

R<sup>2</sup>D<sup>2</sup> Project  
“Workshop on Project Management – Decommissioning Dismantling”  
State University New York at Buffalo  
Buffalo Materials Research Center (BMRC)  
3-7 December 2012, Buffalo, NY, USA

# IAEA Programme on Decommissioning

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**IAEA**

International Atomic Energy Agency

# Content

- Background – IAEA mission
- Safety Standards
- Other IAEA Series and supporting publications
- Technical Cooperation Programme
- International Decommissioning Network
- International projects
- Joint Convention
- Nuclear Safety Action Plan
- Conclusions
- Web links

# From the Statute of the IAEA

## Article III: Functions

- Para A.6. *The Agency is authorized to **establish or adopt ... standards of safety** for protection of health and minimization of danger to life and property, and to **provide for the application of these standards ...***
- Para B.3. *In carrying out its functions, the Agency shall allocate its resources in such a manner as to secure efficient utilization and the greatest possible general benefit in all areas of the world, **bearing in mind the special needs of the under-developed areas of the world.***

## Article VIII: Exchange of information

- *“The agency shall take positive steps to encourage the **exchange among its members of information** relating to the nature and peaceful uses of atomic energy and shall serve as an intermediary among its members for this purpose.”*

# IAEA organizational parts dealing with decommissioning



- Two IAEA sections deal with decommissioning issues – **Waste Technology Section (WTS)** and **Waste and Environmental Safety Section (WES)**
- WTS is one of the sections within Nuclear Fuel Cycle & Waste Technology Division, **Nuclear Energy Department**
- WES is part of Radiation, Transport & Waste Division, **Nuclear Safety & Security Department**

# IAEA Publications

- More than 60 publications on decommissioning (since 1980-s)
  - Safety Standards
  - Safety Report Series
  - Nuclear Energy Series
  - Technical Report Series
  - TECDOC
- Some publications cover both decommissioning and environmental remediation aspects
- Some publications prepared in cooperation with other organizations, e.g. NEA OECD

# International Safety Standards

- IAEA Statute:

- Develop safety standards**



Nuclear safety  
Radiation Safety  
Waste Safety  
Transport Safety

- Provisions for their application and guidance on good practices**



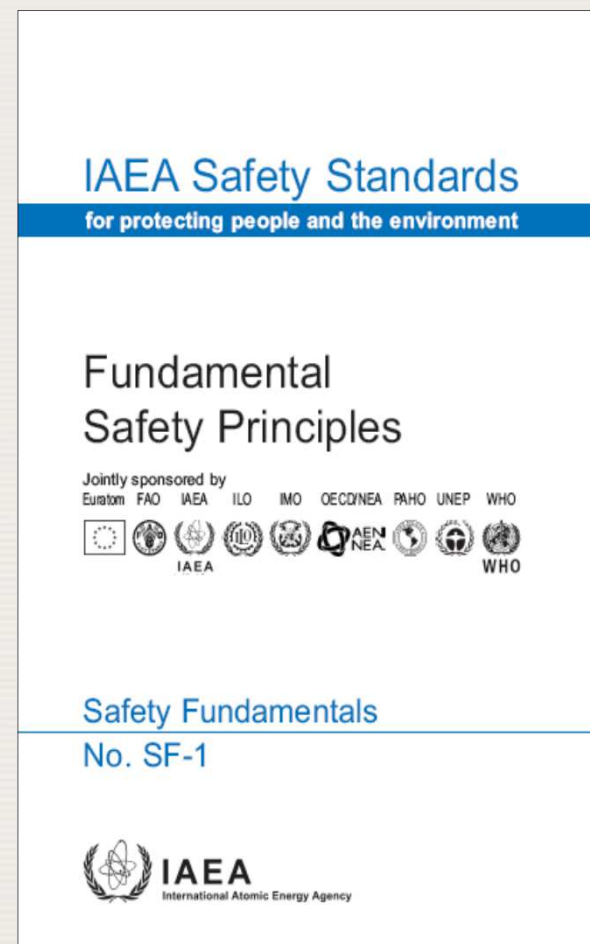
Peer reviews  
Technical cooperation  
Research and development  
Training  
Exchange of information (networks)

# IAEA Safety Fundamentals

Comprised of the fundamental safety objective “to protect people and the environment from harmful effects of ionizing radiation”

and

the 10 principles to be applied to achieve the fundamental objective.



