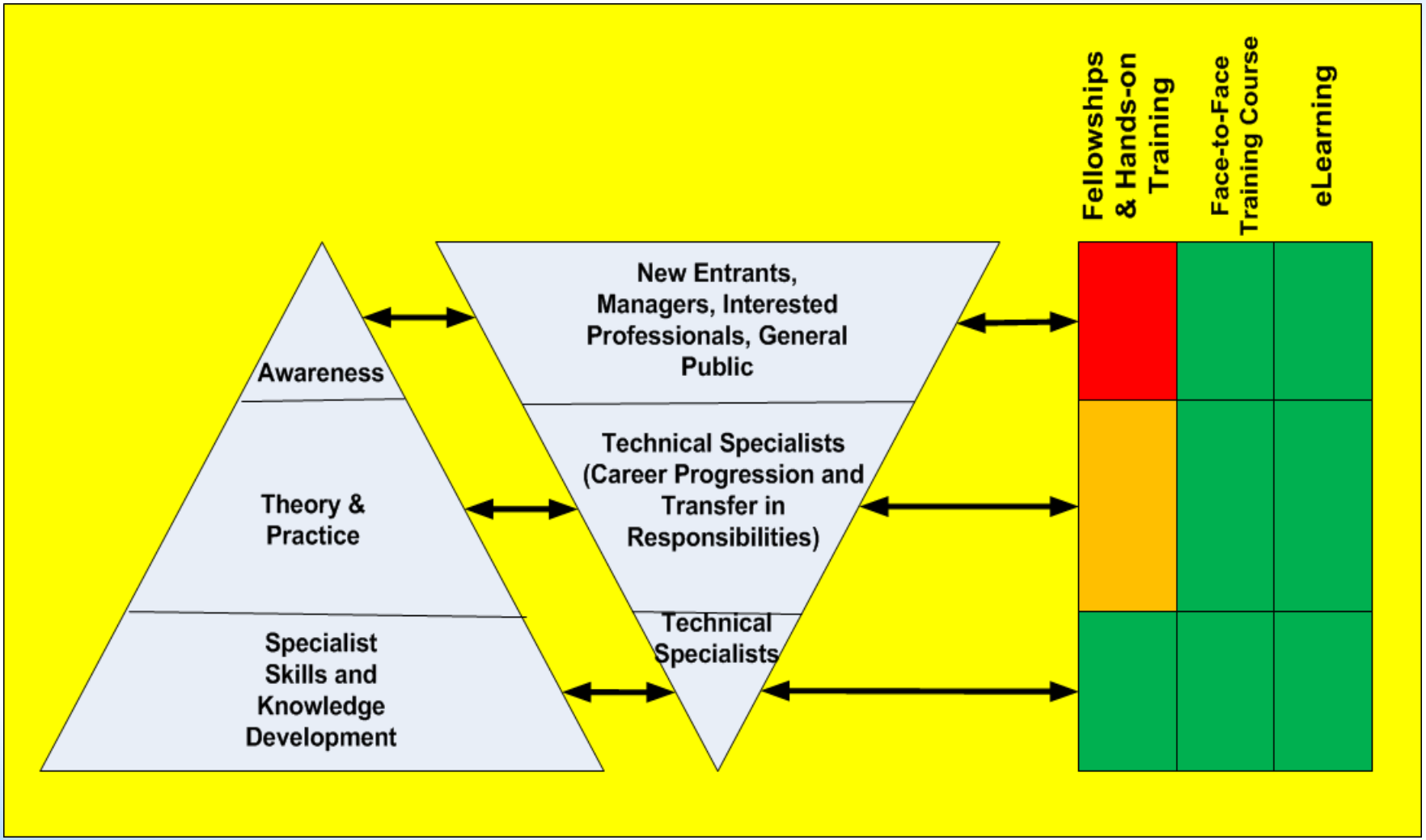
E-learning on Spent Fuel and Radioactive Waste Management, Decommissioning and Environmental Remediation

Patrick O'Sullivan, Vladimir Michal
WTS, NEFW, IAEA

Why E-learning

- Steadily increasing demands on the IAEA to provide professional training and other quality resources to support Member States;
- Constraints on IAEA budget and staff available to meet these demands;
- New tools and opportunities available with internet development;
- Opportunity to build on the success of IAEA Networks and TC projects in training and knowledge sharing.

Training Levels, Audiences and Delivery



E-learning Objectives

- To support the IAEA's communities of practice in spent fuel and radioactive waste management, in decommissioning and in environmental remediation;
- To enhance existing face-to-face training;
- To provide opportunities for distance learning;
- To address the specific needs of countries with emerging or less-developed programmes.

Working together

- E-learning joint effort of three departments:
  - Nuclear Energy Department,
  - Nuclear Safety and Security Department,
  - Technical Cooperation Department.
- Financial support from EC, US State Department and Japan extra budgetary contributions.

