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Regulatory aspects of decommissioning

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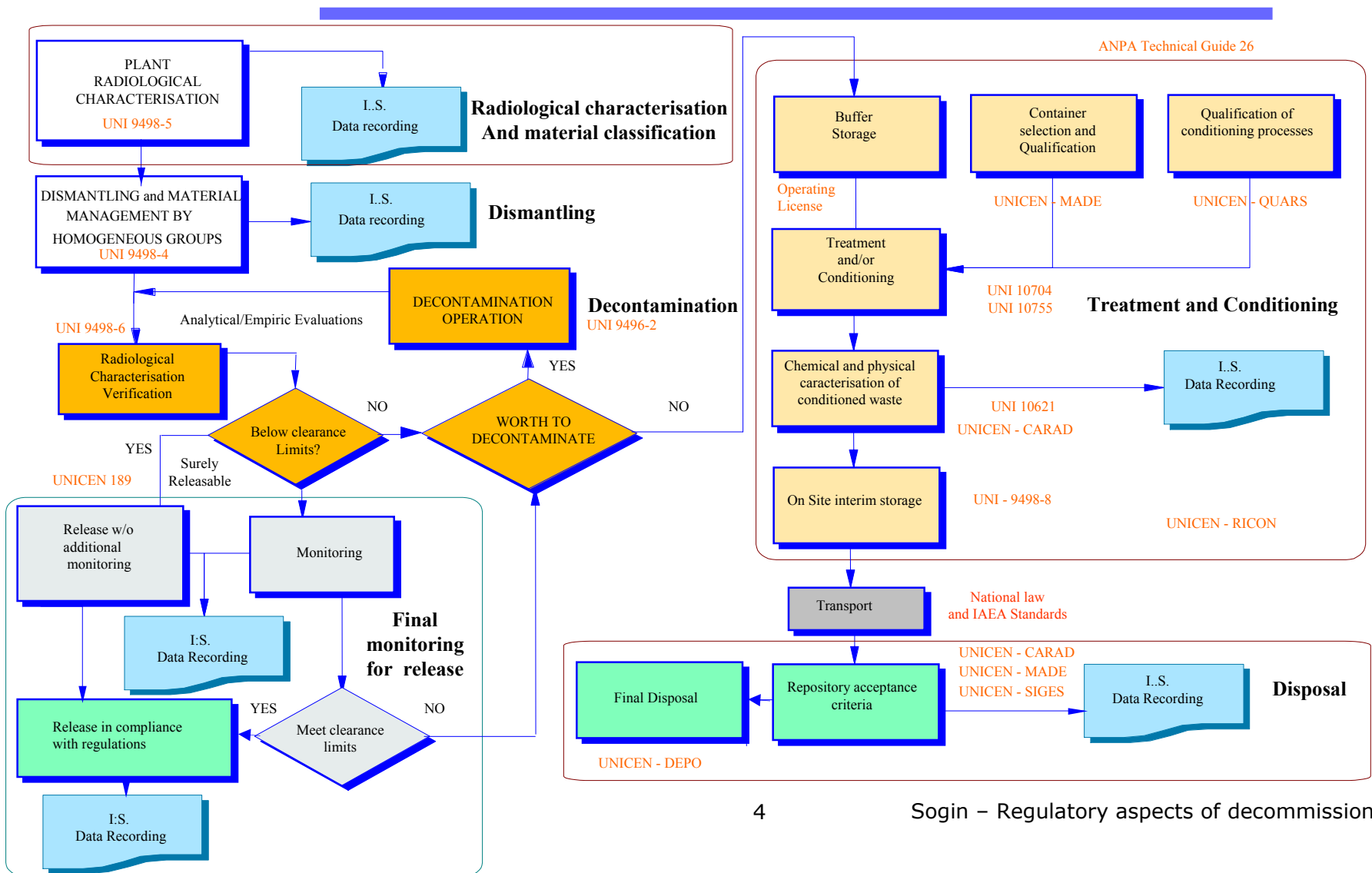
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- **Introductory items**
 - **Safety and radiation protection criteria**
 - **Material Management and release**
 - **Waste Management**
 - **QA Assurance**
 - **Licensing**
 - **Environmental Impact assessment**
 - **Funding**



Main areas to be regulated during the Decommissioning

- **safe operation** and maintenance of nuclear installation under dismantling
- **characterisation** and facility inventory
- **dismantling**, such as cutting, decontamination, handling of removed components
- **waste and material management**, including storage and transport of radioactive material
- **disposal** of both radioactive and non-radioactive hazardous material
- **release** of site.

DECOMMISSIONING: from Characterisation to Final disposal





Safety

Regulatory framework similar to commission and operation one.
Specific rules already issued at both European and member State.
European harmonisation still needed.

Environmental protection

New general regulatory framework has been set up recently in the EU.



- **RESPONSIBILITIES:**

- Licensing authorities
- Government
- Owner
- Contractors etc...

- **RISKS:**

- Technical (workers, public....)
- Societal (future liabilities...)
- Financial
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Each risk should be regulated and managed by a responsible body



Responsibility and functions of regulatory bodies

A primary function of a regulatory body is to **authorise** the activities. The regulatory body first **needs to have in place the safety principles** and criteria that it will use as the basis for its decision-making. So it will be in a sound position to grant permission for different activities to take place.

Agreements have to be reached with potential licensees on what information has to be provided

Another primary function for the regulator is to **inspect** that decommissioning activities are performed in compliance with the conditions that have been set.



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- **STATEMENT OF AN EU EXPERT MEMBER GROUP:**
 - **Not only responsibilities should be transferred, but also means**
 - **Ensure that decommissioning be completed to the final stage defined by Authorities**
 - **Particular responsibility for waste management: repository**

SAFETY AND RADIATION PROTECTION CRITERIA



They are implemented through

- **Fixing dose** limits for worker and people. These imply to fix related quantities as the contamination levels for air, water and soil and the exposure rates inside the working areas and the surround environment.
- Compliance with the **ALARA principle**
- **Waste classification** and waste management.
- National/Regional Storage/**Repository** safety requirements.



- **REGULATORY FRAMEWORK:**

- **International Treaties and Conventions**

- **International rules and Standards**

- **National legislation**

- **National Standards**



- **INTERNATIONAL CONVENTIONS:**
 - Early notification of Nuclear Accident (Sept. 1986)
 - Assistance in case of nuclear accident or radiological emergency (Sept. 1986)
 - Nuclear safety (June 1994)
 - Safety of the Spent Fuel Management and of Radioactive Wastes (June 2001)
- **EURATOM TREATY** (for EU Members)

SAFETY AND RADIATION PROTECTION CRITERIA



EU legislation :

- A **regulation** has general application. It is binding in its entirety and directly applicable in all Member States.
- A **directive** is binding, as to the result to be achieved, upon each Member State to which it is addressed, but leaves to the national authorities the choice of form and methods.
- A **decision** is binding in its entirety upon those to whom it is addressed.
- **Recommendations** and **opinions** are not binding.

