



60 Years

IAEA

Atoms for Peace and Development

Regulatory Information Conference

13-15 March 2018, Rockville MD, United States of America

Update on IAEA Safety Standards for decommissioning and related activities

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International Atomic Energy Agency

Vienna, Austria

Organizational setting for decommissioning work of the IAEA

Decommissioning-related work of the IAEA is shared between two divisions:

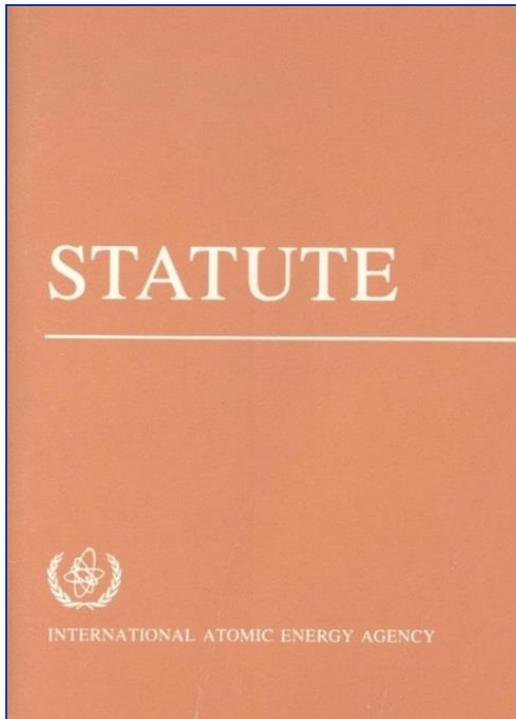
- **Division of Radiation, Transport and Waste Safety (NSRW)**
- **Division of Nuclear Fuel Cycle and Waste Technology (NEFW)**

NSRW is under the **Department of Nuclear Safety and Security**, and has responsibility for safety-related aspects of decommissioning (e.g., development of the IAEA safety standards).

NEFW is under the **Department of Nuclear Energy**, and focuses on technical aspects of decommissioning.

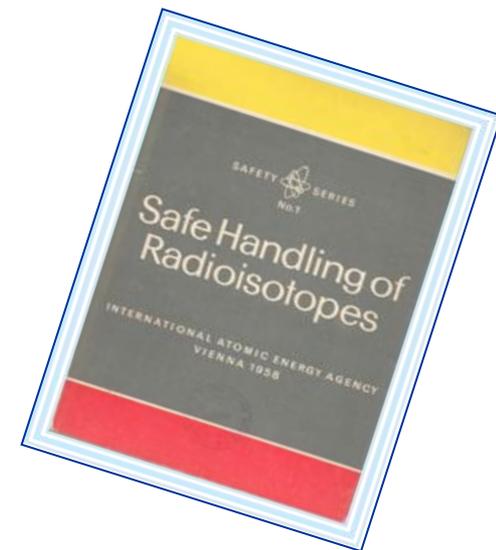
This talk will discuss activities of NSRW.

IAEA Statute

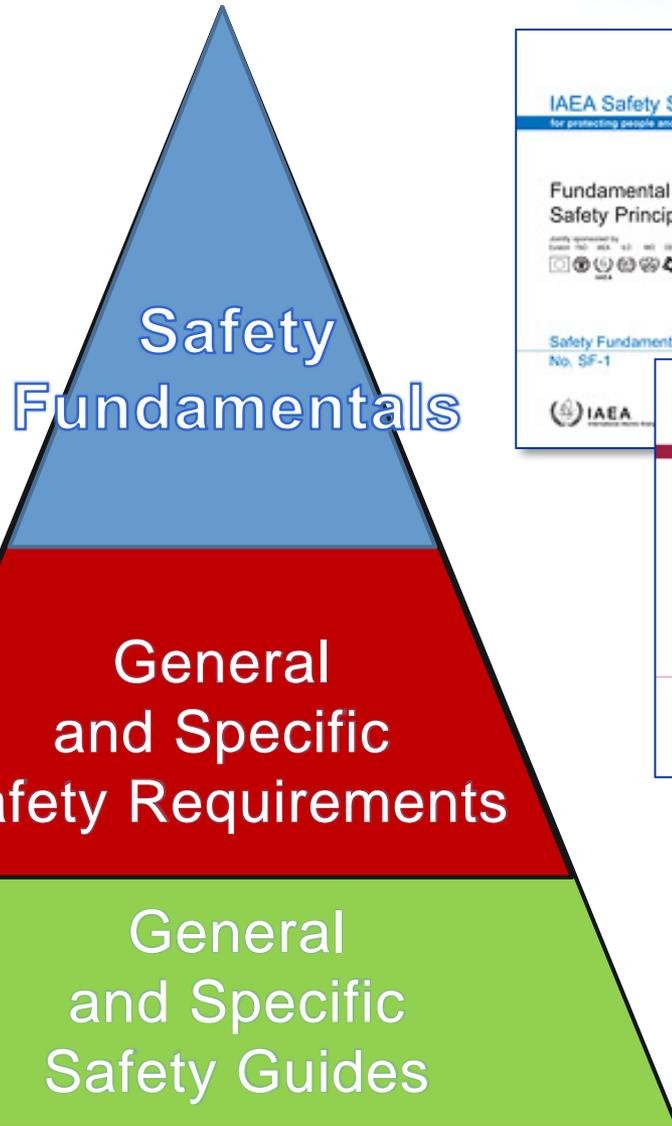


The IAEA Safety Standards have a status derived from the IAEA's Statute, which authorizes the IAEA ***"To establish or adopt, in consultation and, where appropriate, in collaboration with the competent organs of the United Nations and with the specialized agencies concerned, standards of safety for protection of health and minimization of danger to life and property ... and to provide for the application of these standards"***.

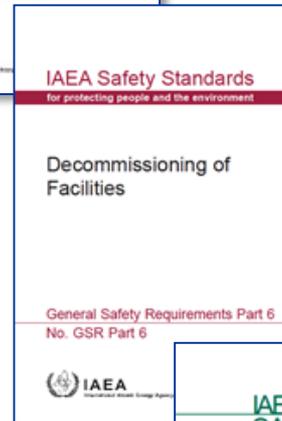
In **1958**, the IAEA published its first Safety Standard, Safety Series No. 1, **Safe Handling of Radioisotopes**. Over the years, more than 200 publications were issued in the Safety Series.



