Review of existing programmes requiring/requesting national SF/RW inventory reporting; requirements to reports; supporting documents

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Outline

- Overview of international considerations (IAEA, EC, NEA, S&T)
- Reporting requirements/requests
  - Joint Convention
  - EC Directive 2011/70 EURATOM;
  - NEA activities;
  - Status and Trends Project

Overview of international considerations (i)

IAEA

- Classification of Radioactive Waste, GSG-1 (IAEA, 2009);
- Classification of Radioactive Waste, SS 111-G-1.1 (IAEA, 1994);
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (IAEA, 1997);
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. Guidelines regarding the Form and Structure of National Reports (IAEA, 2012);
- Specific Safety Requirements SSR-5 “Disposal of radioactive waste” (IAEA, 2011);
- Guidance on Translation of Member State Waste Classes for Purposes of Reporting Waste Inventories to the Net-enabled Waste Management Data Base (IAEA, 2010 – *not published*) ;
- Application of the Concepts of Exclusion, Exemption and Clearance, RS-G-1.7 (IAEA, 2004).

Overview of international considerations (i)

EC

- Council Directive 2011/70/EURATOM establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste (EC, 2011);
- Final Guidelines for MS Reports to the Waste Directive HLG_p(2014-27)_137 (ENSREG, 2014);

OECD NEA

- Nuclear Energy Data (Brown book) is the OECD NEA annual compilation of statistics and country reports documenting nuclear power status.
- The national reports/profiles on the RWMC web-page.

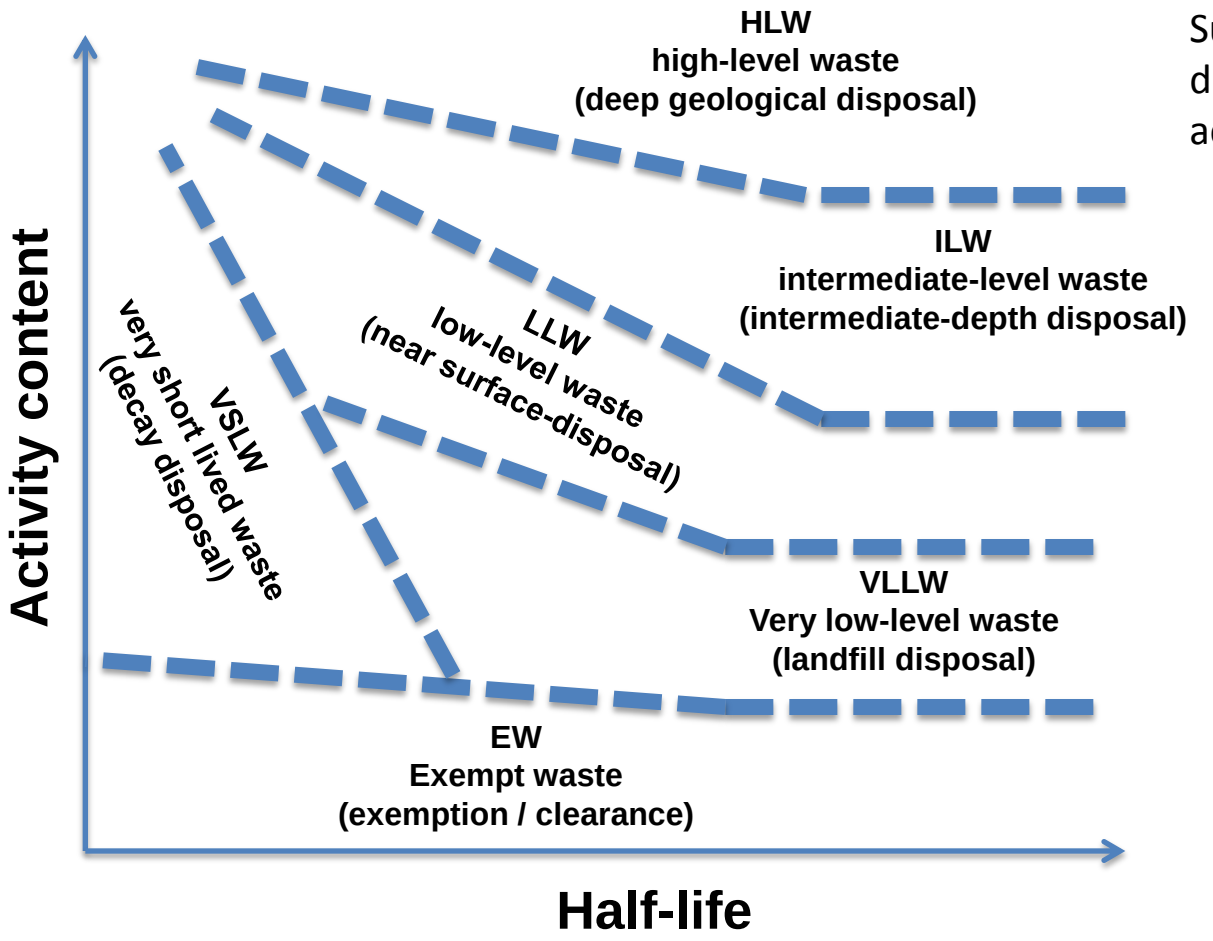
The Status and Trends Project (IAEA, EC and NEA)