Communication is an official document from Commission to the Council or to the Parliament



European initiatives in the field of decommissioning are based on (EIA will be dealt later):

- Euratom Treaty, article 37
- Directive 96/29Euratom (13/5/1996)

SAFETY AND RADIATION PROTECTION CRITERIA



- Directive 96/29 lays down BSS for the protection of the health of workers and general public.
One main criterion is the limit of 10 $\mu\text{Sv}/\text{year}$ for general public. This could be challenging
- A communication (98/C 133/3) has been issued to assist Members in transposing the directive into National rules

SAFETY AND RADIATION PROTECTION CRITERIA



Status of the Implementation of the EU Basic Safety Standards in the Regulations of European Countries (April 2002)

EC COUNTRIES	Progress in the implementation of the BSS	Date of implementation of the BSS
<i>Austria</i>	<i>Draft</i>	<i>Expected 2002</i>
Belgium	Implemented	20 July 2001
Denmark	Implemented	1 January 1998
Finland	Implemented	Before 13 May 2000
France	Partially Implemented	March 2001/April 2002
Germany	Implemented	1 August 2001
<i>Italy</i>	<i>Ready</i>	<i>1 January 2001</i>
Spain	Implemented	6 July 2001
Sweden	Implemented	1 December 2000
The Netherlands	Implemented	September 2001/ 19 February 2002
UK	Implemented	1 January 2000

Feb 2002



IAEA new approach to publications, since 1999

SAFETY FUNDAMENTALS (F):

STATE THE BASIC OBJECTIVES, CONCEPTS AND PRINCIPLES INVOLVED IN ENSURING PROTECTION AND SAFETY

SAFETY REQUIREMENTS (R):

BASIC REQUIREMENTS WHICH MUST BE MET IN ORDER TO ENSURE THE SAFETY OF PARTICULAR ACTIVITIES.

SAFETY GUIDES (G):

CONTAIN RECOMMENDATIONS ON HOW TO MEET REQUIREMENTS



The IAEA SAFETY STANDARDS are not binding on Member States but may be adopted by them at their own discretion, for use in national regulation.

Safety Standards are submitted to all Member States for comments before their approval by IAEA Board of Governors (for F and R) or by the Publication Committee (G)



TECHNICAL REPORTS

Consolidated experience and lesson learned, based on international consensus

TECHNICAL DOCUMENTS (TECDOC)

Preliminary information; no international consensus; useful as a reference



- **IAEA Safety documents are issued in 5 areas:**
 - General Safety - GS
 - Nuclear Safety - NS
 - Radiation Safety - RS
 - Radioactive Wastes Safety - WS
 - Transport Safety - TS

- Each document is so defined with a classification system:
 - AREA . F/R/G . number



Most **IAEA** significant standards for decommissioning:

INTERNATIONAL BASIC SAFETY STANDARDS – BSS - for protection against ionizing radiation and for the safety of radiation sources (**Safety Series 115**, 1996)

Safety Series 111 – F (1995) :”The Principle of Radioactive Waste Management”: establishes the basic principles and concepts for safe radioactive waste management

Safety Series 52 (1980) “Factors relevant to Decommissioning of Land Based Nuclear reactor Plants”: sets out the now nearly universally adopted stages of decommissioning



SAFETY REQUIREMENT WS-R-2'': Predisposal Management of Radioactive Wastes (2000)

Safety Guide WS-G-2.1: Decommissioning of NPPs and research reactors

Safety Guide WS-G-2.2: Decommissioning of Medical and Industrial facilities

Safety Guide WS-G-2.4: Decommissioning of nuclear fuel cycle facilities

SAFETY AND RADIATION PROTECTION CRITERIA



STATUS OF THE IAEA SAFETY STANDARDS PROGRAMME

September 2002

General Safety	Pages	2-4
Nuclear Safety	Pages	5-9
Radiation Safety	Page	10
Radioactive Waste Safety	Pages	11-12
Transport Safety	Page	13

Legend:	
(Blank)	No revision planned
□□□□□□	New document or revision planned
◻□□□□□	DPP in preparation or awaiting approval
■□□□□□	DPP approved
■◻□□□□	Document being drafted
■□□□□□	Awaiting approval of Committee(s) for submission to MS
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■□□□□□	Awaiting comments from MS/incorporating comments from MS
■□□◻□□	Awaiting approval by Committee(s) for submission to the Commission
■□□□□□	Endorsed by the Commission/Final editing
■□□□◻□	Submitted to B of G/Publications Committee
■□□□□□	Approved by B of G/Publications Committee
■□□□□◻	In print/in translation
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Throughout this report the first column provides the list of published IAEA Safety Standards. The second column gives the working identification number (DS ...) of standards being developed or revised. **Bold type** indicates standards issued, or to be issued, under the authority of the Board of Governors, others are issued under the authority of the Director General. The last column provides the list of Committees; the first Committee listed has the lead in the preparation and review of that particular standard.

This document is also available at the IAEA Internet site: www.iaea.org/ns/coordinet



ANNEX 3.3 of the course lists IAEA technical documents specifically related to decommissioning issued since 1985



Three stages of decommissioning defined by Safety Series 52

Each of the three stages can be defined by two parameters:

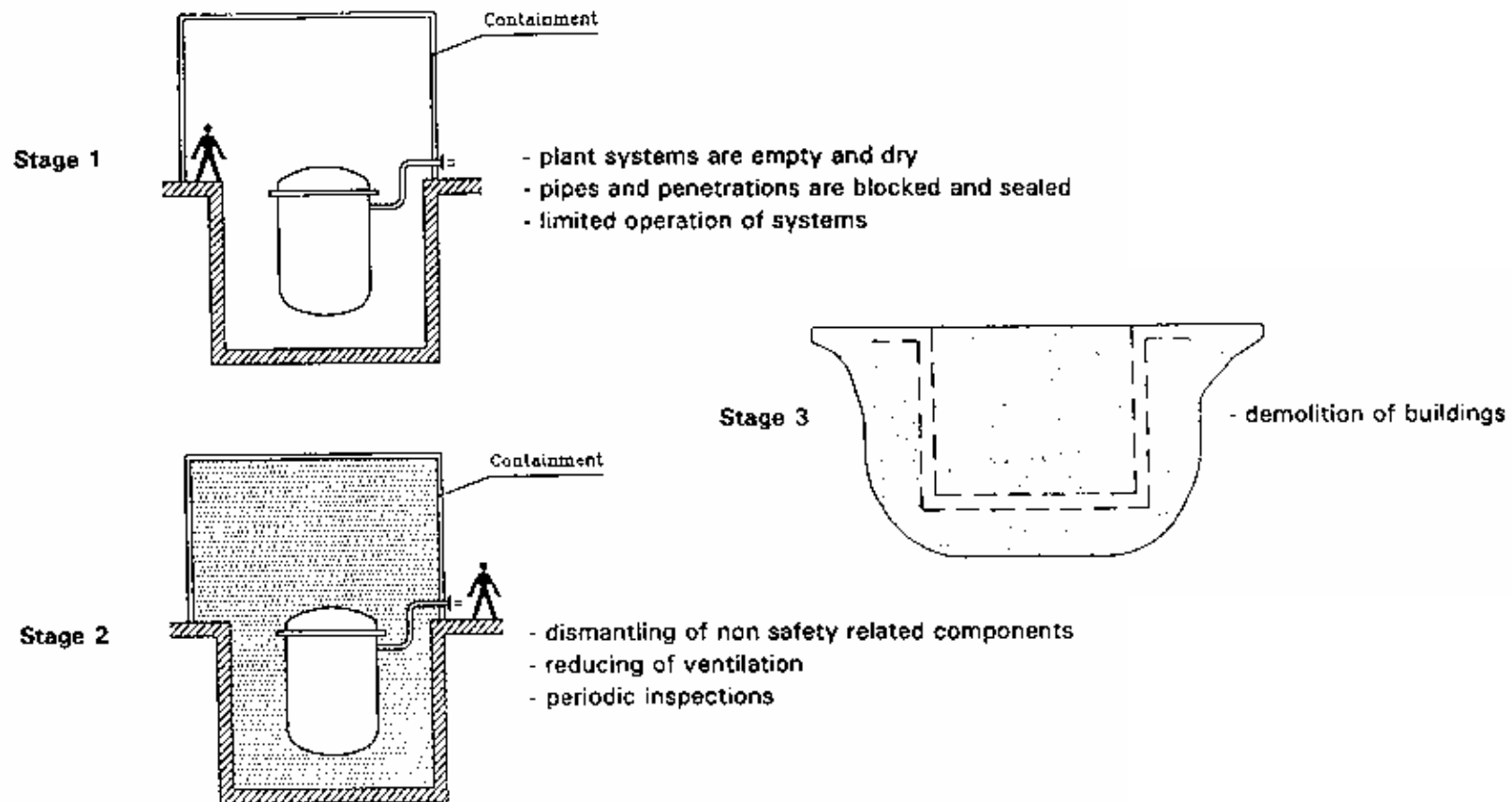
- 1) the physical state of the plant and its equipment
- 2) the surveillance, inspections and tests necessitated by that state.

The three stages define various levels of removal of radioactivity and plant inventory and the corresponding degree of surveillance, ending with Stage 3, at which all significant radioactivity has been removed, no further inspection is required and the site can be released for unrestricted re-use.

The IAEA does not specify any time limits for the duration of the stages, and "IAEA Stage 3" does not necessarily mean that a site is returned to a "green field" state.