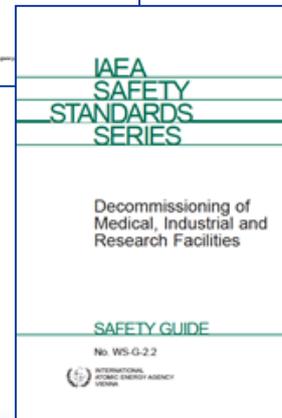
Safety Standards – Hierarchy & Categories



Fundamental Safety Principles



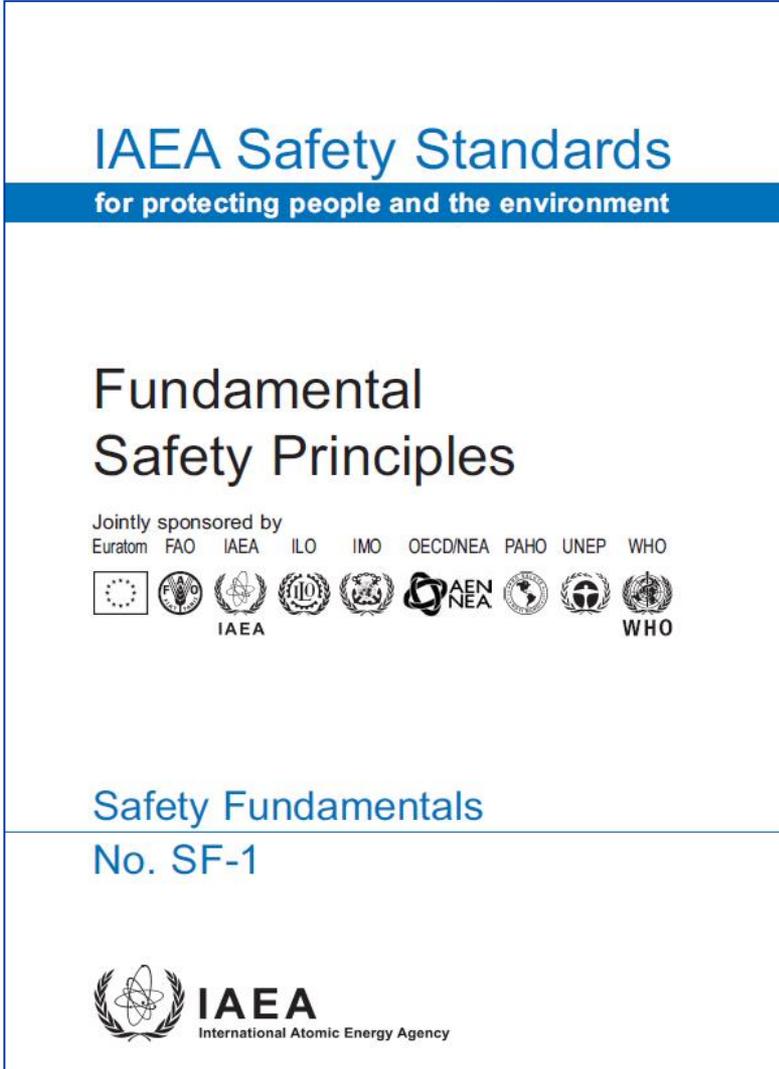
Safety Requirements – legal, technical, & procedural safety imperatives



Safety Guides, best practice to meet Requirements

Safety Fundamentals

- There is only one fundamentals-level standard.
- **Policy document** of the IAEA Safety Standards Series.
- Present the **fundamental safety objective** “*to protect people and the environment from harmful effects of ionizing radiation*”, and **10 principles** of protection and safety.
- Provides the basis for the safety requirements.



IAEA Safety Standards
for protecting people and the environment

Fundamental
Safety Principles

Jointly sponsored by
Euratom FAO IAEA ILO IMO OECD/NEA PAHO UNEP WHO



Safety Fundamentals
No. SF-1

 **IAEA**
International Atomic Energy Agency

Safety through international standards



- More than 200 Safety Standards published.
- Reflect an international consensus on what constitutes a high level of safety for protecting people and the environment.
- Endorsed by Member State Governments and the IAEA Board of Governors.
- International standards and harmonized approaches to safety:
 - promote consistency
 - help to provide assurance that nuclear and radiation related technologies are used safely
 - facilitate international technical cooperation, commerce and trade
- The standards also provide support for countries in meeting their international obligations (treaties, conventions, agreements).

Scope and application

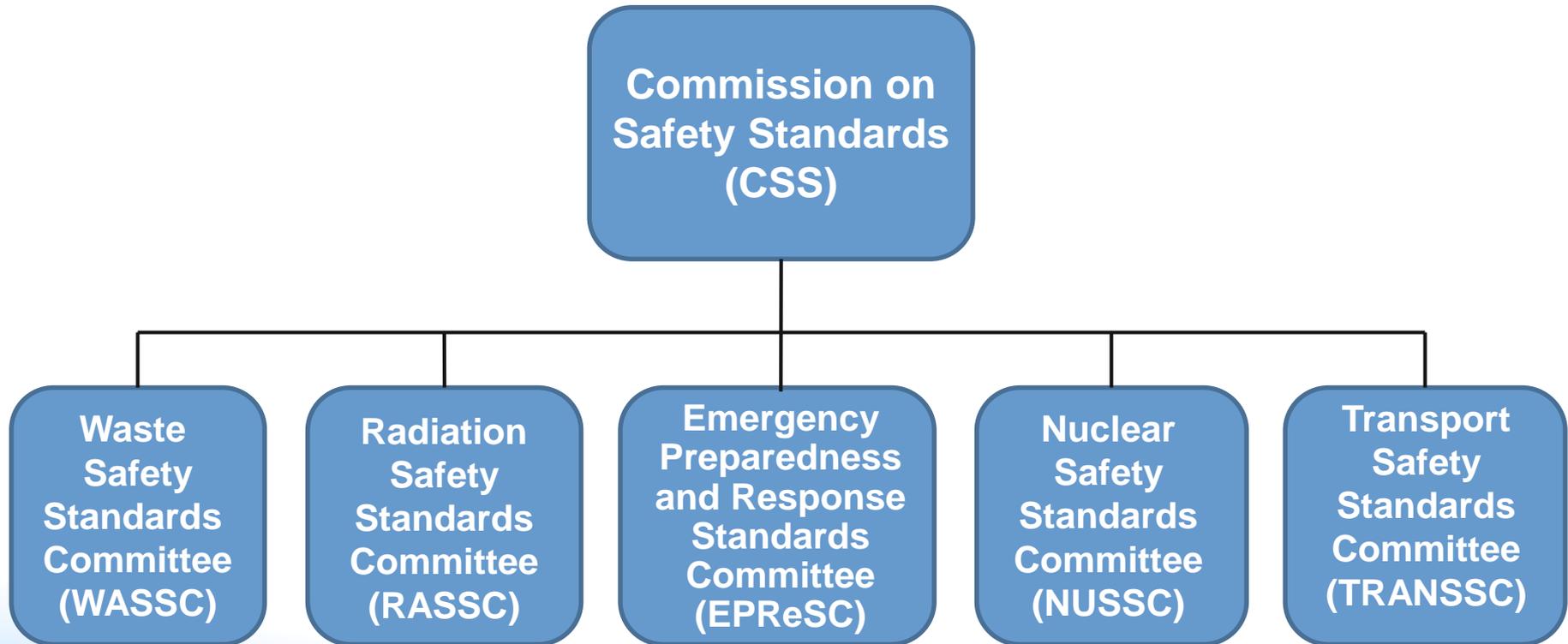
- Applicable, as relevant, throughout the entire lifetime of facilities and activities — existing and new — utilized for peaceful purposes.
- Not binding on the Member States.
- The IAEA Statute makes the safety standards binding on the IAEA in relation to its own operations.
- Any State entering into an agreement with the IAEA for assistance is required to comply with the requirements of the standards.
- Basis for all of the IAEA peer-review services and missions (IRRS, OSART, EPREV, PROSPER, ARTEMIS, etc).