GSG-1 RW classification (boundaries)

- EW - VLLW - values of clearance, exemption and exclusion criteria for individual radionuclides ("Application of the Concepts of exclusion, Exemption and Clearance, IAEA Safety Standard Series No. RS-G-1.7") (parameter - effective dose to individuals in a year (≤10μSv) for artificial radionuclides and natural concentration of natural radionuclides).
- VLLW - LLW - 1-2 orders of magnitude above the EL (for SL-RW + limited total activity). The border SL-RW – LL-RW is $T_{1/2}$=30 years.
- LLW - ILW - 400Bq/g (4000Bq/g in ind. Pack.) for LL α – nuclides and up to tens of KBq/g for LL γ,β-nuclides + 2mSv/h of contact dose rate.
- ILW - HLW - heat emission 2-20kW/m^3 (total activity – 10^4-10^6TBq/m^3 – 10^9-10^{11}Bq/g approx.)

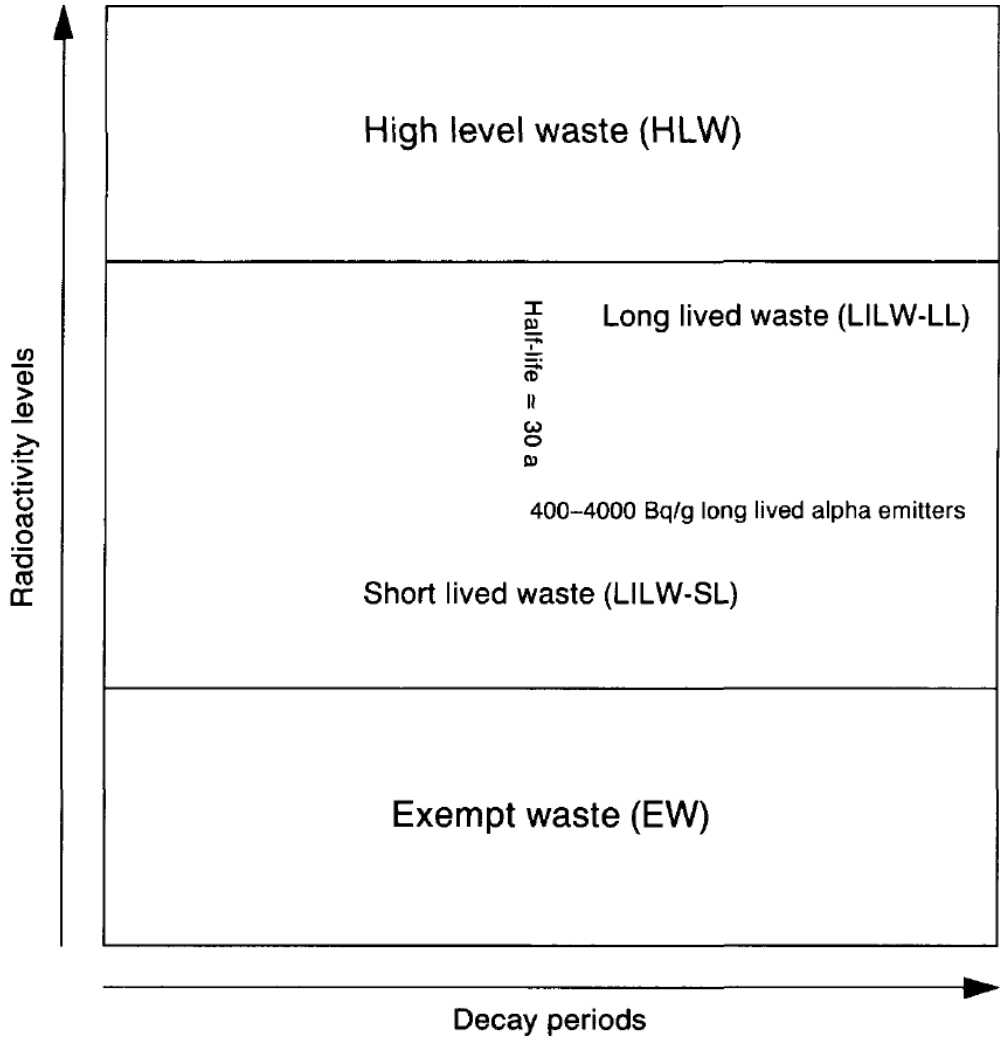
Types of Radioactive Waste

IAEA Classification of RW– GSG-1



Suitability of the RW class for disposal in facilities arranged according to depth.

SS 111-G-1.1 (IAEA, 1994)



HLW

LILW

EW

IAEA standard – SSR-5/GSG-1

GSG-1 - Classification of Radioactive Waste (General Safety Guide, IAEA)
SSR-5 - Disposal of Radioactive Waste (Specific Safety Requirements, IAEA)

GSG-1 RW class	GSG-1 disposal route	SSR-5 disposal route
EW	-	-
VSLW	Decay storage	-
VLLW	Landfill disposal	Specific landfill disposal
LLW	Near surface disposal	Near surface disposal
ILW	Intermediate level disposal	Different underground facilities
HLW	Deep geological disposal	Deep geological disposal
		Borehole disposal

SSR-5 + Disposal of mining and mineral processing waste: Disposal usually on or near the ground surface, but the manner and the large volumes in which the waste arises, its physicochemical form and its content of long lived radionuclides of natural origin distinguish it from other radioactive waste. The waste is generally stabilized in situ and covered with various layers of rock and soil.

NEWMDB - IAEA Net-Enabled Waste Management Data Base (I)

"Guidance on Translation of Member State Waste Classes for purposes of Reporting Waste Inventories to the NEWMDB" (Working Material, version 0.1, 12 Aug. 2010 – not published).

- EW and VSLW not considered;
- four cases of transposition of national RW classification into IAEA's one:
  - a) national classification fully follows to IAEA's GSG-1 (Australia, Italy);
  - b) when national classification follows to IAEA's Safety Series No. 111- G-1.1 (Czech Republic, Hungary – particularly, Norway);
