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Inventory of radioactive waste and spent fuel present in the Community's territory and the future prospects

Accompanying the document

REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

on progress of implementation of Council Directive 2011/70/EURATOM and an inventory of radioactive waste and spent fuel present in the Community's territory and the future prospects

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List of abbreviations

DSRS	Disused sealed radioactive sources
EU	European Union
HLW	High Level Waste
IAEA	International Atomic Energy Agency
ILW	Intermediate Level Waste
LLW	Low Level Waste
NORM	Naturally Occurring Radioactive Material
OECD-NEA	Nuclear Energy Agency of Organisation for Economic Co-operation and Development
RAW	Radioactive waste
SF	Spent fuel
tHM	Tons of heavy metal
VLLW	Very Low Level Waste
VSLW	Very Short Lived waste

1. Introduction

Radioactive waste is generated in all Member States of the European Union even though the quantities are very small in non-nuclear power Member States compared to those Member States operating nuclear power plants.

Nuclear power plants are the main producers of spent fuel although small quantities of spent fuel are also generated during the operation of research, training and demonstration reactors.

According to the Council Directive 2011/70/EURATOM[1] establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste (further "Directive") Member States have to provide for appropriate national arrangements for a high level of safety of spent fuel and radioactive waste management, including the establishment, implementation and updating of national programmes for the management of such material. Member States have to communicate such national programmes and the national reports on the implementation of the Directive (including the national inventories in line with Article 12(1)c of the Directive) to the Commission in line with Article 13(1) and 14(1) of the Directive.

This document gives an overview of spent fuel and radioactive waste inventory in the European Union and the future prospects, as required by Article 14(2)b of the Directive. It contains background information to the inventory data presented in the Report from the Commission to the Council and the European Parliament on progress of implementation of Council Directive 2011/70/EURATOM and an inventory of radioactive waste and spent fuel present in the Community's territory and future prospects (COM(2017)236).

Previously the European Commission (further "Commission") published a series of "Situation Reports"[2] which were developed in order to analyse and inform stakeholders about the situation of spent fuel and radioactive waste management in the European Union. Data from the 6th Situation Report[3] and 7th Situation Report[4] have been used here for comparison and identification of trends in the evolution of the European Union inventory.

Information about the Member States' installations generating radioactive waste and spent fuel, policies, strategies, concepts, plans and financing mechanisms is summarised in the Staff Working Document COM(2017)159 on progress of implementation of Council Directive 2011/70/EURATOM and an inventory of radioactive waste and spent fuel present in the Community`s territory and future prospects.

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1 Council Directive 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste; OJ L 199/48, 2.8.2011.

2 The last one of the series was "Commission staff working paper, Seventh situation report, radioactive waste and spent fuel management in the European Union; SEC(2011) 1007 final, 22.8.2011".

3 Report from the Commission to the European Parliament and the Council, Sixth situation report on radioactive waste and spent fuel management in the European Union; COM(2008)542 final, 8.9. 2008 and accompanying document SEC(2008)2416 final/2, 16.7.2010.

4 Commission staff working paper, Seventh situation report, radioactive waste and spent fuel management in the European Union; SEC(2011) 1007 final, 22.8.2011.

2. Sources of information

The European Union spent fuel and radioactive waste inventory data presented in this document is based on the **national programmes** and **national reports** submitted by Member States to the Commission. Although the data from individual Member States have different reference dates ranging from end of 2013 to 2016, most of the Member States have chosen the **end of 2013 as a reference date**[5].

The summaries presented in this document have been verified by the respective Member States, with one exception.

For the trend analysis additional documents containing historical inventory data have been used. Most of the data for 2004, 2007 and 2010 inventories have been taken from the **Sixth and Seventh Situation Reports, as well as unpublished inventory data reported to the Commission by the Member States in 2010**.