Development of Safety Standards

- Drafted by international experts from the Member States and IAEA Staff.
- Reviewed and approved by the IAEA Safety Standards Committees, which are chaired by and made up of experts nominated by their Member State.
- Draft safety standards are sent to the MS for a 120 day period of review. They are also posted for public comment.
- Some standards are co-sponsored by other international organizations (e.g., WHO, FAO, UNEP, EC, OECD/NEA).
- The **Safety Fundamentals** and **Safety Requirements** are approved by the IAEA Board of Governors.
- **Safety Guides** are approved by IAEA Director General.
- Since 1996 more than 100 volumes have been published.

Committees for Safety Standards Development

One commission and five safety standards committees oversee the development and approval of the IAEA safety standards.

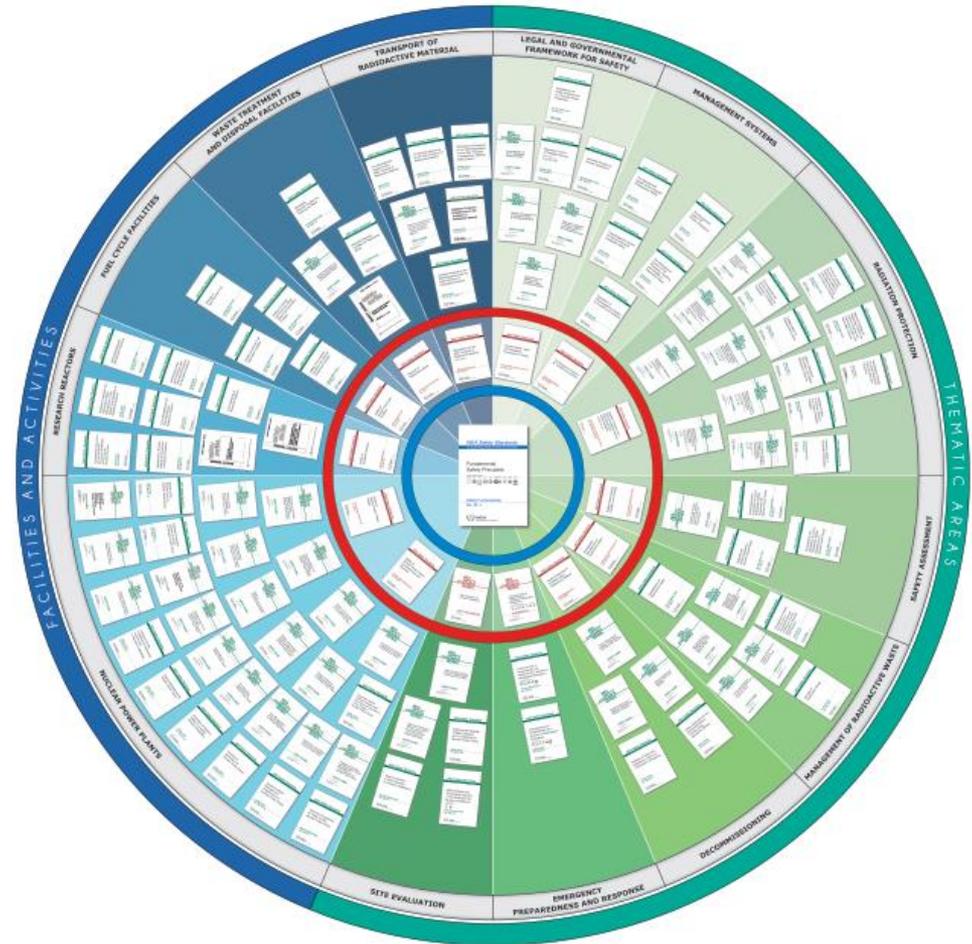


Member States nominate the committee members.

IAEA Safety Standards

protecting people and the environment

- The “wheel” of IAEA safety standards.
- The series is maintained at a manageable size, about 120 standards.
- Need for revision of **Safety Guides** evaluated every 5 years.
- Need for revision of **Safety Requirements** evaluated every 10 years.



Status as of June 2012



IAEA
International Atomic Energy Agency
Atoms for Peace



The International Atomic Energy Agency (IAEA) is a United Nations system organization with its headquarters in Vienna, Austria. The IAEA's mission is to promote the peaceful uses of nuclear energy and to ensure that nuclear energy is used in a safe and secure manner.