  - c) when national classification is different of IAEA's ones;
  - d) when there is no national RW classification.

NEWMDB (II)

2nd case - the matrix of transposition based on application of WAC (if exist) or on assessment of specific activities of individual radionuclides and compare with EL (to distinguish VLLW and LLW).

New NEWMDB Waste Class	Previous NEWMDB Waste Class		
	LILW-SL	LILW-LL	HLW
VLLW	*X* %	0 %	0%
LLW	(100- *X*) %	0 %	0%
ILW	0 %	100 %	0%
HLW	0 %	0 %	100%

Not easy to apply to big volumes of LILW-SL to extract the VLLW class.

NEWMDB (III)

3rd case - the application of WAC is recommended. If there is no WAC - analysis all available information about RW, to use the table of class boundaries (below) and to assess the specific activities of nuclides. Then on the base of this assessment and using the table it's proposed to converse national classes into international.

4th case – no transfer.

Shortcomings:

- Need to review all RW inventory data and to assess the values and attributes of RW. Serious efforts when RW stored in different places/packages of huge volume.
- NEWMDB methodology proposes to use this factor and also to apply criteria from SS-111-G-1.1 (removed from GSG-1).

NEWMDB Waste Class	Minimum Disposal Option[5]	Suggested[6] Waste Class Boundary Conditions for NEWMDB Reporting	
		Lower limit	Upper limit
HLW	Geologic repository	10^8 Bq/g total activity ; heat generation of 2 kW/m^3 (See footnote [7])	
ILW	Intermediate depth repository	Long-lived alpha emitters 4,000 Bq/g (maximum single package) or 400 Bq/g average over packages (See footnote [8])	10^8 – 10^9 Bq/g total activity; heat generation of 2 kW/m^3
LLW	Near-surface	~100 times the BSS exemption levels. [For waste not containing alpha activity a limit of 100 Bq/g average activity may be used] (See footnote [9])	Long-lived alpha emitters 4,000 Bq/g (maximum single package) or 400 Bq/g average over packages
VLLW	Landfill		100 Bq/g total activity (See footnote [3])[9]

Joint Convention (INCRC/546 24 December 1997) (i)

- "Each Contracting Party shall in due course take the appropriate steps to review:

(ii) the results of past practices in order to determine whether any intervention is needed for…." *Article 12.*

- "For each Contracting Party the report shall also address its:

(i) SF management policy;
(ii) SF management practices;
(iii) radioactive waste management policy;
(iv) radioactive waste management practices;
(v) criteria used to define and categorize radioactive waste .