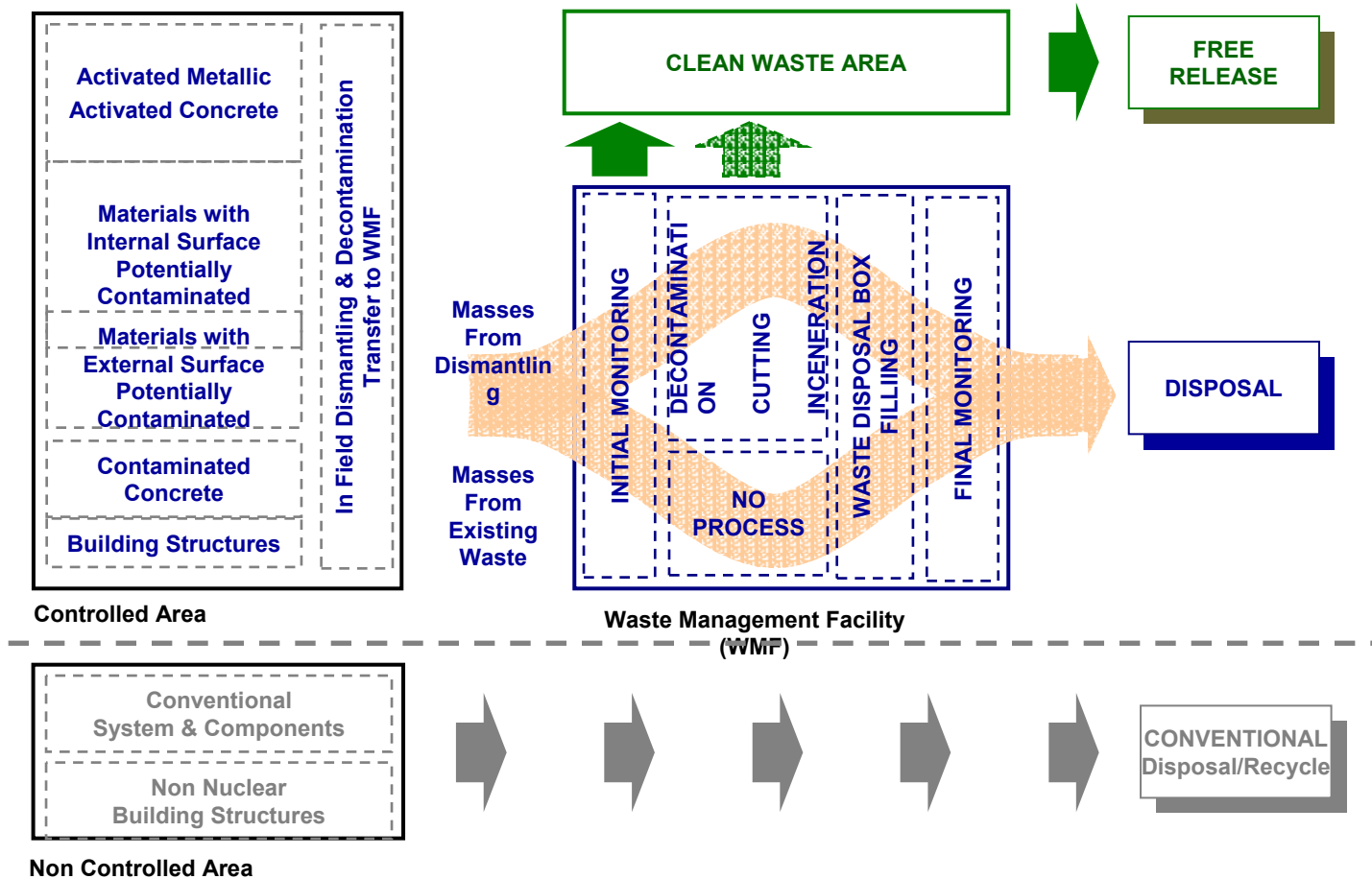


IAEA Decommissioning stages



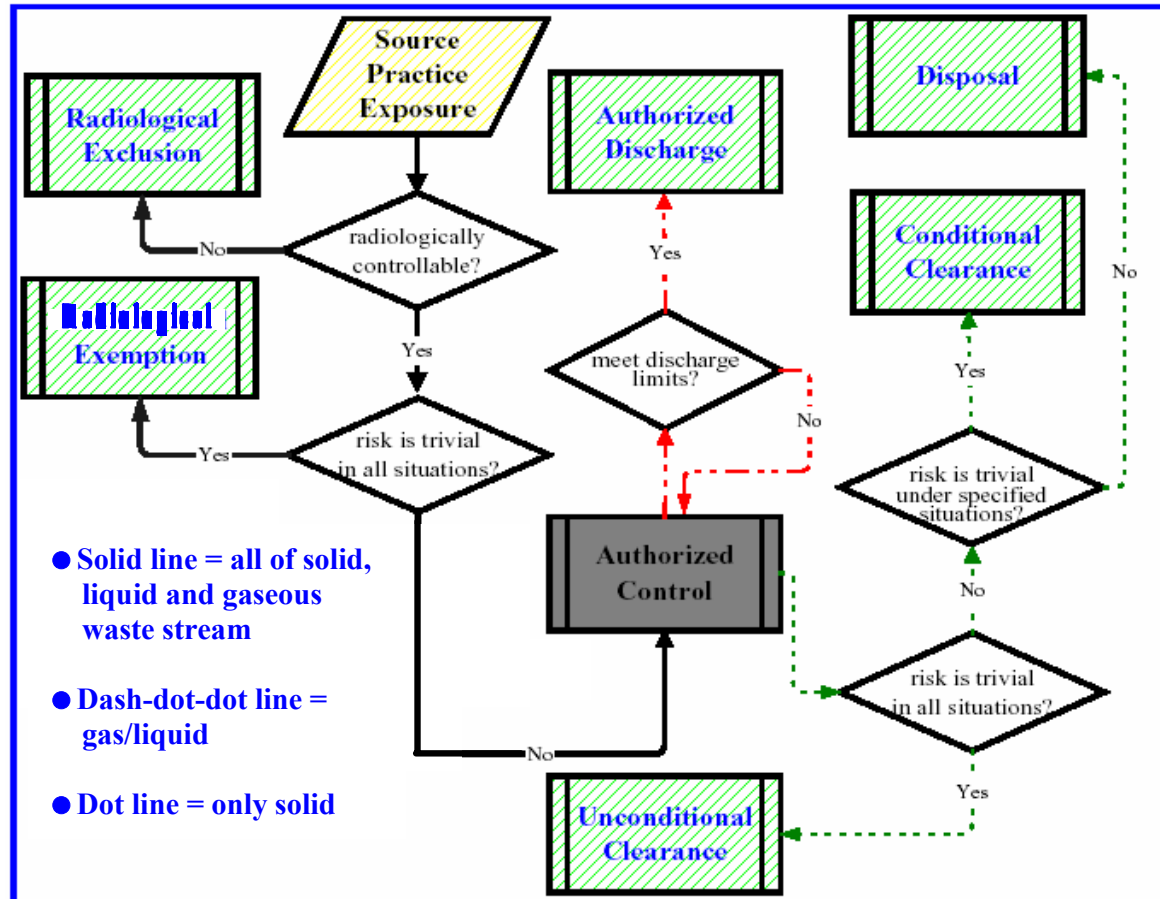


Material Flow – General scheme



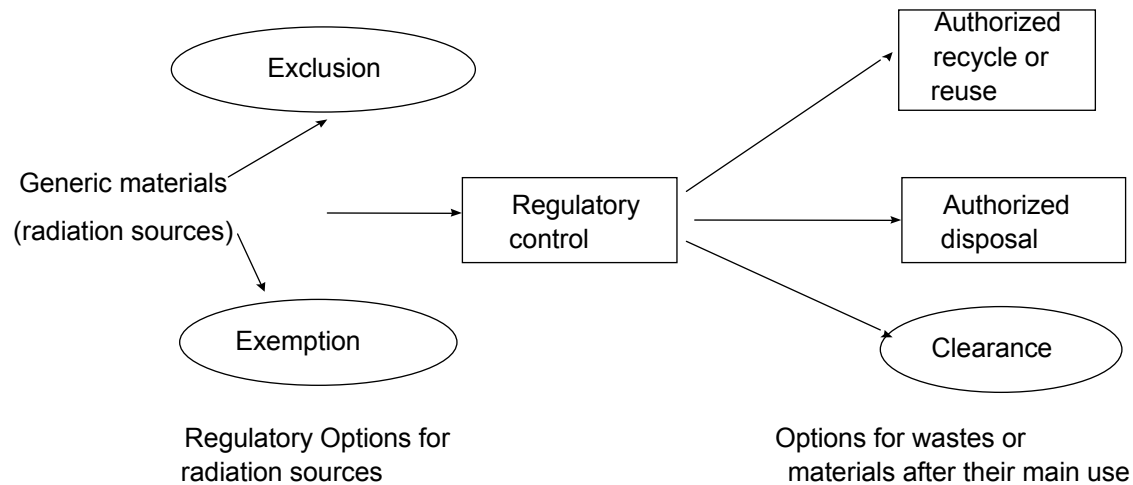


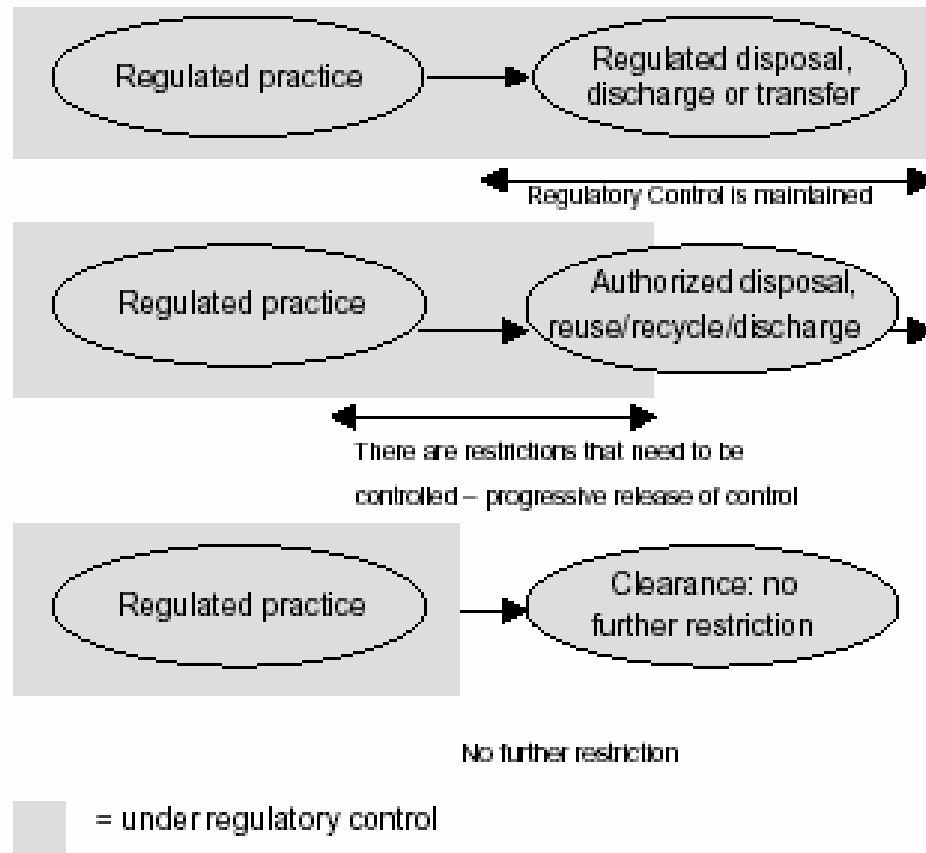
- **Exclusion**: not amenable to control (ex.: cosmic rays)
- **Exemption**: expected radiation exposure are
- **Clearance**: the source is released from regulatory system