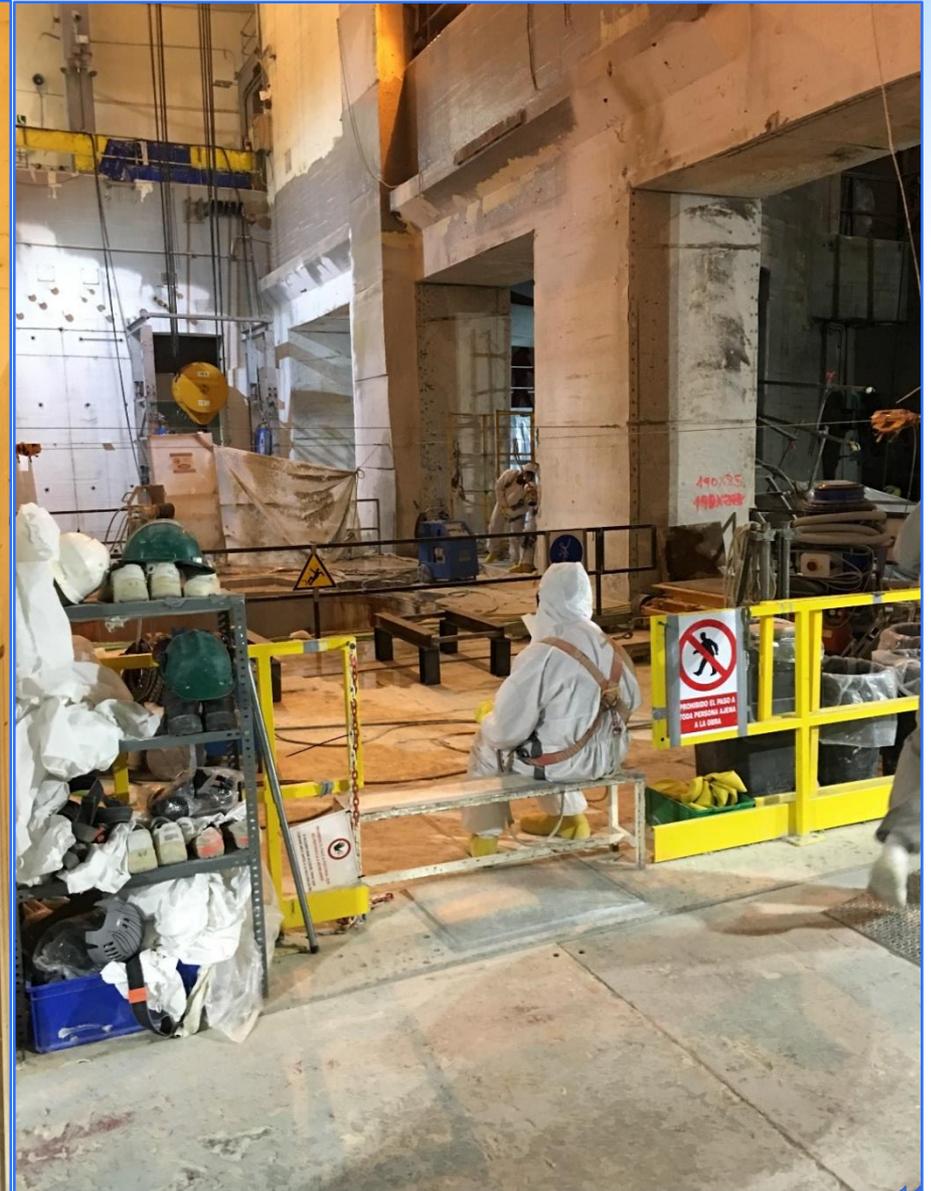
Further information on the activities undertaken by the IAEA can be found at: www.iaea.org

To provide high levels of nuclear safety, the IAEA publishes Safety Standards for use in the nuclear industry. The hierarchy of the Safety Standards begins with the Fundamental Safety Principles, then the Safety Requirements and finally the Safety Guides. In addition, numerous more specific technical reports are produced to support the Safety Standards. The Safety Standards are produced with the involvement and agreement of all Member States and provide a global reference for nuclear safety. All nuclear organizations in all Member States are encouraged to adopt and implement the principles, requirements and guidelines given in the Safety Standards in order to maintain and improve global nuclear safety.

The Safety Standards can be downloaded or ordered from www.iaea.org/standards, under 'List of all valid Safety Standards'.

Note: The printing of Safety Standards into the 'hardcopy' and 'softcopy' editions is at the discretion of the Member States. The IAEA is not responsible for the content of the national websites or the national standards or regulatory bodies that are developed in the Member States. The IAEA is not responsible for the content of the national websites or the national standards or regulatory bodies that are developed in the Member States.

Decommissioning



Decommissioning - definition

The IAEA Safety Standards define decommissioning as:

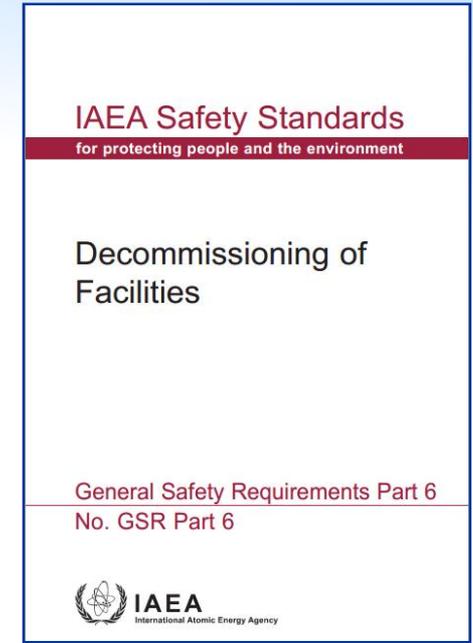
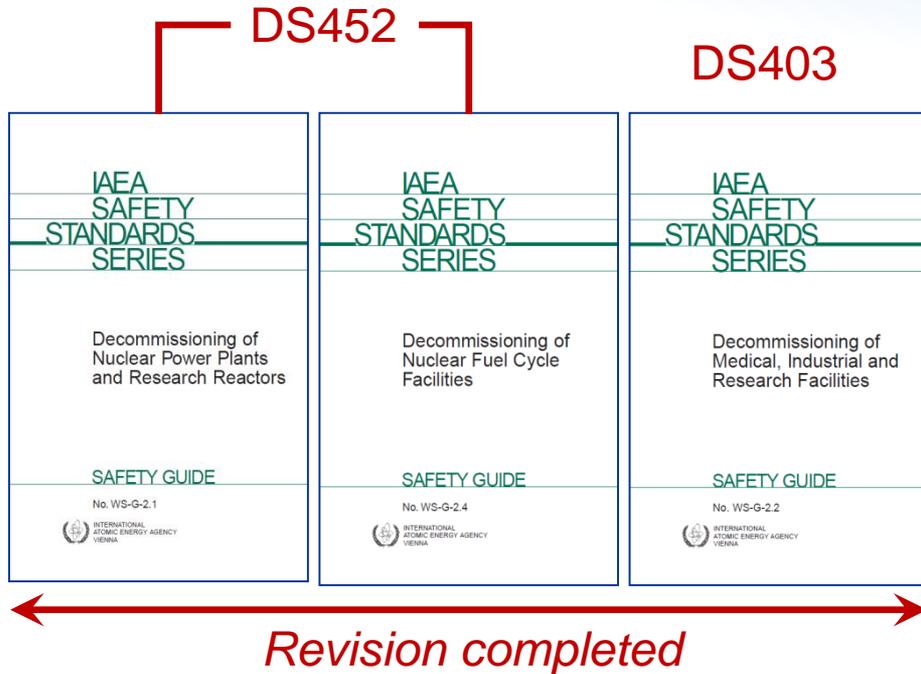
- *the administrative and technical actions taken to allow the **removal of some or all of the regulatory controls** from a facility (except for the part of a disposal facility in which the radioactive waste is emplaced, for which the term ‘closure’ instead of ‘decommissioning’ is used).*

*Decommissioning is the last phase in the lifetime of a facility. **Aspects of decommissioning have to be considered throughout the other phases** (siting, design, construction, commissioning and operation).*

Objectives of IAEA programme for decommissioning

- To develop and maintain a comprehensive set of safety standards, and to service international conventions.
- To organize international meetings and projects to promote exchange of information.
- To offer peer review and advisory services to Member States
- To assist Member States with capacity building.