# Safety Requirements for Decommissioning

- Elaborate on the basic objectives and concepts of SF-1 as they apply to a specific activity or facility.
- Should be concise and reflect the ‘**What**’ and ‘**Who**’ of safety management – associated explanatory text should describe ‘**Why**’ the requirements exist.
- Use “**shall**” statements.



IAEA Safety Standards  
for protecting people and the environment

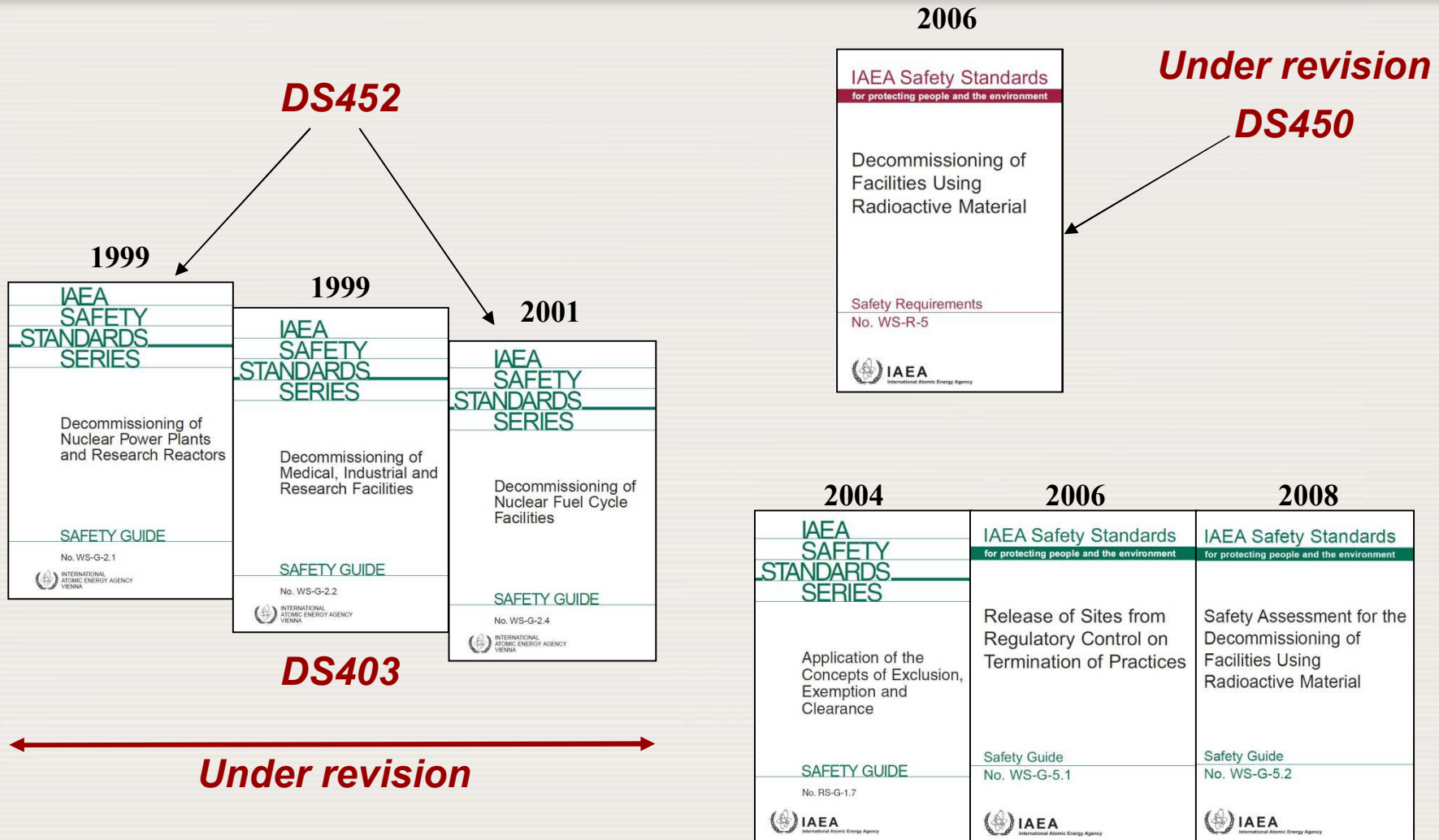
Decommissioning of  
Facilities Using  
Radioactive Material