Starting with Curriculum map

◄D: Fundamentals of RW Disposal D.2 Safety Guidance and Regulatory Aspects of Disposal ►

D.1 Basic Concepts of Disposal

Module Overview

An introduction to Radioactive Waste Disposal principles and practices, including historical perspective and the role of economy and safety.

Learning objectives:

- Explain radioactive waste disposal, near surface disposal, geological disposal, borehole disposal, unregulated historical disposal.
- Distinguish the difference between disposal and storage.
- Identify disposal for various types of radioactive waste.
- Distinguish between IAEA and national waste classification approaches.
- Point out the differences between exemptions and clearance.
- Apply waste classification to examples.
- Explain the concept of barriers.
- Describe what isolation and containment are.
- Apply different isolation and containment methods.
- Discuss the requirement for the duration of isolation and containment for different waste classes.
- Describe IAEA definition of the waste form.
- Describe the components of the waste packages.
- Explain the difference between waste forms, waste matrices, waste packages / containers.
- Recognize the differences in expected performance and lifecycle for different types of waste forms.

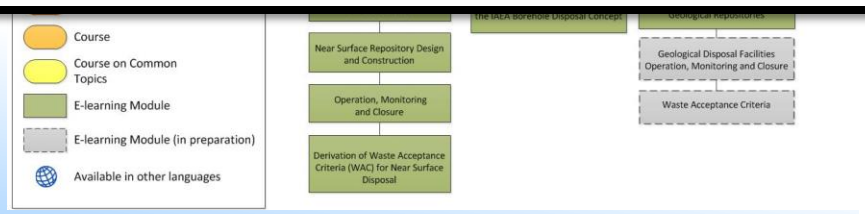
D 1.1 Introduction

D 1.2 Waste Classification

D 1.3 Multibarrier Disposal System

D 1.4 Waste Forms and Waste Packages

◄D: Fundamentals of RW Disposal Jump to... D.2 Safety Guidance and Regulatory Aspects of Disposal ►



Focus on Decommissioning: 8 modules

D&D 1: Strategy, Planning and Licensing

The four lectures in this module introduce basics of decommissioning:

D&D 1.1: Decommissioning Fundamentals

D&D 1.2: Decommissioning Strategy

D&D 1.3: Decommissioning Planning

D&D 1.4: Licensing Process for Decommissioning

D&D 2: Inventory

This module provides an overview of approaches for the physical and radiological characterization of the facility and site aiming to estimate the waste inventory from decommissioning activities in support to efficient planning and implementation.

D&D 3: Costing and Funding

This module introduces in two lectures basics of decommissioning costing and funding including ISDC (International Structure for Decommissioning Costing) and CERREX code (Cost Estimation for Research Reactors in Excel):

D&D 3.1: Decommissioning Costing

D&D 3.2: Funding for Decommissioning

Focus on Decommissioning: 8 modules

D&D 4: Transition Period

By completing this module will be understood technical and organizational objectives of the transition period and easily recognized the typical technical activities that are usually performed during the transition period.

D&D 5: Project Management and Organization and Detailed Planning

Based on main technical and cultural changes that occur during the transition from operation of a nuclear facility to its decommissioning, this module introduces the main considerations and tasks as well as special project management issues that have to be taken into account for the successful implementation of a decommissioning management programme.

D&D 6: Technical Aspect during Implementation

This module is devoted to technical aspects relevant for decommissioning implementation. Three lectures explain the advantages and disadvantages of decontamination of different structures, systems and components, the basic principles of how to create dismantling and demolition scenario and address also management of decommissioning material.

D&D 6.1: Decontamination of Structures, Systems and Components (SSC)

D&D 6.2: Dismantling and Demolition

D&D 6.3: Decommissioning Material Management

Focus on Decommissioning: 8 modules

D&D 7: Site Redevelopment and Reuse

This module explains possible redevelopment and reuse of a nuclear site after completion of decommissioning including the regulatory and stakeholder processes for agreeing the associated end state, and the relationship with the decommissioning strategy to be adopted.

D&D 7.1: Technical and Regulatory Aspects

D&D 7.2: Social Aspects

D&D 8: Decommissioning Case Studies

This module provides several case studies of decommissioning of different nuclear facilities in various countries. Several completed and ongoing projects as well as future needs in nuclear decommissioning are presented.

Demonstration video

Modules and lectures

- Modules have normally more than 1 lecture;
- Lectures about 30 minutes, some also longer;
- Include also:
  - animations,
  - short video-clips,
  - narrative explanations and voice-overs or a framed ‘talking heads’,
  - photos, pictures.
- Self-assessment (quiz);
- Each lecture has Glossary and Resources.