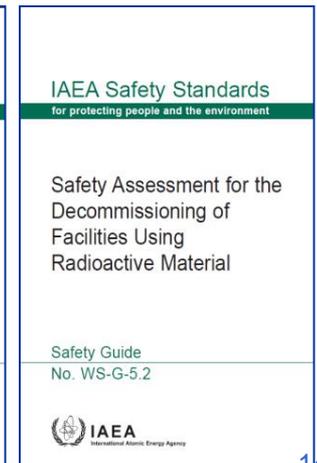
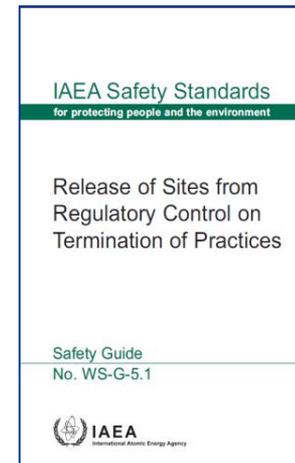
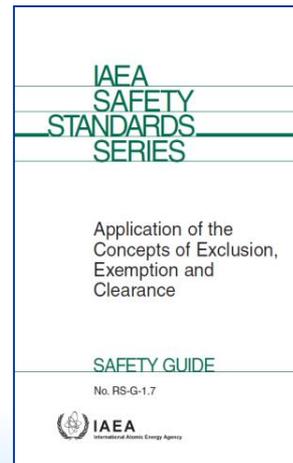
IAEA Safety Guides for Decommissioning



DS452 has been approved for publication.

Revision of DS403 has been approved by all the SSCs and final approval by the CSS is expected in 2018.

Revision of RS-G-1.7 has just started.



IAEA Safety Standards Series No GSR Part 6: Decommissioning of Facilities

IAEA Safety Standards
for protecting people and the environment

Decommissioning of
Facilities

General Safety Requirements Part 6
No. GSR Part 6

Applicable for all aspects of decommissioning from the siting and design of a facility to the termination of the authorization for decommissioning

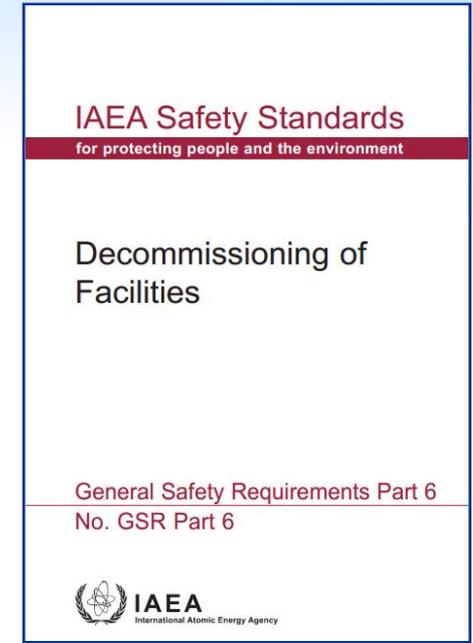
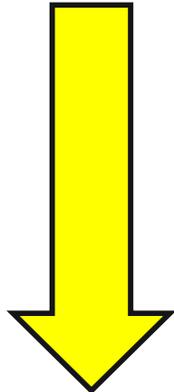
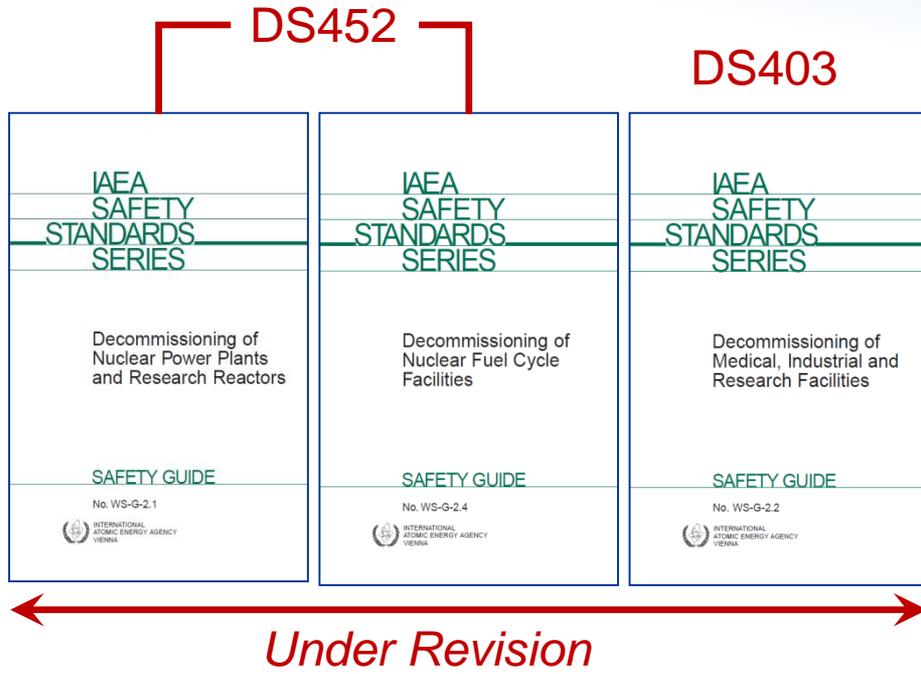
Total of 15 requirements

(2014)

GSR Part 6 has 15 main requirements supported by 61 “explanatory” requirements

- R-1: Optimization of protection and safety in decommissioning
- R-2: Graded approach in decommissioning
- R-3: Assessment of safety for decommissioning
- R-4: Responsibilities of the government for decommissioning
- R-5: Responsibilities of the regulatory body for decommissioning
- R-6: Responsibilities of the licensee for decommissioning
- R-7: Integrated management system for decommissioning
- R-8: Selecting a decommissioning strategy
- R-9: Financing of decommissioning
- R-10: Planning for decommissioning
- R-11: Final decommissioning plan
- R-12: Conduct of decommissioning actions
- R-13: Emergency response arrangements for decommissioning
- R-14: Radioactive waste management in decommissioning
- R-15: Completion of decommissioning actions and termination of the authorization for decommissioning

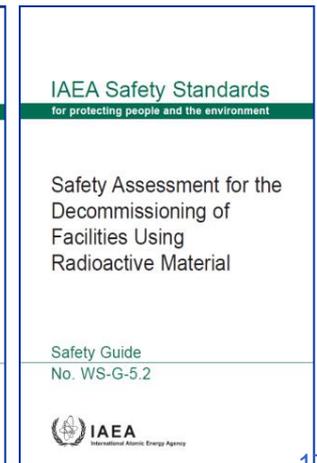
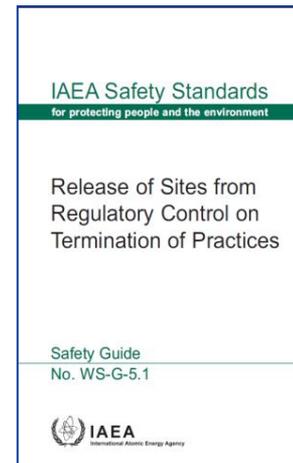
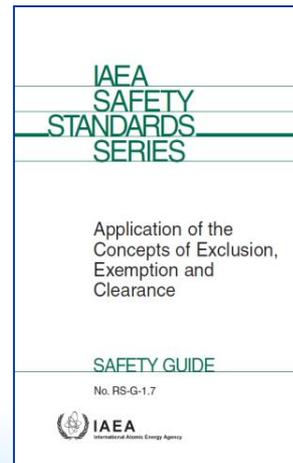
IAEA Safety Guides for Decommissioning



Revision of RS-G-1.7 has just started.