Safety Requirements  
No. WS-R-5

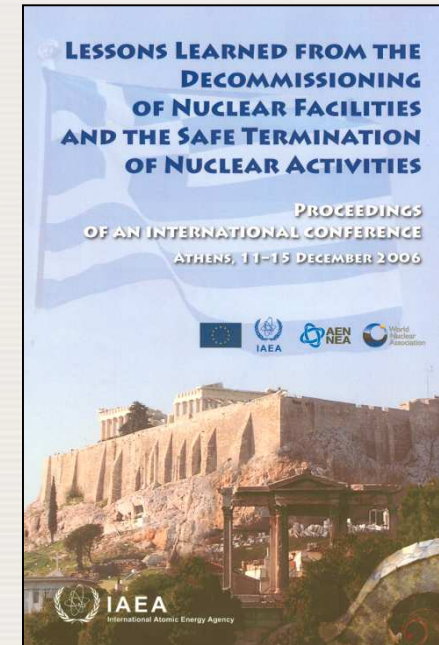
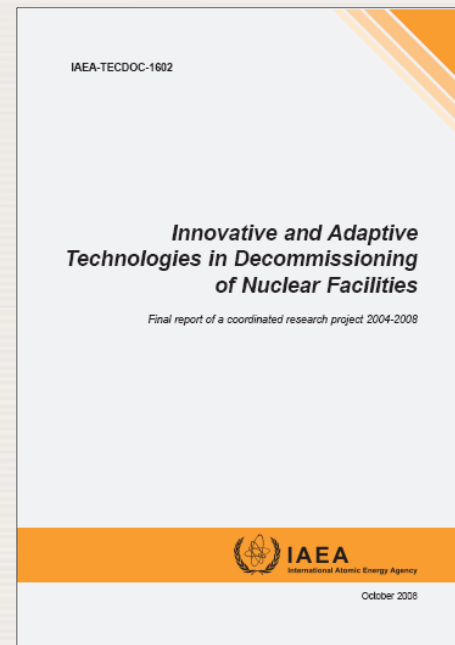
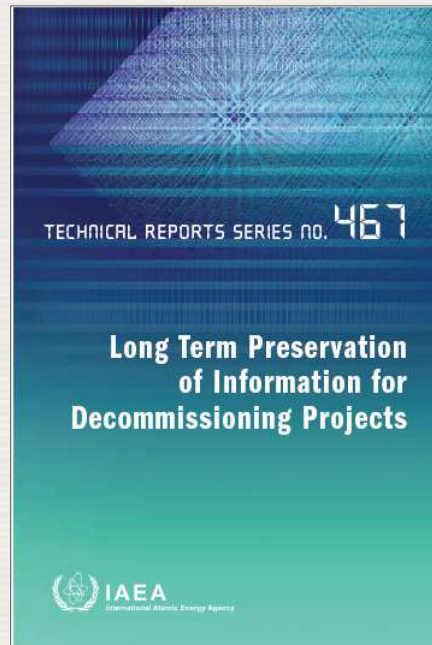
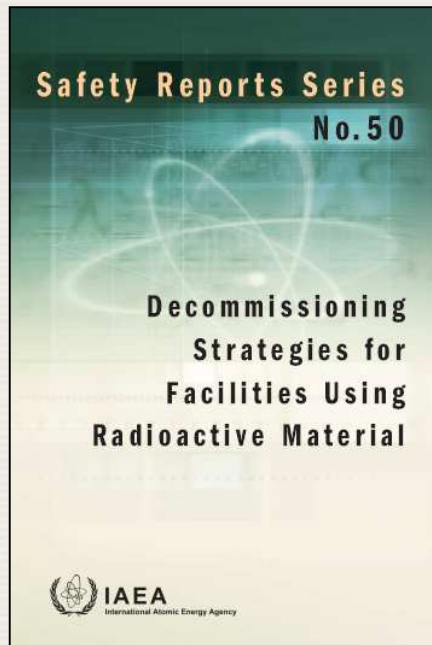




# Safety Standards for decommissioning



# Supporting publications



# IAEA Safety Reports Series

## **Support IAEA Safety Standards:**

*Safe Enclosure of Nuclear Facilities During Deferred Dismantling, Safety Reports Series No. 26 (2002)*