In order to perform trend analysis for the European Union inventory of spent fuel and radioactive waste, missing and inconsistent data from the above-mentioned sources were reviewed and updated by using various sources, such as national inventory reports published by competent authorities, and national Joint Convention[6] reports. Any updates to data for 2004, 2007 and 2010 are identified in the tables in the Annex. The collected inventory data also appeared to be consistent with the IAEA inventory data.

In preparation of this report, the following main **sources of uncertainty** have been identified:

- Member States report radioactive waste data using their **national classification schemes**. Therefore, conversion to a common reporting basis (IAEA GSG-1 classification[7]; see Chapter 4 below) introduces uncertainties, as the radioactive waste classes in different national classification schemes often cannot be directly matched, and the transformation is carried out on a "best approximation" basis.
- Member States use **different units** (volume, mass, etc.). With some exceptions, volumes of radioactive waste are reported. Where this is not the case, conversion from mass to volume without detailed knowledge of radioactive waste treatment/conditioning methods used can result in significant uncertainty.

  This includes different ways to reporting disused sealed radioactive sources. Especially in countries with large nuclear programmes, the disused sealed radioactive sources are generally integrated into other large radioactive waste streams and are not reported separately. In other countries, especially where the disused sealed radioactive sources are a significant part of the national inventory, they are reported separately from the other radioactive waste and radioactive waste classes, and in general are reported as number of sources.

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5 Article 14(1) of the Directive states "...taking advantage of the review and reporting under the Joint Convention." In the last Joint Convention reporting cycle (5th Joint Convention meeting in May 2015) the Member States used 2013 as a reference date.

6 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, INFCIRC/546, 24.12.1997.

7 Classification of Radioactive Waste. IAEA Safety Standards No. GSG-1, 2009, Vienna.

- Member States used different approaches to report volume of radioactive waste – **some reported volumes as stored, while others reported volumes as ready for disposal.**

  When inventory is reported "as disposed" volumes – it is used for integration of the national reporting into the overall European Union inventory, since this represents the final step in management of radioactive waste.

  Interpretation of volume "as stored" in some cases can lead to significant uncertainties, especially when estimating the need for disposal capacities. One example is the usually very large volume of liquid radioactive waste and sludge in storage. After treatment and conditioning for disposal this volume may be significantly reduced. The same is true for combustible and compactible radioactive waste.

  To achieve consistency and comparability of the data, it is preferable for Member States to report radioactive waste volumes as packaged for disposal.

- **Limited knowledge of radioactive contamination of** facilities subject to decommissioning results in uncertainties in predicting amounts of decommissioning waste**.** The detailed characterization of a facility subject to decommissioning increases the precision in forecasting the amount of radioactive waste, however, only when decommissioning is well progressed will the actual categories and amounts of waste be fully known. This is also valid for the limited knowledge of characteristics of some legacy wastes.
- **Differences in materials considered as radioactive waste**. Waste containing naturally occurring radioactive material – NORM (e.g. from uranium mining and milling) is not categorised as radioactive waste in some Member States, although a few Member States declare this waste in the scope of their national programmes.
- **Pending decisions** result in uncertainties in the projection of future radioactive waste inventories (e.g. volumes, classes). Examples of pending decisions are:
  - Final decisions about the management routes for radioactive waste (such as evaporation versus cementation);
  - Immediate or deferred decommissioning, with the amount of radioactive waste potentially decreasing with prolonged safe enclosure of a facility;
  - Final disposal end-points, potentially with considerable differences in acceptance criteria.
- **Political decisions and changes in the legal/regulatory framework** may also introduce considerable changes in estimates of future arisings, e.g.:
  - Decisions to retrieve disposed radioactive waste;
  - Changes to the fuel cycle;
  - Inclusion or not of certain materials – e.g. spent fuel being categorised as waste, or other materials such as depleted uranium.

During the **assessment of the evolution of Member States inventories with time**, the following additional sources of **uncertainties have been identified**:

- Use of **different radioactive waste classification** schemes from one reporting period to another.