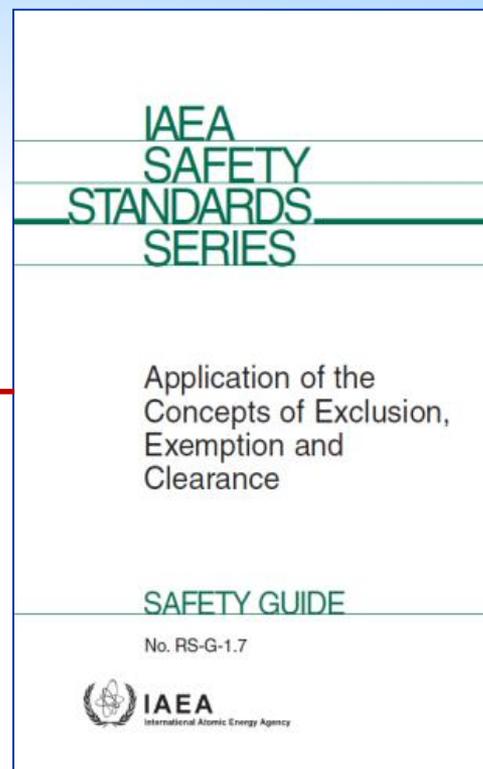
DS499 and DS500

Needs for revision of WS-G-5.1 will be discussed by WASSC in June 2018.



New Safety Guide on Implementation of the Concept of Clearance

- Increased importance of clearance with more intense decommissioning works worldwide
- Existing guide “**Application of the Concepts of Exclusion, Exemption and Clearance**”, IAEA Safety Standards Series No RS-G-1.7 (2004).
 - Based on Safety Requirements and Safety Fundamentals from 1996 and earlier.
 - Much information from RS-G-1.7 is now incorporated into IAEA Safety Standards Series No GSR Part 3 (2014).
- GSR Part 3 provides requirements related to exemption and clearance, but does not expand upon the application of the concepts of exemption and clearance
- Guidance is needed to address requirements of GSR Part 3



(2004)

New Safety Guide on Application of the Concept of Clearance
(DS500)
WASSC, RASSC, TRANSSC

New Safety Guide on Application of the Concept of Exemption
(DS499)
• RASSC, WASSC

To be developed in parallel

New Safety Guide on Implementation of the Concept of Clearance

DS500 will provide guidance on:

- Clearance process;
- Establishment of national regulations related to clearance;
- Planning, organization and implementation of clearance;
- Technical and safety implications;
- Resources needed to implement the clearance process;
- Derivation of surface specific clearance levels;
- Conditional clearance;
- Aspects related to clearance of liquids and gases;
- Clearance in the context of existing exposure situations;
- Involvement of interested parties.



New Safety Guide on Implementation^A of the Concept of Clearance

DS500 will clarify and differentiate between various related concepts and processes. For example:

- Clearance vs. exemption;
- Conditional vs. unconditional clearance;
- Clearance vs. authorized discharges;
- Material that is eligible for clearance vs. material that is considered as part of existing exposure situations (commodities);
- Clearance of materials vs. release of sites from regulatory control.

IAEA Safety Reports - Decommissioning



New publication – Model Regulations for Decommissioning

Many States are currently faced with the decommissioning of ageing facilities that are nearing the end of their life or of facilities that have already been permanently shut down.

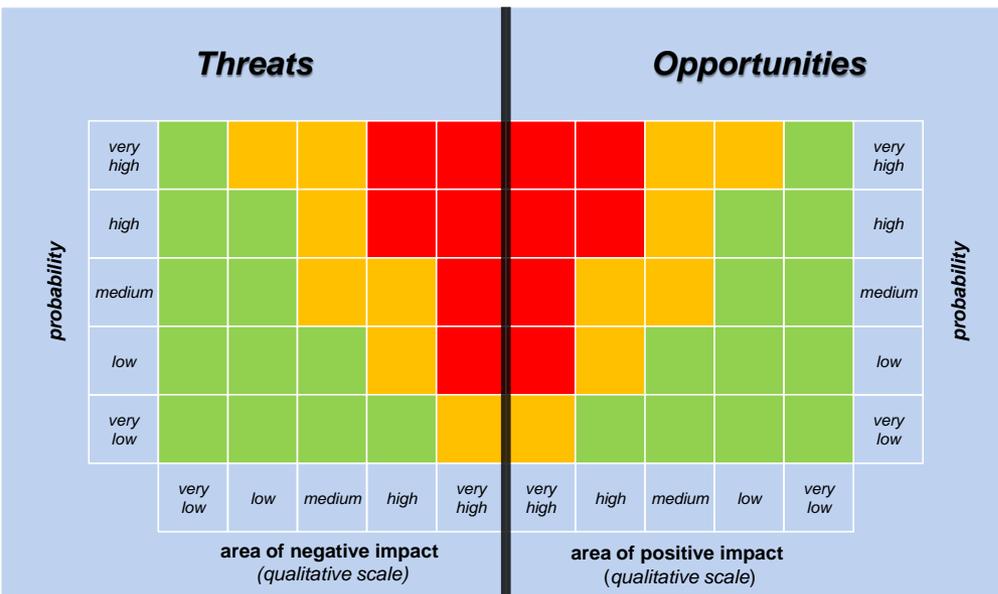
In some cases, decommissioning activities are only starting to be considered (or not considered at all) in the national legal and regulatory framework for protection and safety.

This publication provides information on an appropriate set of regulations covering all aspects of decommissioning.