Joint Convention (INCRC/546 24 December 1997) (ii)

- "This report shall also include:

(ii) an inventory of **SF** that is subject to this Convention and that is being held in storage and of that which has been disposed of. This inventory shall contain a description of the material and, if available, give information on its mass and its total activity;

(iv) an inventory of **RW** that is subject to this Convention that:
(a) is being held in storage at radioactive waste management and nuclear fuel cycle facilities;
(b) has been disposed of; or
(c) has resulted from past practices."
"This inventory shall contain a description of the material and other appropriate information available, such as volume or mass, activity and specific radionuclides"

INFCIRC/604/Rev.2 (07 Sept 2012) (i)

Guidelines regarding the Form and Structure of National Reports

- "each Contracting Party may submit a report with the form, length and structure it believes necessary in order to describe the measures taken to implement its obligations under the Convention;" - *II. General.3.(a).*
- "the need for effective and efficient review makes it desirable that reports be in as similar a format as possible, to aid comparison;" - *II. General.3.(b).*
- "Contracting Parties are encouraged to report in Système International (SI) units."- *II. General.10.*
- "It (report) should include a statement outlining the national policy for SF management and a description of national practices pertaining to SF management, together with a statement outlining the national policy for RW management and a description of national practices pertaining to RW management. It should also specify the criteria used to define and categorize RW." – *Section B, 17. Policies and Practices*

INFCIRC/604/Rev.2 (07 Sept 2012) (ii)

- "In this section, the position of the Contracting Party as regards the following matters should be stated clearly:

(a) whether the Contracting Party has declared reprocessing to be part of SF management, pursuant to Article 3(1);

(b) whether any waste that contains only naturally occurring radioactive material and does not originate from the nuclear fuel cycle has been declared as RW for the purposes of the Convention, pursuant to Article 3(2), and, if so, where this RW appears in the inventory; and

(c) whether any spent fuel or RW within military or defence programmes has been declared as SF or RW for the purposes of the Convention, pursuant to Article 3(3)." *Section C. 19.*

INFCIRC/604/Rev.2 (07 Sept 2012) (iii)

- "Contracting Parties are encouraged to use clearly defined waste categories when reporting inventories" - *Section D, 21*
- "Contracting Parties are encouraged to report here on their experiences concerning transboundary movements." *Section I. Transboundary Movement 31*
- "- national strategy for the management of disused sealed sources,…" *Section J. 33*

EC approach

- Recommendations to the form and content of national report under the Council Directive 2011/70/EURATOM are given in supporting guidelines [HLG_p(2014-27)_137] “The inventory of RW should be reported according to the RW classification system presented in Appendix 2 (GSG-1), National classification system, used in the national programmes, should not be used for the purposes of reporting under Article 14 of the Waste Directive, if different from the system specified in Appendix 2”.
- Appendix 2 gives the RW classification and method how to transpose previous international classification (equivalent EC Recommendation 1999 categories – the same as 111-G-1.1 IAEA).
- Now, the ENSREG WG2 is working on the revision of the guidelines based on experience and feedbacks after the first round of reporting.

Council Directive 2011/70/EURATOM of 19 July 2011

Article 14. Reporting

1. Member States shall submit a report to the Commission on the implementation of this Directive for the first time by 23 August 2015, and every 3 years thereafter, taking advantage of the review and reporting under the Joint Convention.

2. On the basis of the Member States' reports, the Commission shall submit to the European Parliament and the Council the following:

(a) a report on progress made with the implementation of this Directive; and

(b) an inventory of RW and SF present in the Community's territory and the future prospects.

HLG_p(2014-27)_137. C (i)

Final Guidelines for MS Reports to the Waste Directive

- 28. In order for the Commission to deliver consistent information about the inventory of RW and SF to the Council and European Parliament, Member States are recommended to utilize a unified radioactive waste classification system in their National Reports. –

- **Note**: It is suggested that for the purposes of clarity that Member States provide the Commission with information on how they have translated their national classification systems into the unified system. It should be noted that for the purposes of notifying the national programme, Member States should use their national classification systems".