- **Differences in the reference dates of Member States inventories** – for the current reporting period although the majority of Member States reported inventories as of the end of 2013, a few have chosen to report more recent inventories with dates ranging from 2014 to 2016.
- **Change in radioactive waste status** - some Member States plan to recover previously disposed radioactive waste, process and re-dispose of it in existing and/or newly constructed disposal facilities. So there might be changes depending on whether radioactive waste is still reported as disposed of or stored. Also the overall volume might change as a result of subsequent retreatment and final disposal. Overall after a decision for remediation of a disposal site, radioactive waste is considered as stored whilst awaiting retrieval.
- **Change of assumptions used for reporting** during different reporting periods. For example, some Member States reported combined radioactive waste classes like "Low and Intermediate Level Waste" as "Low Level Waste" while in a subsequent period this was reported as "Intermediate Level Waste". This however has no effect on the need for safe management of this waste.
- **Declaration of material as radioactive waste or not**, changing from one reporting period to the other (e.g. spent fuel and depleted uranium). It has also been noted that some Member States report “irradiated fuel” and others “spent fuel”.

3. Sources of spent fuel and radioactive waste

The largest source of radioactive waste stems from the nuclear power plants and associated nuclear fuel cycle activities. The latter include those from the nuclear fuel cycle, i.e. from conversion of uranium through to fuel fabrication prior to electricity generation, and subsequent reprocessing of spent fuel. Other Member States make use of the once-through fuel cycle option, with direct disposal of the spent fuel in deep geological facilities foreseen. Decommissioning of nuclear power plants and other nuclear facilities at the end of their useful lifetime also results in generation of significant volumes of radioactive waste, mainly low-level waste. Another large contribution can be waste from mining and milling of uranium, if it is declared as radioactive waste. Some Member States report such material as a part of radioactive waste inventory, whereas others do not. Therefore, a comparison of inventories of waste containing naturally occurring radioactive material between Member States or compilation of an overall European Union inventory (incl. NORM waste) is currently not possible and therefore outside the scope of this report.

Smaller volumes of radioactive waste are generated as a result of non-power uses of radioactive materials, such as the manufacturing of radioactive materials for use in medical and industrial applications, or research facilities such as laboratories, and research reactors. Therefore, all Member States generate radioactive waste, though non-power related wastes represent a small proportion of the total generated radioactive waste.

4. Classification of spent fuel and radioactive waste

In line with Article 12(1)c of the Directive, Member States need to develop as part of their national programmes and notify to the Commission spent fuel and radioactive waste inventories in accordance with an appropriate classification. Correspondingly, Member States notify their national programmes and reports on their spent fuel and radioactive waste inventories based on radioactive waste classifications that may differ from one Member State to another.

In order to make spent fuel and radioactive waste inventories comparable among different Member States and in order to aggregate the overall inventory on the territory of the European Union, Member States inventories were translated into a common classification scheme. The IAEA GSG-1 classification system has been chosen for that purpose in order to facilitate Member States reporting to various international organisations (e.g. IAEA) and instruments (e.g. Joint Convention).

The categories of radioactive waste used for data aggregation are:

- **Very Low Level Waste** (VLLW): waste that does not need a high level of containment and isolation and, therefore, is suitable for disposal in near surface landfill type facilities with limited regulatory control.
- **Low Level Waste** (LLW)**:** waste that is above clearance levels, but with limited amounts of long-lived radionuclides. Such waste requires robust isolation and containment for periods of up to a few hundred years and is suitable for disposal in engineered near surface facilities. This class covers a very broad range of waste. LLW may include short-lived radionuclides at higher levels of activity concentration, and also long-lived radionuclides, but only at relatively low levels of activity concentration.
- **Intermediate Level Waste** (ILW): waste that, because of its content, particularly of long lived radionuclides, requires a greater degree of containment and isolation than that provided by near surface disposal. However, ILW needs no provision, or only limited provision, for heat dissipation during its storage and disposal. ILW may contain long-lived radionuclides, in particular, alpha emitting radionuclides that will not decay to a level of activity concentration acceptable for near surface disposal during the time for which institutional controls can be relied upon. Therefore, waste in this class requires disposal at greater depths, of the order of tens of metres to a few hundred metres.
- **High Level Waste** (HLW): waste with levels of activity concentration high enough to generate significant quantities of heat by the radioactive decay process or waste with large amounts of long lived radionuclides that need to be considered in the design of a disposal facility for such waste. Disposal in deep, stable geological formations usually several hundred metres or more below the surface is the generally recognized option for disposal of HLW.

Spent fuel (SF) is also considered in its entirety, whether it might be intended for reprocessing or awaiting decision for future long term management (reprocessing or disposal).

In addition to the above mentioned waste classes, IAEA GSG-1 classification system defines:

- **Exempt waste** with concentrations of radionuclides small enough to not require provisions for radiation protection. Such material can be cleared from regulatory control and does not require any further consideration from a regulatory control perspective.
- **Very short lived waste** containing only very short half-life radionuclides, thus such a waste can be stored until the activity has fallen beneath the levels of clearance, allowing for the cleared waste to be managed as conventional waste.

The latter two waste classes do not require future long term management or disposal as radioactive waste due to their short-lifetime and/or levels allowing the exemption or clearance from regulatory control. Accordingly, exempt waste and very short lived waste are in most cases not reported by Member States. Thus, these waste classes have not been used for data aggregation in the present document.

Several Member States combine VLLW and LLW, or do not have a separate VLLW class. In the latter case such material could be subject to clearance in accordance with the respective national legislation. Reflecting the disposal routes, several Member States also use a combined waste class "low and intermediate level waste" - LILW. Where other than the IAEA GSG-1 classification system is used for reporting by Member States, a conversion provided by the Member States is applied in this Report in order to achieve the transformation from the national to the IAEA classification systems.

5. Estimated spent fuel and radioactive waste inventory in the European Union

The present inventory covers all European Union Member States. The data was analysed with respect to Member States currently or previously having operated nuclear power plants and those not, i.e. those with relatively much smaller radioactive waste inventories.

When comparing the current data with the data provided for previous reporting (i.e. Situation Reports) the data are generally consistent. In some cases, however, there are some deviations due to reasons such as the use of the older classification scheme, affecting in particular the ratio between LILW and VLLW; successful programmes of volume reduction; the decommissioning of nuclear installations; and shipments of radioactive waste/spent fuel for reprocessing.

Radioactive waste

At the end of 2013 the estimated total inventory of radioactive waste in the European Union was 3 313 000 m^3, with 70 % disposed of (2 316 000 m^3), and 30 % stored (997 000 m^3). Table 1 summarizes the overall amounts of radioactive waste in the European Union.

Table 1. Volumes of radioactive waste in the European Union, end 2013

Waste Category	Total amount (m^3)		
	Stored	Disposed	
VLLW	237 000	279 000	516 000
LLW	428 000	2 025 000	2 453 000
ILW	326 000	12 000	338 000
HLW	6 000	0	6 000
Total (m^3)	997 000	2 316 000	**3 313 000**