Options for radiation source control







SAFETY Series n. 89 (1988): recommended policy and suggested first levels for exemption/clearance:

- Individual dose: 10 μ Sv/year
- Collective dose: 1 mS/year

Safety Series 111 – P1.1 (1992) : “Application of Exemption Principles to r Waste Management”: establishes the basic principles to the Recycle and reuse of materials”

Safety Series 111 – G1.5 (1995): “Clearance levels for radionuclides in solid materials”

TECDOC 855 (1996) “Clearance levels for radionuclides in solid materials”. While interim report, considered as a **REFERENCE**



Safety Series 115 –(1996) Basic Safety Standards: gives a list of nuclide specific exemption values

A new SAFETY Guide is being prepared (2002 or 2003): rationalisation of concepts and levels will be attempted



Radiation Protection 89 (1998): makes proposal for recycling and reuse metal scraps

Radiation Protection 114 –(1999) and Radiation Protection 113 –(2000) : definition of clearance levels for buildings and building rubble

Radiation Protection 122 –(2000) : rationalisation of concepts



Example of Specific Activity Limits for release in several countries

Contamination Limit	Country	Additional Information
0.10 Bq/g	Germany	---
0.10 Bq/g	Sweden	Over and above the content of natural activity that occurs in corresponding goods outside the nuclear installation (primarily for limiting the activity in materials that, having been melted down, can be re-used in new products)
0.40 Bq/g	UK	Total activity for solids, other than closed sources, that are substantially insoluble in water
0.40 Bq/ml	UK	Total activity for organic liquids that are radioactive solely because of the presence, either separately or simultaneously, of Carbon 14 and Tritium
1.00 Bq/g	Germany	Re-use of metal in a general melting facility
N/A	USA	The United States has not developed a volumetric release standard



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- **STATEMENT OF AN EU EXPERT MEMBER GROUP:**
 - **Concepts of exemption, conditional and unconditional clearance should be maintained, although a disparity may be perceived between the values**
 - **Industrial concrete is more and more recycled: release criteria should be pursued**
 - **Relationship between clearance levels and detection limits**
 - **Importance of cooperation and clarification in an international context**



Current IAEA Solid Radioactive Waste Classification System

Waste Classes	Typical Characteristics	Disposal Options
Exempted Waste (EW)	Activity levels at or below national clearance levels which are based on an annual dose to members of the public of <math><0.01\text{ mSv}</math>	No radiological restrictions
Low and Intermediate Level Waste (LILW) Short Lived waste (LILW-SL) Long Lived waste (LILW-LL)	Activity levels above clearance levels and thermal power below about 2 kw/m^3 Restricted long lived radionuclide concentrations (limitation of long lived alpha emitting radionuclides to 4000 Bq/g 4 GBq/te) in individual waste packages and to an overall average of 400 Bq/g (0.4 GBq/te) per waste package) Long lived radionuclide concentrations exceeding limitations for short lived waste	Near surface or geological disposal facility Geological disposal facility
High Level Waste (HLW)	Thermal power above about 2 kw/m^3 and long lived radionuclide concentrations exceeding limitations for short lived waste	Geological disposal facility



- Community Strategy for waste management. Outstanding points
 - **Proximity Principle**: case by case
 - **Self sufficiency** for disposal: solidarity approach
 - **Equivalence concept**: to be improved



DISPOSAL

- WS-R-1. (1999) : Near Surface Disposal of Radioactive Wastes
- WS-G-1.1 (1999): Safety Assessment for Near Surface Disposal of Radioactive Wastes
- Technical Report 355 (1993) : Containers for Packaging of solid Low and Intermediate level RW
- Technical Report 390 (1998): Interim Storage of RW packages
- TECDOC 1256 (2001) : Technical considerations in the design of near surface disposal facilities for RW