International Cooperation: Projects and Communities of Practice

- R2D2 - Research Reactor Decommissioning Demonstration
- DRiMa - Decommissioning Risk Management
- DAROD - Decommissioning and Remediation of Damaged Nuclear Facilities



International projects on research reactor decommissioning

- R2D2 Project
 - Implemented in 2006-2015
 - 14 participating countries from Europe, Africa, Asia and Latin America
 - Focus on countries with small programmes
 - **Demonstration of all the phases of a typical RR decommissioning project**
 - Series of practical / demonstration workshops at RRs preparing for or being under decommissioning.
 - 14 Workshops held - Philippines, Australia, Germany, Denmark, Romania, USA.
- Support for Planning the Decommissioning of RRs in the North Africa Region (2014-2016) – 3 workshops in Vienna with visits to the ARC Seibersdorf and to the RR of the University of Vienna.

International Project on Decommissioning Risk Management (DRiMa)

- Among IAEA Member States are many that have never dealt with decommissioning.
- In these MS, responsibility for decommissioning may be assigned to institutions that lack experience in running large engineering projects and in managing associated project risks.
- To assist MS in this situation, the IAEA organized and implemented the DRiMa project from 2012-2015.
- Objectives of the DRiMa project:
 - Collect experience in Member States and identify good practices related to management of project risks – both general and decommissioning specific;
 - Provide a recommended risk management methodology;
 - Provide recommendations on the application of that methodology to decommissioning, addressing strategic and operational risks;
 - Assist MS to reduce threats and to increase opportunities related to decommissioning.

DRiMa output and outcomes

- Direct output – DRiMa project report, which has been made available through the project web page as “working material”.
- Project had a significant networking and training component – many examples provided and discussed, several risk workshops performed.
- Project results will be used for organizing future training events under the IAEA TC Programme

DAROD Project - Managing the Decommissioning and Remediation of Damaged Nuclear Facilities

- Project initiated in 2014 to address decommissioning of damaged nuclear facilities and related elements of site clean-up (from IAEA's Fukushima action plan).
- Scope: **post-accident situations, legacy sites**, other exceptional circumstances.
- Three Working Groups (WGs):
 - Regulatory Issues
 - Technical Issues
 - Institutional Framework and Strategic Planning
- Makes extensive use of **case studies** (e.g., TMI-2, Chernobyl, Sellafield ponds and silos).
- Final DAROD workshop held in UK from 16 to 20 October 2017, project report is being finalized.

New Project - Decommissioning of Medical, Industrial and Research Facilities

- International cooperation in the area of decommissioning often focuses on larger nuclear facilities (NPPs, large RRs, other nuclear fuel cycle facilities), while thousands of smaller facilities receive little attention.
- Draft Safety Guide DS403 on *Decommissioning of Medical, Industrial and Research Facilities* is soon to be published.
- A platform to promote DS403 and to establish community of practice for decommissioning of smaller facilities is needed.
- Received support from USG to launch a new project on decommissioning of small facilities. First meeting to be held **25-29 June 2018 in Vienna.**

New International Project on Completion of Decommissioning

- Determination of end state is one of the strategic decisions to be made early in planning for decommissioning.
- IAEA Safety Guide *WS-G-5.1 “Release of Sites from Regulatory Control on Termination of Practices”* (2006) is to be revised in the near future.
- In 2017 a Technical Meeting was held on the ***Planning and Implementation of Long Term Institutional Controls and on the Release of Sites from Regulatory Control***. It addressed end state selection, especially when the target is release of sites from regulatory control with restrictions and with continuing of institutional control.
- Arising from 2017 Technical Meeting, the Agency will launch a new international project on completion of decommissioning at a Technical Meeting to be held 24-28 Sept 2018 in Vienna.

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management



- Fifth Review Meeting of the JC (May 2015) attended by 61 contracting parties and 600 delegates.
- ***Sixth Review Meeting will be held from 21 May to 1 June 2018.***

The Joint Convention

- Is a **legal instrument** to directly promote the safety of waste management on a global scale.
- applies to spent fuel and radioactive waste resulting from **civilian nuclear reactors**
- places obligations of the Contracting Parties based on the principles contained in the IAEA Safety Standards



73 Contracting Parties

CHAPTER 2 SAFETY OF SPENT FUEL MANAGEMENT

- ARTICLE 4 GENERAL SAFETY REQUIREMENTS
- ARTICLE 5 EXISTING FACILITIES
- ARTICLE 6 SITING OF PROPOSED FACILITIES
- ARTICLE 7 DESIGN AND CONSTRUCTION OF FACILITIES
- ARTICLE 8 ASSESSMENT OF SAFETY OF FACILITIES
- ARTICLE 9 OPERATION OF FACILITIES
- ARTICLE 10 DISPOSAL OF SPENT FUEL

CHAPTER 3 SAFETY OF RWM

- ARTICLE 11 GENERAL SAFETY REQUIREMENTS
- ARTICLE 12 EXISTING FACILITIES AND PAST PRACTICES
- ARTICLE 13 SITING OF PROPOSED FACILITIES
- ARTICLE 14 DESIGN AND CONSTRUCTION OF FACILITIES
- ARTICLE 15 ASSESSMENT OF SAFETY OF FACILITIES
- ARTICLE 16 OPERATION OF FACILITIES
- ARTICLE 17 INSTITUTIONAL MEASURES AFTER CLOSURE

CHAPTER 4 GENERAL SAFETY PROVISIONS

- ARTICLE 18 IMPLEMENTING MEASURES
- ARTICLE 19 LEGISLATIVE AND REGULATORY FRAMEWORK
- ARTICLE 20 REGULATORY BODY
- ARTICLE 21 RESPONSIBILITY OF THE LICENCE HOLDER
- ARTICLE 22 HUMAN AND FINANCIAL RESOURCES
- ARTICLE 23 QUALITY ASSURANCE
- ARTICLE 24 OPERATIONAL RADIATION PROTECTION
- ARTICLE 25 EMERGENCY PREPAREDNESS
- **ARTICLE 26 DECOMMISSIONING**

CHAPTER 5 MISCELLANEOUS PROVISIONS

- ARTICLE 27 TRANSBOUNDARY MOVEMENT
- ARTICLE 28 DISUSED SEALED SOURCES

ARTEMIS - New Peer Review Service for Waste, Decommissioning and Remediation

A comprehensive peer review service for the front and back end of the nuclear fuel cycle.