*Safety Considerations in the Transition from Operation to Decommissioning of Nuclear Facilities, Safety Reports Series No. 36 (2004)*

*Standard Format and Content for Safety Related Decommissioning Documents, Safety Reports Series No. 45 (2005)*

*Decommissioning Strategies for Facilities Using Radioactive Material, Safety Reports Series No. 50 (2007)*

# IAEA Safety Reports Series - Recent

## **Support IAEA Safety Standards:**

*Monitoring for Compliance with Exemption and Clearance Levels,*  
Safety Reports Series No. 67 (2012)

*Monitoring for Compliance with Remediation Criteria for Sites,*  
Safety Reports Series No. 72 (2012)

## **Approved for publication:**

*Safety Assessment for Decommissioning - Outcomes of the  
International Project on Evaluation and Demonstration of Safety  
for Decommissioning of Facilities Using Radioactive Material  
(DeSa)*

# IAEA Nuclear Energy Series

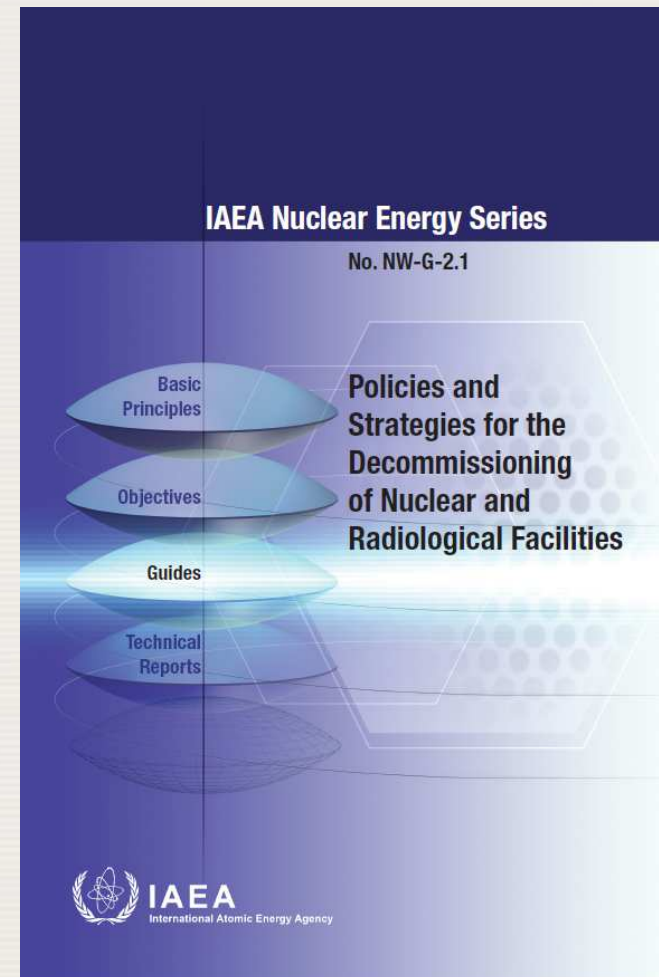
New publication series.

The IAEA Department of Nuclear Energy is the primary contributor to this series.

Hierarchical structure that is patterned after the IAEA Safety Standards.

Have no legally binding implications for the IAEA or its Member States.

Contain much technical information and approaches used by Member States.



## Technical Reports - recent publications

- Policies and Strategies for the Decommissioning of Nuclear and Radiological Facilities (NW-G-2.1)
- Selection and Use of Performance Indicators in Decommissioning (NW-T-2.1)
- Redevelopment and Reuse of Nuclear Facilities and Sites: Case Histories and Lessons Learned (NW-T-2.2)
- Decommissioning of Small Medical, Industrial and Research Facilities: A Simplified Stepwise Approach (NW-T-2.3)
- International Structure for Decommissioning Costing (ISDC) of Nuclear Installations, developed jointly with the OECD Nuclear Energy Agency and the European Commission (NEA Report no. 7088)
- Design Lessons Drawn from the Decommissioning of Nuclear Facilities, IAEA-TECDOC-1657



## Technical publications under preparation

- TECDOC resulted from Coordinated Research Project on Planning, Management and Organizational Aspects in Decommissioning of Nuclear Facilities (2008-2012)
- Cost Estimation for Decommissioning of Research Reactors \*
- Decommissioning of Pool-like Facilities \*
- Management of Human Resources during Decommissioning with a Focus on Motivation Aspects \*
- Decommissioning – Managing the Unexpected \*
- Decommissioning of Particle Accelerators \*.