HLG_p(2014-27)_137. C (ii)

- "Therefore, it will be necessary to focus the inventory reporting on the main waste categories in direct relationship with long-term management by or towards disposal, and to clearly indicate in the inventory reporting the relationship between the main waste categories and the disposal routes.
- Inventory reporting by MS should also be based on common rules such as units and reference dates, in order to obtain homogeneous and easily comparable and interpretable information".
- In the reporting on the RW and SF inventory MS should clearly indicate for each of the main waste categories the considered, planned or operational disposal routes".

HLG_p(2014-27)_137. C (iii)

- In the inventory reporting a distinction should be made between current inventories of radioactive waste and spent fuel and future prospects.
- "Member States have also national policy and management flexibility in terms of separate disposal facilities for each waste category or combined disposal facilities for more than one waste category. A MS might plan to develop one single disposal facility for all its RW. If RW from two or more waste categories is (or is planned to be) co-disposed in one disposal system, this should be indicated in the reporting either by providing a waste volume for the two or more combined categories (e.g. LLW + ILW or ILW + HLW) linked to one disposal system or by providing waste volume estimations for each of the waste categories that are or will be routed to the same disposal system".

HLG_p(2014-27)_137. C (iv)

- **RW** volumes (m^3) by category disposed of in (an) operational or closed disposal facility(y)(ies). For operational disposal facilities the existing total capacity (m^3) should also be given
- MS which have exported waste for disposal should indicate the quantities concerned (volumes in m^3 by category) and countries of destination, and refer to the export agreement(s)
- Waste volumes (m^3) of conditioned waste by category stored in storage facilities. For unconditioned waste in storage, if possible, some indication of the final conditioned volume should be provided.
- This should include waste currently stored abroad, subject to return, e.g. HLW from reprocessing.
- MS holding foreign waste for return should indicate quantities and destinations (EU or non-EU countries)".

HLG_p(2014-27)_137. C (v)

- Quantities of **SF** disposed of (tHM), number of assemblies and type - BWR, PWR, CANDU, MOX, spent fuel from research reactor, …
- If shipped to another MS or outside EU for disposal (or reprocessing without return of waste): quantities in tHM, number of assemblies and type, countr(y)(ies) of destination, and reference to the export agreement(s)
- Quantities of SF in storage (tHM), number of assemblies and type (BWR, PWR, CANDU, MOX, spent fuel from research reactor, by store type (dry cask, vault, pond) and locations (number of locations could be acceptable if this is seen as sensitive)
- For SF from research reactors, the quantities of fuel subject to a "return" agreement should be indicated
- MS should indicate separately the quantities and location of SF stored abroad awaiting reprocessing. Correspondingly MS holding foreign SF should indicate the quantities stored from EU and non-EU countries."

SF/RW inventory/management strategy reporting

Different requirements to RW inventory reporting:

- **EC** – GSG-1 terms (transfer is recommended) vs **JC** – national classifications (transfer is not required);
- RW **EC** – in [m^3] vs **JC** – [m^3] or [t]; [Bq];[nuclides]
- SF **EC** – [tHM]; [N ass]; [type of reactor] vs **JC** [tHM]; [Bq]
- RW – disposed/stored to be reported to both
- RW – **EC** –conditioned form vs **JC** – not specified
- DSRS – **EC** – not considered vs **JC** - considered

Strategy:

- **EC** – inventory in connection to disposal rout vs **JC** – strategy to be reported (separately);
- International SF/RW management – to be reported for both;

Forecast:

- **EC** – to be reported vs **JC** – not required

NEA activities

Brown book

- Information provided by member country governments includes statistics on SF storage capacity [tHM], SF arising and accumulation [tHM], as well as projected values to 2035 (2020/2025/2030), where available;
- SF:
  - Storage capacity according to reactor type (till 2035);
  - SF amount arising and in storage (till 2035);
- RW:
  - Some countries provide RW volumes (country reports);
  - National management strategies.

NEA activities

National profiles/reports (RWMC) no requirements:

WR and SF management strategies and current practices:

- waste classification,
- RW and SF quantities and sources (decommissioning RW should be taken in account as far as possible) – RW [m3], SF [tHM]
- RW and SF management strategies,
- overview of main RW and SF issues,
- overview of R&D programs,
- overview of financing of RW/SF management.

Overview of international considerations

Status and Trends Project (IAEA, EC and NEA)

SF:

– [tHM];

- Management strategy (reprocessing / abroad);
- Storage (facility type);
- Disposal (future);
- Forecast;

RW:

- [m^3]; “as disposed” – appreciated;
- Transfer to GSG-1 system;
- Disposed/to be disposed;
- Storage (facility type/used/ remaining capacity);
- Disposal route;
- Origin;
- Forecast.

Thank you for your attention!