More than 80 lectures already available

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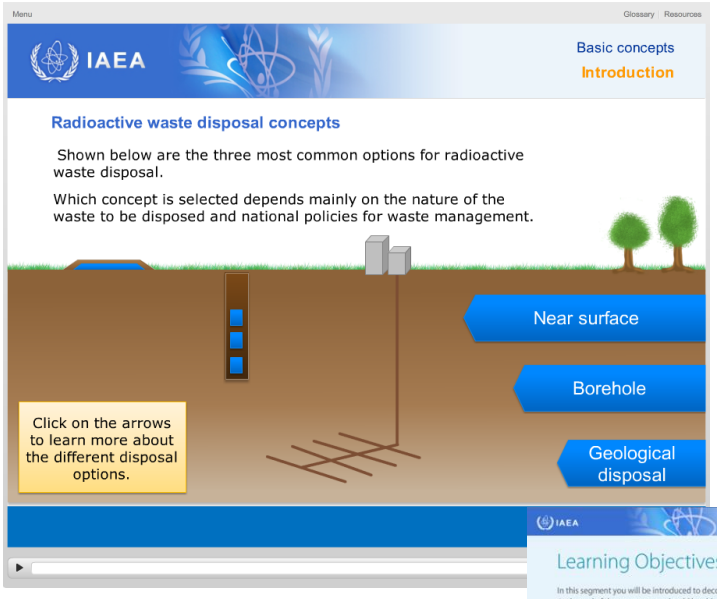

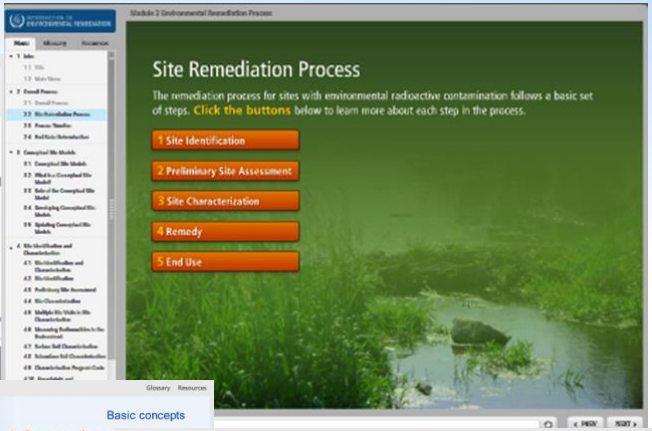

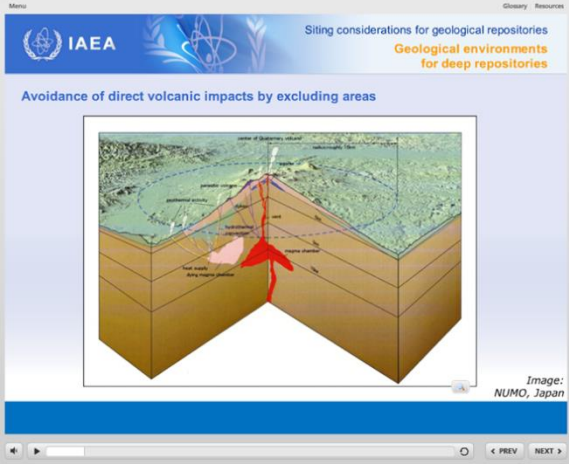

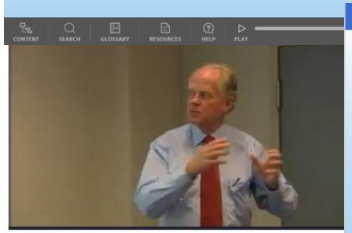

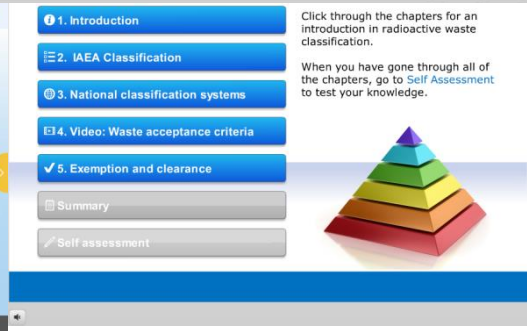

Some modules in Russian

Current situation

- E-learning material accessible on the IAEA web platform CLP4Net;
- 39 modules with 84 lectures already available;
- Translations of selected modules to other languages in preparation:
  - Currently several modules on disposal already available in Russian,
  - Spanish and French translations of modules on DSRS in preparation,
  - Japanese translations of modules on decommissioning planned.
- New modules under production:
  - 2 modules on geological disposal being finalized,
  - 3 additional modules on DSRS,
  - 4 additional modules on environmental remediation.
- Development of 7 modules on Spent Fuel Management on-going and planned to be completed in 2017.

What next?

- Plans for further development of e-learning modules:
  - New modules,
  - New or improved features
  - More translations of selected modules,
  - Strengthen the review process.
- Feedback from users will be followed:
  - Internal,
  - External.
- First use of e-learning modules started this autumn at Okayama University in Japan, interest expressed also by Hiroshima University;
- E-learning modules used for pre-training of participants of the workshop in JRC Ispra in September 2016.

Link to e-learning material

Link to the CLP4Net platform with the e-learning material (registration to NUCLEUS portal is necessary):

http://elearning.iaea.org/m2/course/index.php?categoryid=60