\* IAEA Nuclear Energy Series reports



# IAEA Technical Cooperation Programme

- The main mechanism through which the IAEA delivers services to its Member States
  - to build, strengthen and maintain capacities in the safe, peaceful and secure use of nuclear technology
  - Group events – Workshops, Training Courses, Group Scientific Visits
  - Expert missions
  - Individual scientific visits
  - Fellowships
  - Procurement



## On-going TC projects

- INT9175 (2012-2015) “Promoting Safe and Efficient Clean-up of Radioactively Contaminated Facilities and Sites”
- RER9120 (2012-2015) “Supporting Decommissioning Implementation for Facilities Using Radioactive Material”
- RER9106 (2012-2013) “Supporting Decommissioning and Waste Management for the Chernobyl, Ignalina and A1 Nuclear Power Plants” (mini-regional TC project)
- Number of national projects to address country specific issues
  - Ukraine, Lithuania, Slovak Republic, China, Iraq, Egypt, Philippines

# International Decommissioning Network (IDN)

- Joint initiative of the IAEA's Departments of Technical Co-operation, Nuclear Energy, Nuclear Safety & Security
- Launched in 2007 as a forum to improve the exchange of information and organization of practical / “hands-on” decommissioning training
- Annual meetings, Steering Group, members, participants
- Many WSs and TCs offered to the IAEA TC programme (RER/3/005, RER/3/009, RER/9/120, INT/9/175)
- CONNECT - concept and a tool to facilitate interactions between individuals and organizations involved in all aspects of RWM

# International projects on safety assessment for decommissioning

- Evaluation and Demonstration of Safety for Decommissioning of Facilities Using Radioactive Material (DeSa, 2004 - 2007)
  - Safety assessment methodology for decommissioning
  - Graded approach, Regulatory review, three supporting test cases
- Use of Safety Assessment Results in the Planning and Implementation of Decommissioning (FaSa, 2008 – 2011)
  - Evolution of the decommissioning safety assessment and its update during the facility life time and during project implementation
  - Implementation of safety assessment results during planning and conduct of decommissioning
  - Regulatory review of the implementation
  - Four supporting test cases
  - Project completed in November 2011, project report is being finalized

# DRiMa Project

- During FaSa project it was recognized that apart from the safety related risks, there are many other project risks that should be managed in order to implement a decommissioning project successfully.
- Hence, new international project on **Decommissioning Risk Management (DRiMa)**
- initiated under the International Decommissioning Network (IDN) in 2011 – planning consultancies in Feb and May, 2012
- will use similar working mechanisms as DeSa and FaSa (Coordination Groups Annual Meetings, working groups, test cases)
- first project meeting 17-21 December 2012 in Vienna
- 45 participants from more than 20 countries expected

# DRiMa Project

Purpose and objectives are to:

- address management of project risks in decommissioning
- collect and analyse MS experience in decommissioning risk management
- provide recommendations on the application of risk management methodology in decommissioning
- address decommissioning risk management at strategic and operational levels (two working groups envisaged)
- illustrate the recommendations by examples and (optional, TBD) test cases

# International Decommissioning Network (IDN)

- IDN Annual Meeting 6-8 November 2012, Vienna
- IDN Projects
  - Decommissioning Risk Management (DRiMa), First TM 17-21 December 2012, Vienna
  - Data Analysis and Collection for Costing of Research Reactor Decommissioning (DACCORD), First TM 10-14 December 2012, Vienna
  - Constraints to Implementing Decommissioning and Environmental Remediation Programmes (CIDER)
- ENVIRONET - Network of Environmental Management and Remediation
- Other networks on RWM
  - LABONET - International Network of Laboratories for Nuclear Waste Characterization
  - DISPONET - International Low Level Waste Disposal Network
  - URF - Underground Research Facilities Network



# Decommissioning of the former nuclear complex in Iraq

- 10 locations with 18 facilities covered by the programme
- Main focus in the previous period on the establishment of a regulatory framework and capacity building
- Current activities
  - Support the operator and the regulator in developing and reviewing documents (national policy and strategy on WM, overarching and site specific decommissioning plans, safety assessments)
  - Fellowships, site visits, training courses
- Implementation of several ongoing field activities (in lower risk areas)
- IAEA support programme to be closed by the end of 2013, activities in Iraq will continue