- NO EU specific requirements

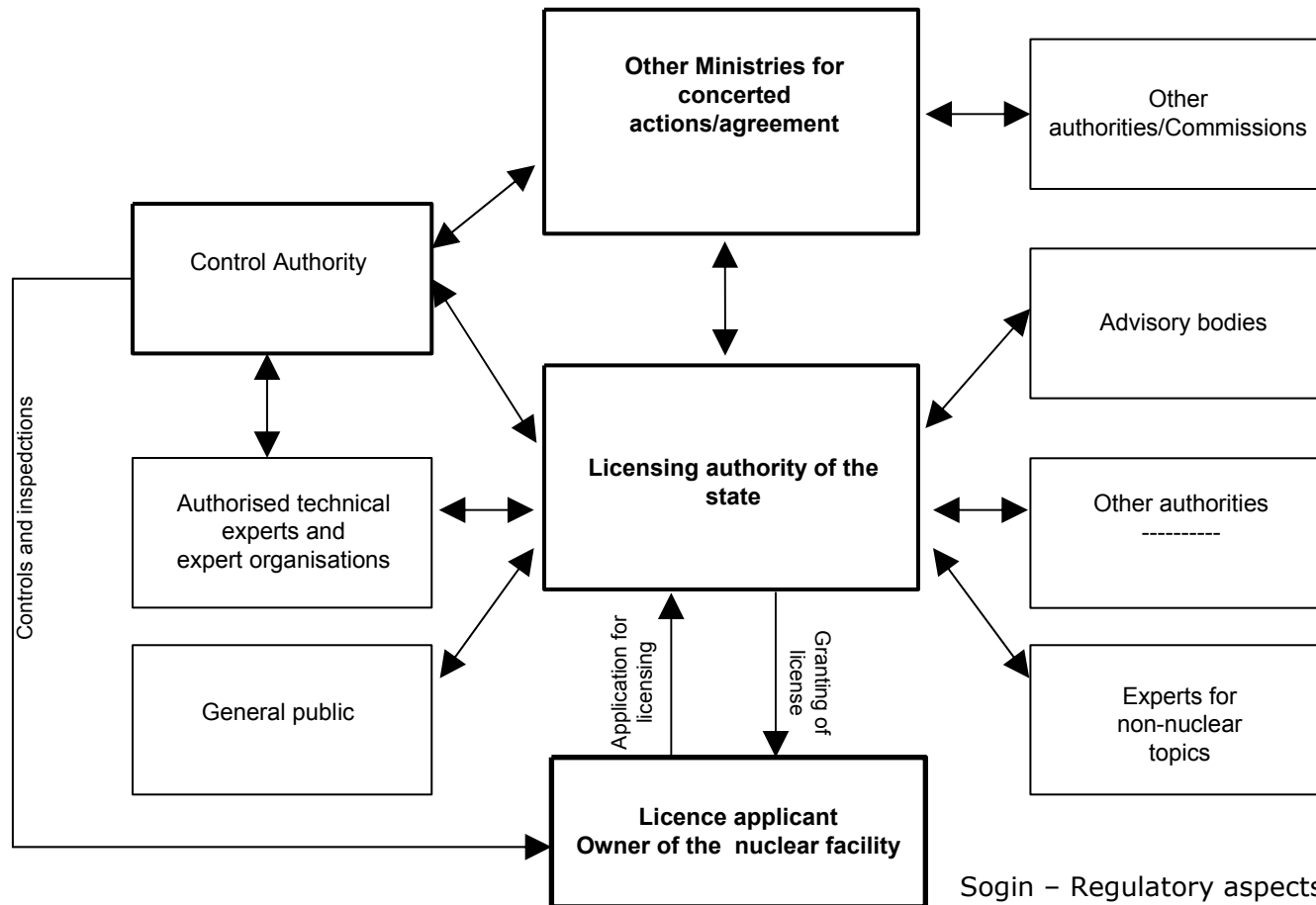


Most important documents/guidance dealing with QA Issues

Document	Title
IAEA TECDOC-680, Dec 1992	Quality assurance requirements and methods for high level waste packages acceptability
CEC, Report EUR 13069 EN, 1991	Quality assurance in the management of radioactive waste in the European Community
IAEA Technical Report Series N. 350, Jan. 1993	Improved cement solidification of low and intermediate level radioactive wastes
IAEA Technical Report Series N. 376, 1995	Quality assurance for Radioactive Waste Packages
IAEA Technical Report Series N. 399, 2000	Organisation and Management for Decommissioning of Large Nuclear facilities
IAEA TECDOC-1222, Jun 2001	Waste inventory record keeping systems (WIRKS) for the management and disposal of radioactive waste
IAEA Technical Report Series N. 355, 1993	Containers for packaging of Solid Low and Intermediate Radioactive Waste
IAEA Safety Guide N. WS-G-2.1, 1999	Decommissioning of Nuclear Power Plants and Research Reactors



Generic Decommissioning License scheme



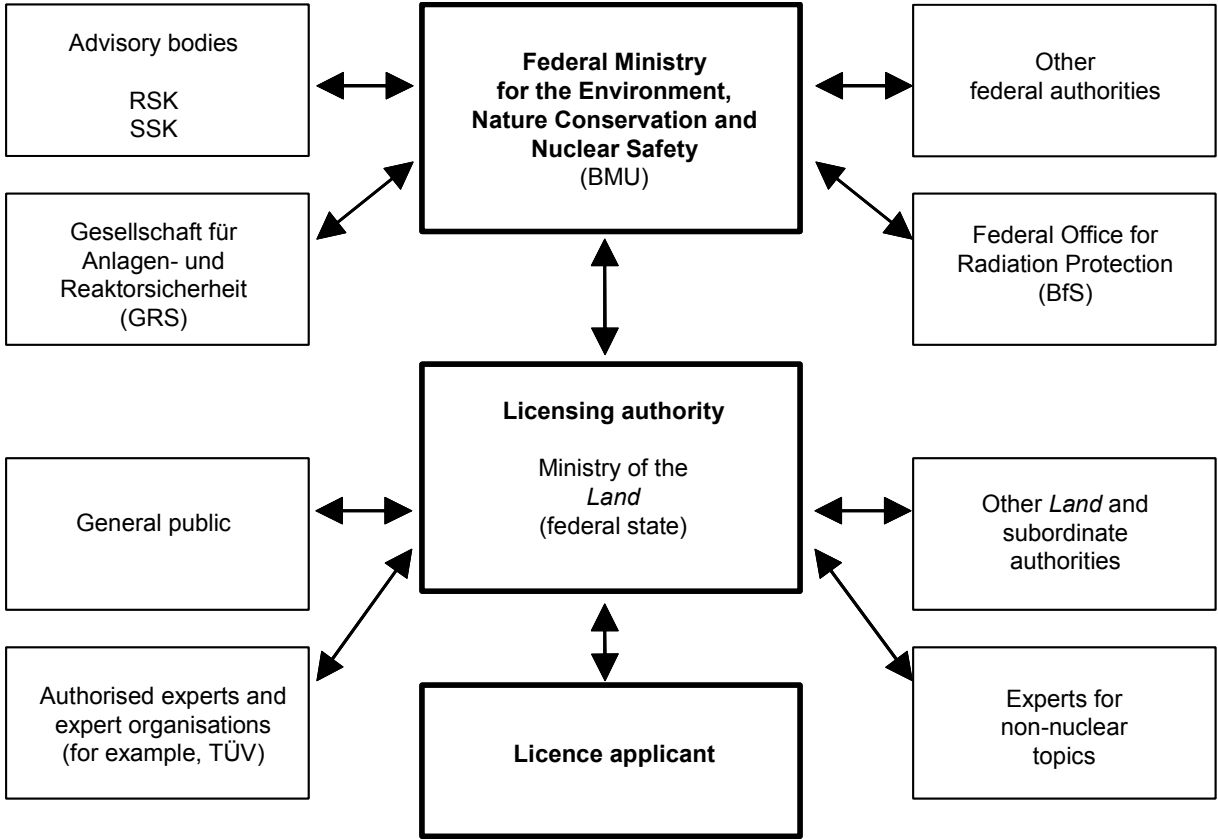
Licensing: 10 Golden Rules by EWN



1. Licensing strategy and projects should be discussed in advance with competent authority
2. Identification of relevant aspects, submit consistent and checkable documents
3. Clear identification of start and goal situation
4. Maximise exchange of information (papers sent in parallel to all involved players)
5. Agree time schedule in advance, if possible the Authority should bind its experts in checking documentation and make additional request
6. Organise, on regular basis, status discussion meeting
7. Technical discussion, on behalf of the authority, between applicant and experts
8. Reading of the expert opinion draft together
9. Authority has to well define relevant documents in the granted license
10. Early agreement on necessary details and integration of the required documents necessary for the fulfillment of additional requirements