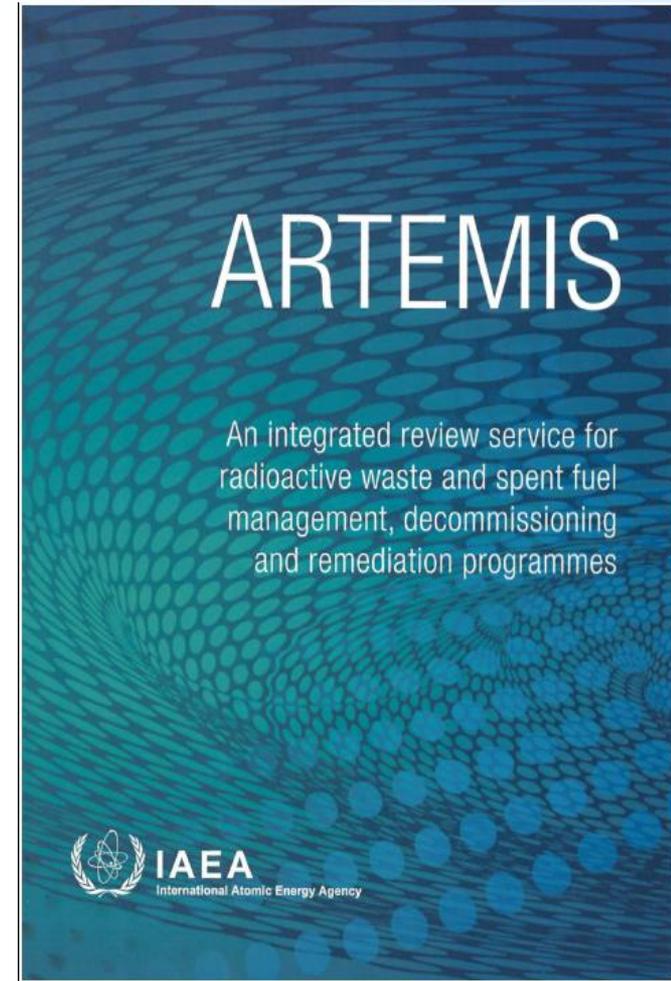
Targeted at programmes for radioactive waste management, decommissioning and remediation.

Scope includes uranium production sites.

Adaptable to a broad range of needs (e.g., at national or project level)

Aligned with European Commission's "Radioactive Waste Directive".

ARTEMIS reviews structured similar to other IAEA review services.



Motivation for developing the ARTEMIS service

IAEA peer reviews related to radioactive waste management, decommissioning and environmental remediation have for many years been conducted on an *ad hoc* basis. It became apparent that a consistent approach was needed.

Under the European Union's Council Directive 2011/70/EURATOM of 19 July 2011 for the responsible and safe management of spent fuel and radioactive waste:

Member States of the EU must – at least every 10 years – invite an international peer review of their national programmes for safe management of spent fuel and radioactive waste (Article 14 of the Directive).

ARTEMIS Review in Italy

- First ARTEMIS peer review carried out in July 2017 in Italy.
- Government of Italy requested the review with the aim to evaluate and improve national programmes for decommissioning and radioactive management.
- The ARTEMIS review was focused on the programme of the state agency SOGIN (Società Gestione Impianti Nucleari).



ARTEMIS Review in Italy

The review mission took place 2-13 July 2017 and involved site visits to 7 nuclear installations.

The review team comprised 6 international experts and two scientific secretaries from the IAEA.

Exiting the review there were 10 recommendations and 6 suggestions which are documented in a mission report of circa 80 pages.

Further ARTEMIS reviews are being planned or in consultation phase.



International Conferences

International Conference on Advancing the Global Implementation of Decommissioning and Environmental Remediation Programmes
23–27 May 2016, Madrid, Spain



Organized by the
IAEA
International Atomic Energy Agency

Held in co-operation with the European Commission

In cooperation with the OECD Nuclear Energy Agency
OECD
Organization for Economic Co-operation and Development

and the European Bank for Reconstruction and Development
EBRD
European Bank for Reconstruction and Development

Hosted by the Government of Spain

Through Empresa Nacional de Reservas Estratégicas de Productos Petrolíferos, S.A.
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Co-organizer is Supporter Nuclear
ESN
European Supporter Nuclear

Academically Sponsored by the Institute Electrica de Estudios de Aplicaciones
INEA
Instituto Nacional de Estudios de Aplicaciones

UNESCO

Madrid, Spain, 23–27 May 2016

International Conference on the Safety of Radioactive Waste Management
21–25 November 2016
Vienna, Austria



Organized by the
IAEA
International Atomic Energy Agency

Held in cooperation with the European Commission

and the OECD Nuclear Energy Agency
OECD
Organization for Economic Co-operation and Development

NEA
Nuclear Energy Agency

UNESCO

Vienna, Austria, 21–25 Nov 2016

New Training Materials for Decommissioning

- Presently, basic training materials for decommissioning safety are being revised and new specialized training modules are being developed.
- To date, the only Agency training material in use has been the IAEA's basic training course for decommissioning safety, which dates from 2008.
- Revision of the 2008 basic training course started in 2015 and is now complete.
- The basic training course will be pilot tested at two events in 2018.
- Training materials for all MS to use (e.g., for events organized independently by Member States).

New Training Materials for Decommissioning

From 2009 to 2015, the IAEA organized more than 100 training events on different aspects of decommissioning.

Based upon that experience, a need to develop specialized training modules for decommissioning safety was identified.

Specialized modules for the following topics are being developed:

- *Regulatory supervision of decommissioning activities.*
- *Planning and Project Management;*
- *Characterization;*
- *Safety Assessment;*
- *Management of Materials Arising from Decommissioning Activities;*
- *Final Survey and Release of Sites;*

Specialized modules to be completed by 2020.

IAEA Technical Cooperation Programme

The principal mechanisms by which the IAEA delivers assistance to Member States through the **Technical Cooperation Programme** are:

- Workshops and Training Courses
- Expert missions
- Scientific visits
- Fellowships
- Procurements

Capacity building is at the centre of the TCP's mission.

Ongoing TC projects (2016-2017)

- INT9183 “Overcoming the Barriers to Implementation of Decommissioning and Environmental Remediation Projects” – covers both decommissioning and environmental remediation.
- RER9146 “Enhancing Capacities in Member States for the Planning and Implementation of Decommissioning Projects” – focus on small facilities.
- RER9150 “Improving Capabilities to Efficiently Implement Large Ongoing Decommissioning Projects and Waste Management with Minimization of Risks Based on Initiatives and Potential Synergies” – focus on large ongoing decommissioning projects (Ignalina NPP, Chernobyl NPP, A1 NPP, Kozloduy NPP).
- At any given time there are many national TC projects underway to provide assistance with country-specific issues.

Summary

- Almost 60 years of the IAEA's Safety Standards programme
 - Provide an international consensus on what is needed to achieve a high level of safety and on good practices
 - Developed in close cooperation with Member States
 - Sometimes involve co-sponsorship with other international organizations
 - Periodically reviewed and revised.
- Safety Requirements for decommissioning recently revised (GSR Part 6), ongoing revision of the Safety Guides
- Number of supporting documents close to publication
 - Some presenting results of international projects

Summary

- See increased activities on decommissioning worldwide.
- IAEA assistance through
 - Developing Safety Standards and technical publications
 - Facilitating international safety conventions
 - Offering wide variety of services to the Member States
 - Projects
 - Training events
 - Peer reviews
 - Information exchange



60 Years

IAEA

Atoms for Peace and Development

Atoms for peace and development



Thank you!