# International Research Reactor Decommissioning Demonstration Project (R2D2P)

- Launched in 2006, 14 participating countries
- Focused on countries with small programmes
- Demonstration of all the phases / steps of a typical RR decommissioning project
- Series of practical / demonstration workshops hosted by a single pilot facility (initial idea)
- “Decommissioning Planning” phase – completed
  - 11 Workshops - Philippines, Australia, Germany, Denmark, Romania
- “Decommissioning Implementation” phase underway
  - Next WS in Buffalo, USA, 3-7 December 2012 – decommissioning project management and dismantling exercise





# Joint Convention on the Safety of Spent Fuel Management and on the Safety of RWM

- First legal instrument to directly address issues of SFM and RWM on a global scale
- The JC applies to SF and RW resulting from civilian nuclear reactors and applications and to SF and RW from military or defense programmes if and when such materials are transferred permanently to and managed within exclusively civilian programmes
- The Convention also applies to planned and controlled releases into the environment of liquid or gaseous radioactive materials from regulated nuclear facilities
- Decommissioning in the scope of the JC (Article 26)
- 64 Contracting Parties (status August 2012)
- Fourth Review Meeting of the JC held in Vienna, 14-23 May 2012
- More than 600 delegates from 52 Contracting Parties



# Decommissioning safety appraisal services

Independent reviews and assessments of activities associated with the planning and undertaking of decommissioning of nuclear facilities

- Compliance based review against the International Safety Standards
- Review against best practices

Assessments and advice on

- National regulations
- Decommissioning strategies and plans
- Ongoing decommissioning programmes
- Safety and technical considerations

## Coordinated Research Projects

- CRP on Planning, Management and Organizational Aspects in Decommissioning of Nuclear Facilities (2008-2012)
- CRP on Innovative and Adaptive Technologies in Decommissioning of Nuclear Facilities (2004-2008), IAEA-TECDOC-1602 published in 2008
- Decommissioning Techniques for Research Reactors (1997-2001), IAEA-TECDOC-1273 published in 2002

# Nuclear Safety Action Plan

Proposed by the IAEA after the accident at the Fukushima-Daiichi NPP, approved by the IAEA General Conference in 2011

Several tasks on decommissioning and remediation after a nuclear accident

- Experience and lessons learned worldwide on approaches, main issues, safety considerations, techniques, tools and equipment. Two consultancies held - Interim Report available
- International Experts' Meeting on Decommissioning and Remediation after a Nuclear Accident, Vienna, 28 January - 1 February 2013

<http://www-pub.iaea.org/iaeameetings/44453/International-Experts-Meeting-on-Decommissioning-and-Remediation-after-a-Nuclear-Accident>

# International Experts Meeting


The IAEA's **Nuclear Safety Action Plan** has called for the Secretariat to organize a number of International Experts Meetings (IEMs).

This will be the 4<sup>th</sup> such IEM.


Jan. 28 to Feb. 1, 2013  
Vienna



International Experts' Meeting on  
**Decommissioning and Remediation  
after a Nuclear Accident**

A photograph of a paved road stretching into the distance, flanked by bare trees. A blue sign on the right side of the road reads "Road to RECOVERY".

IAEA Action Plan on Nuclear Safety  
IAEA Headquarters  
28 January – 1 February 2013  
Vienna, Austria

 **IAEA**  
International Atomic Energy Agency

www.pub.iaea.org/iaemeetings  
CN-211

# Scope of the IEM

## Temporal:

- Covers circa 60 years of experience.
- Concerns actions to be taken **after the accident has been declared ended.**

## Technical Scope:

- **Decommissioning** of damaged facilities
- **Remediation** of contaminated areas, off-site
- Management of **radioactive waste** arisings created by the accident

# Scope of the IEM

## Thematic Areas:

- Strategies
- Planning and cost
- Case studies, such as Windscale, TMI and Chernobyl, Kyshtym
- Regulatory oversight and authorizations
- Technologies
- Knowledge management
- Stakeholder engagement, confidence building
- Conventions, laws and regulations
- Application and adaptation of existing standards

# Target Audience

- Government - policy and decision makers
- Agencies responsible for implementation of decommissioning, remediation and waste management.
- International organizations (e.g., NEA, WENRA, WNA, EPRI)
- Regulatory bodies
- Engineering companies, contractors (commercial sector)
- Other stakeholders



# Format and Output

- Largely invited papers
- Contributed papers to be presented as “oral posters”
- Focused panel discussions
- Parallel sessions

Output: distillation of knowledge from 60 years of experience. Present concise findings and recommendations.