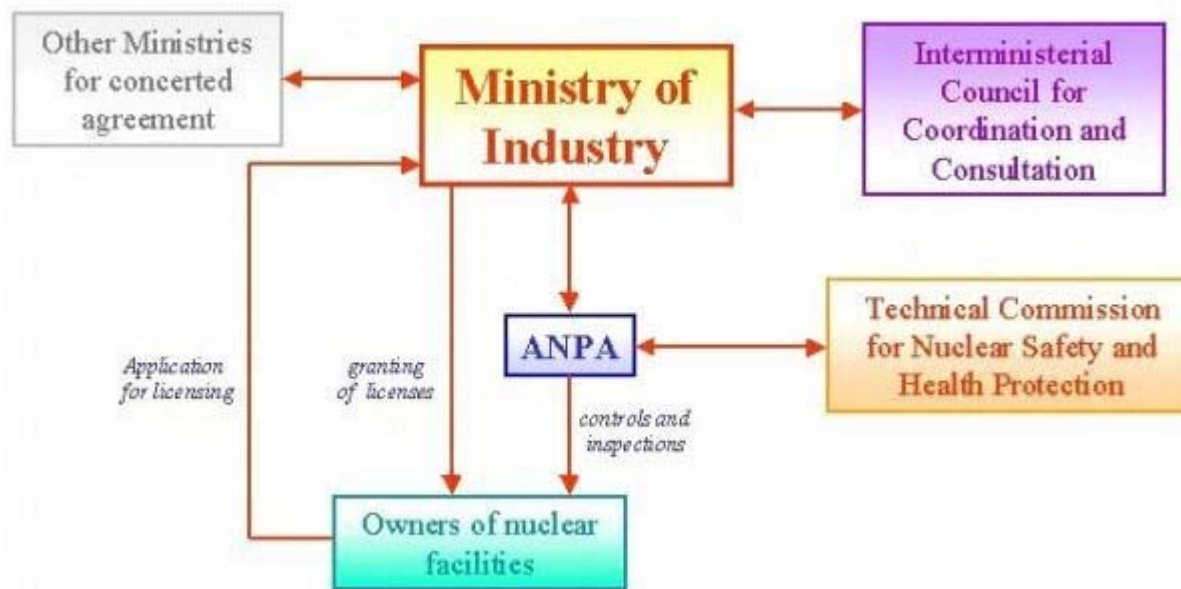


GERMAN Decommissioning License scheme



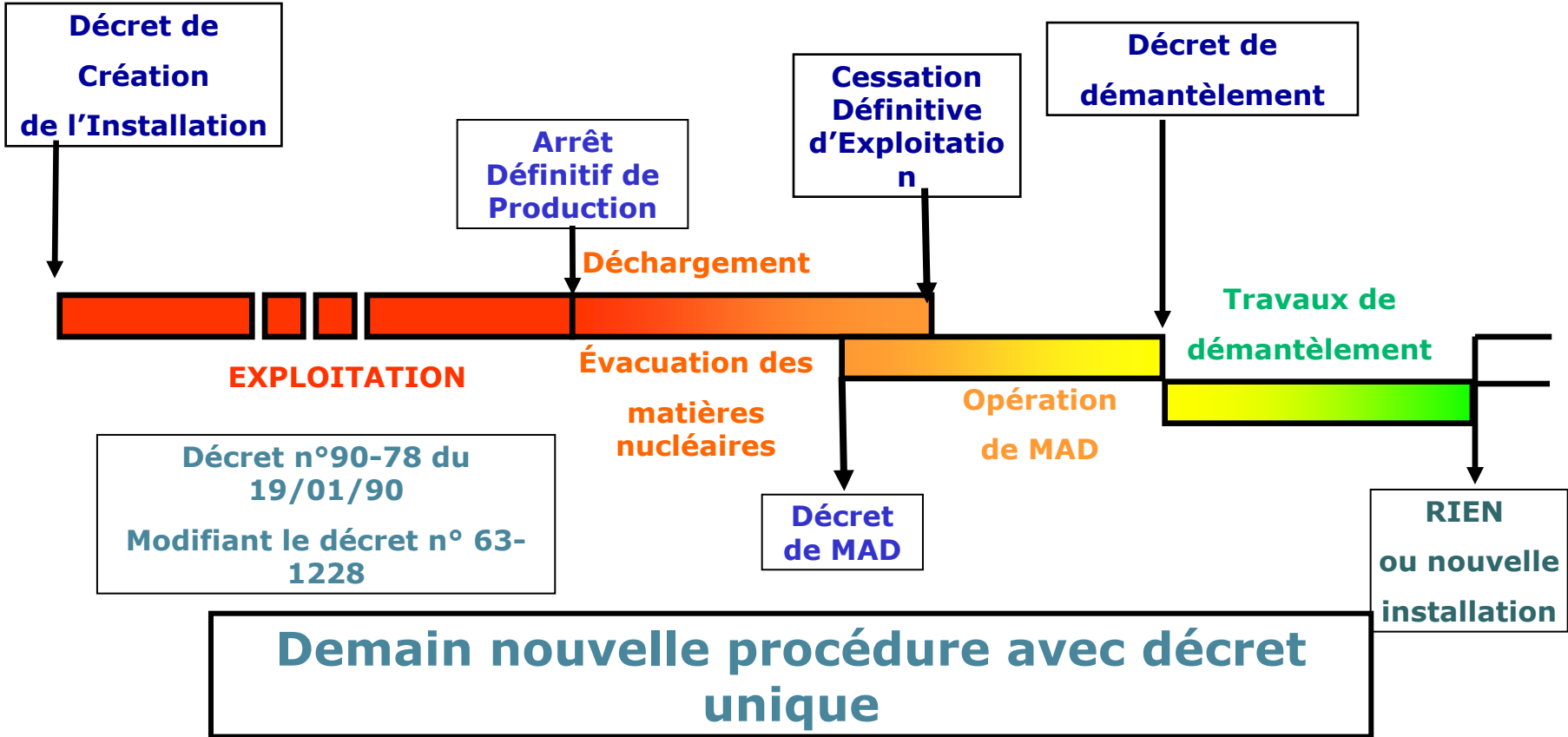


ITALIAN Simplified Decommissioning License scheme



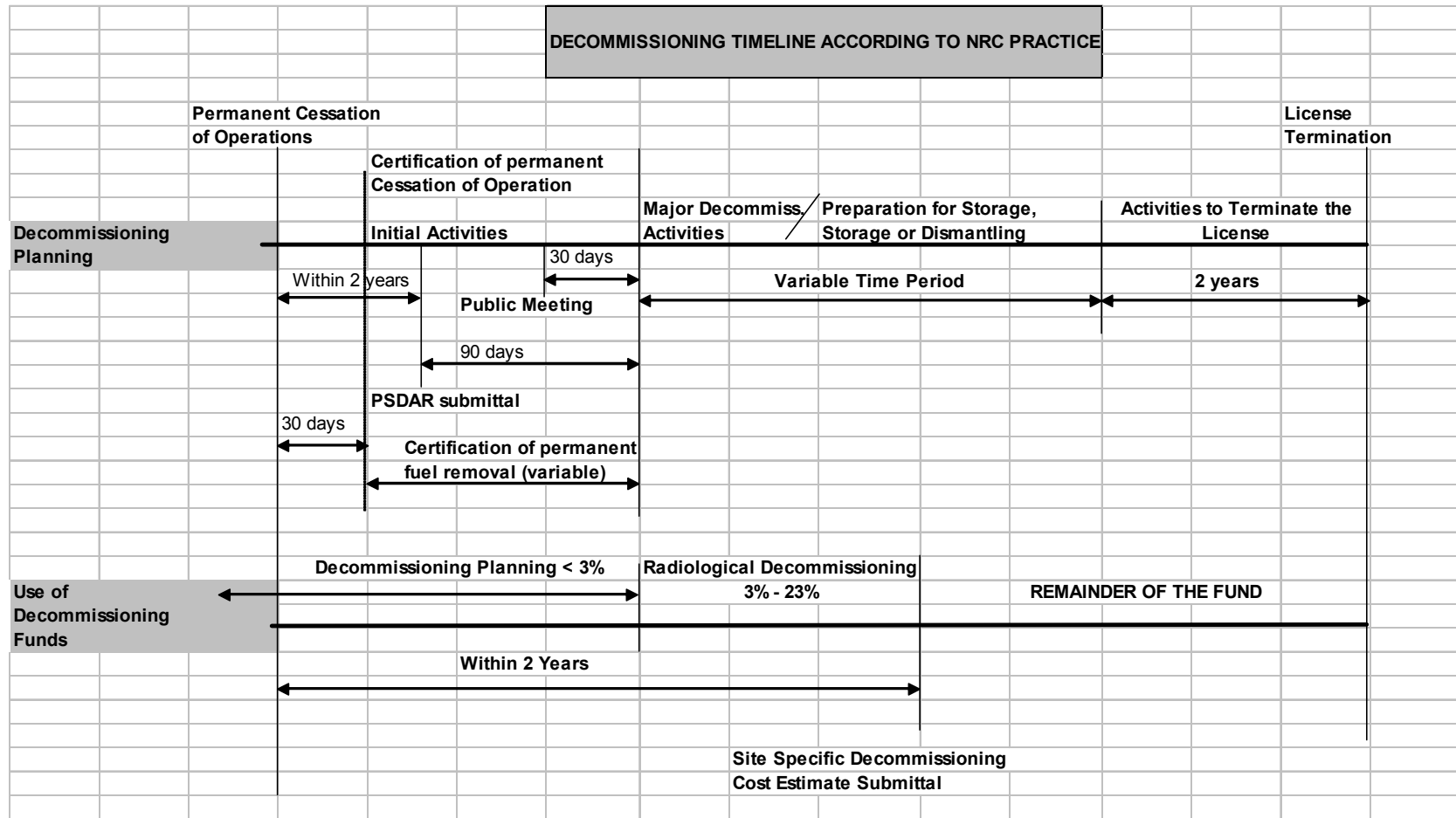


FRENCH Simplified Decommissioning License scheme





USA Decommissioning License scheme



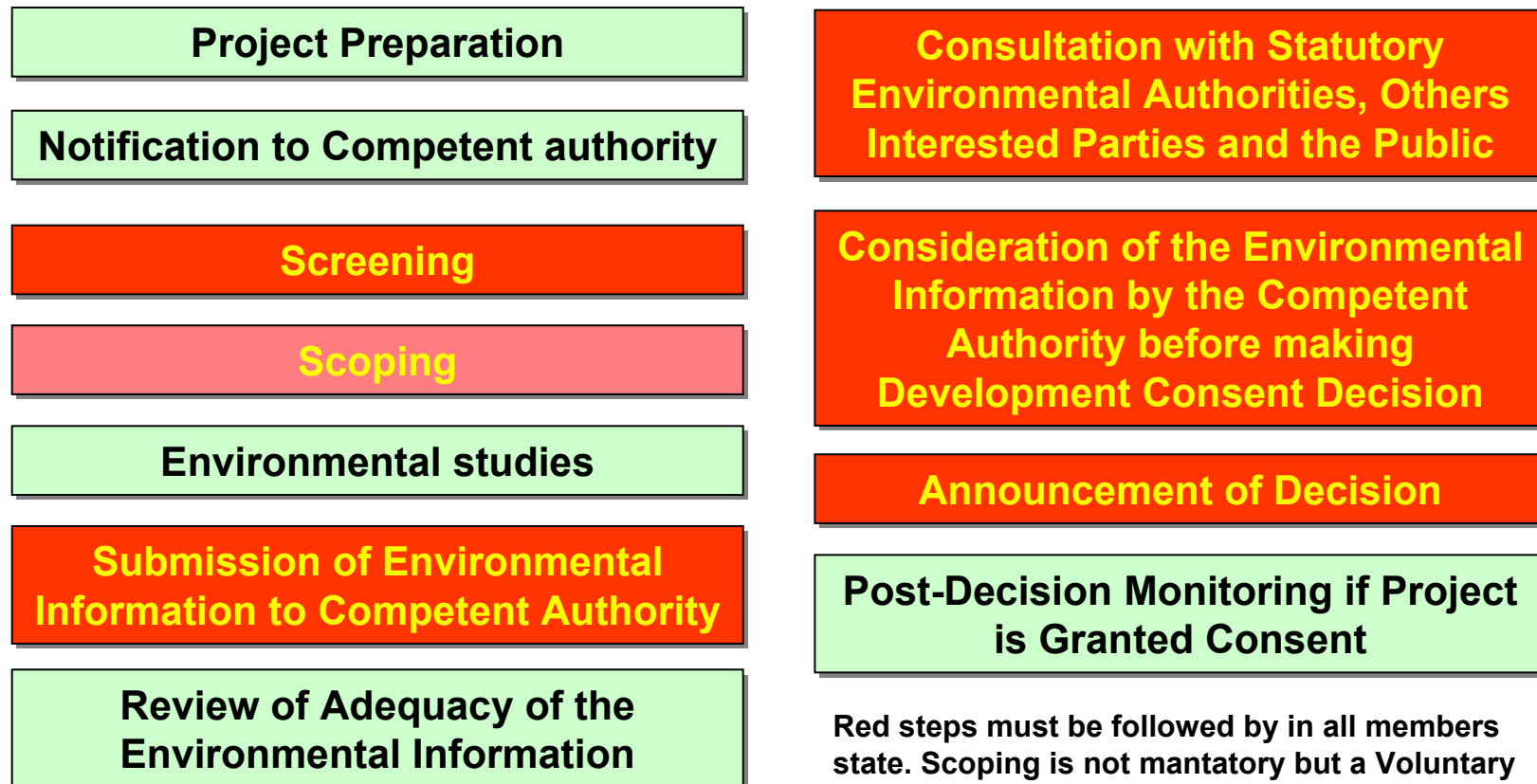


- Environmental and socio-economic aspects are formally included in the Environmental Impact Assessment (EIA)
- Requirements for EIA are set out in the Council Directive 97/11/EC amending the 85/337/EC:

“Nuclear Power stations and other nuclear reactors, including the dismantling or decommissioning....”



EIA KEY Stages



Red steps must be followed by in all members state. Scoping is not mandatory but a Voluntary procedure by which developers can request a Scoping Opinion has to be put in place



- EC (DG Environment) has provided specific guidance for the EIA process:
 - Guidance on **Screening** (June 2001)
 - Guidance on **Scoping** (June 2001)
 - EIA **review** check list (June 2001)
 - Guidelines on the assesement of **cumulative** impact and **interactions** (1999)



- Two different authorisation procedures, the first for the safety and radioprotection, the second for the EIA, should be adequately defined in order to avoid interferences and duplications.



- Other Regulatory items for EI:
 - UNECE Convention on Environmental Impact Assessment in a **Transboundary Context** - Espoo (1997)
 - UNECE Convention on Access to **Information, Public participation**.....in Environmental Matters - Aarhus (1998)



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- Regulators intend to establish specific rules in order to guarantee that sufficient resources are always available:
 - **Collecting** funds
 - **Managing** funds
 - (A specific EU Directive is being drafted)