# Opportunity

Technical innovation paves the way for doing decommissioning faster, cheaper, and safer.

Daunting challenges are often the cradle for invention.

Innovations - technical and other - that come in the years ahead from Fukushima recovery actions may make “conventional decommissioning” faster, cheaper and safer.

# Coordination and cooperation with other international organizations

- IAEA works closely with other international organizations
  - Organization of conferences and topical meetings
  - Review of national decommissioning programmes
  - Development of harmonized regulatory requirements for decommissioning
  - Specific topics as development of recommendations on characterization, clearance of material, cost estimate, stakeholders involvement
- Nuclear Energy Agency (NEA) of OECD
- World Nuclear Association (WNA)
- European Commission (EC)
- Western European Nuclear Regulatory Association (WENRA)
- Contact Expert Group for International Radioactive Waste Projects in the Russian Federation (CEG)



# Conclusions

- Increased activity on decommissioning worldwide
- Importance of ensuring safety of workers, public and the environment
- IAEA is working systematically to address this challenge
  - Developing Safety Standards and technical publications
  - Facilitating international safety conventions
  - Offering wide variety of services to the Member States
    - Projects
    - Training events
    - Appraisal services
    - Information exchange
- Activities coordinated with other international organizations



## Links - publications

- IAEA Publications  
[www-pub.iaea.org/MTCD/publications/series1.asp](http://www-pub.iaea.org/MTCD/publications/series1.asp)
- IAEA Safety Standards  
[www-ns.iaea.org/standards/](http://www-ns.iaea.org/standards/)
- Decommissioning Safety Standards  
[www-ns.iaea.org/downloads/rw/waste-safety/decom-safety-standards.ppt](http://www-ns.iaea.org/downloads/rw/waste-safety/decom-safety-standards.ppt)
- Documents other than Safety Standards  
[www-ns.iaea.org/publications/default.asp?s=5&l=36](http://www-ns.iaea.org/publications/default.asp?s=5&l=36)
- Decommissioning Publications – Waste Technology  
[www.iaea.org/OurWork/ST/NE/NEFW/Technical\\_Areas/WTS/decommiss ioning-publications42693.html](http://www.iaea.org/OurWork/ST/NE/NEFW/Technical_Areas/WTS/decommiss ioning-publications42693.html)

## Links – activities / projects

- Decommissioning:  
[www-ns.iaea.org/tech-areas/waste-safety/decommissioning.asp?s=3&l=17](http://www-ns.iaea.org/tech-areas/waste-safety/decommissioning.asp?s=3&l=17)  
[www.iaea.org/OurWork/ST/NE/NEFW/Technical\\_Areas/WTS/decommissioning.html](http://www.iaea.org/OurWork/ST/NE/NEFW/Technical_Areas/WTS/decommissioning.html)
- FaSa:  
[www-ns.iaea.org/tech-areas/waste-safety/fasa/default.asp](http://www-ns.iaea.org/tech-areas/waste-safety/fasa/default.asp)
- R2D2P:  
[www-ns.iaea.org/projects/r2d2project/default.asp](http://www-ns.iaea.org/projects/r2d2project/default.asp)
- Iraq Decommissioning Project:  
[www-ns.iaea.org/projects/iraq/default.asp?s=8&l=66](http://www-ns.iaea.org/projects/iraq/default.asp?s=8&l=66)
- Waste Management Networks:  
[www.iaea.org/OurWork/ST/NE/NEFW/WTS-Networks/overview.html](http://www.iaea.org/OurWork/ST/NE/NEFW/WTS-Networks/overview.html)
- Joint Convention:  
[www-ns.iaea.org/conventions/waste-jointconvention.asp?s=6&l=40](http://www-ns.iaea.org/conventions/waste-jointconvention.asp?s=6&l=40)
- TC Programme:  
[www.iaea.org/technicalcooperation/Home/index.html](http://www.iaea.org/technicalcooperation/Home/index.html)





**THANK YOU FOR YOUR ATTENTION !**

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