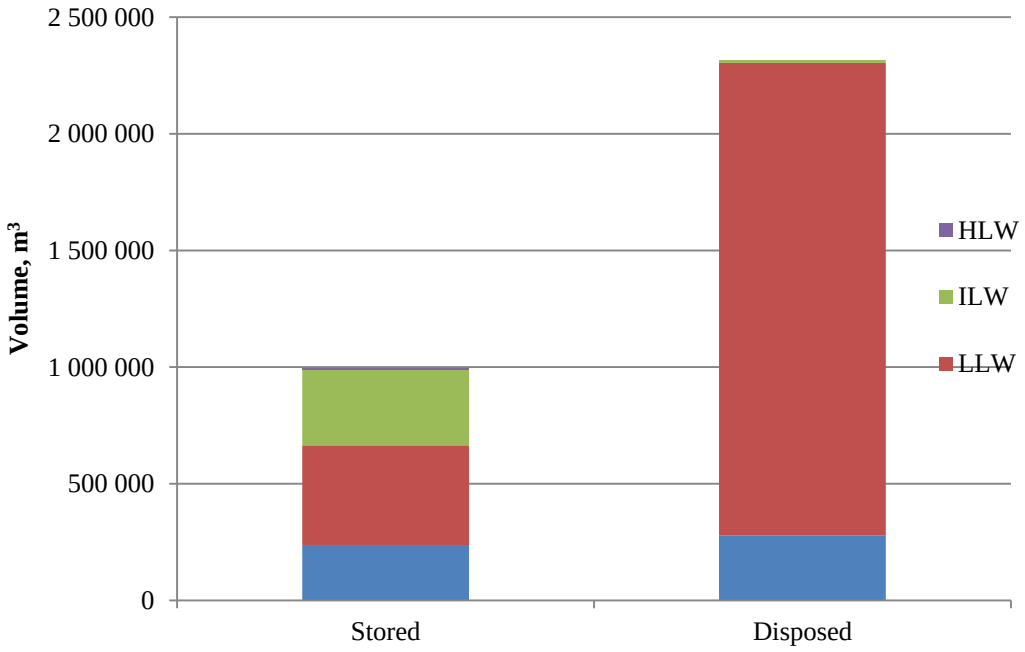


Figure 1. Distribution of the radioactive waste in the European Union between stored and disposed of by waste class, end of 2013

Distribution of the European Union radioactive waste inventory according to different radioactive waste classes is shown in Figures 1 and 2. LLW is the dominating waste class making around 74% of the overall waste, while VLLW and ILW is estimated to be 15% and 10% respectively. HLW makes the smallest fraction of the overall waste volume, accounting for 0.2%.

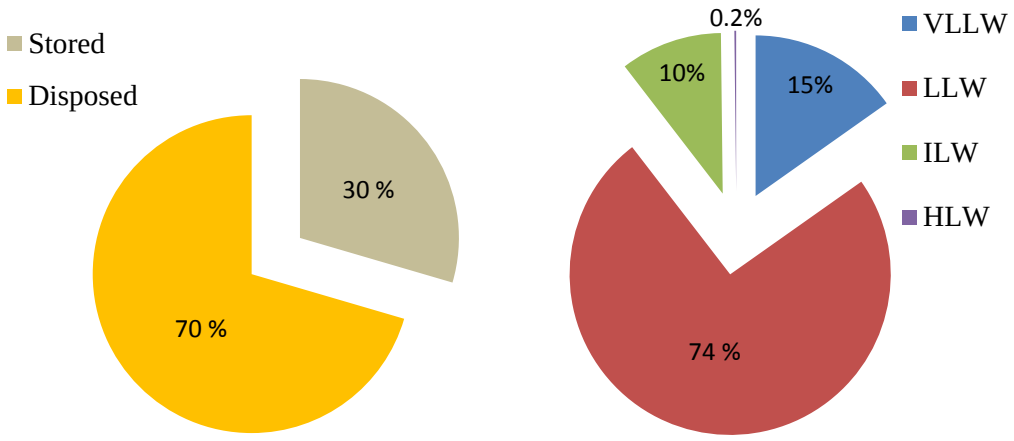


Figure 2. Distribution of the radioactive waste in the European Union, end of 2013

There are sixteen European Union Member States that operate or have operated nuclear power plants. They account for 99.7% of the radioactive waste inventory in the European Union. The total volume of radioactive waste in those Member States and the distribution among them is shown in Figures 3 and 4.

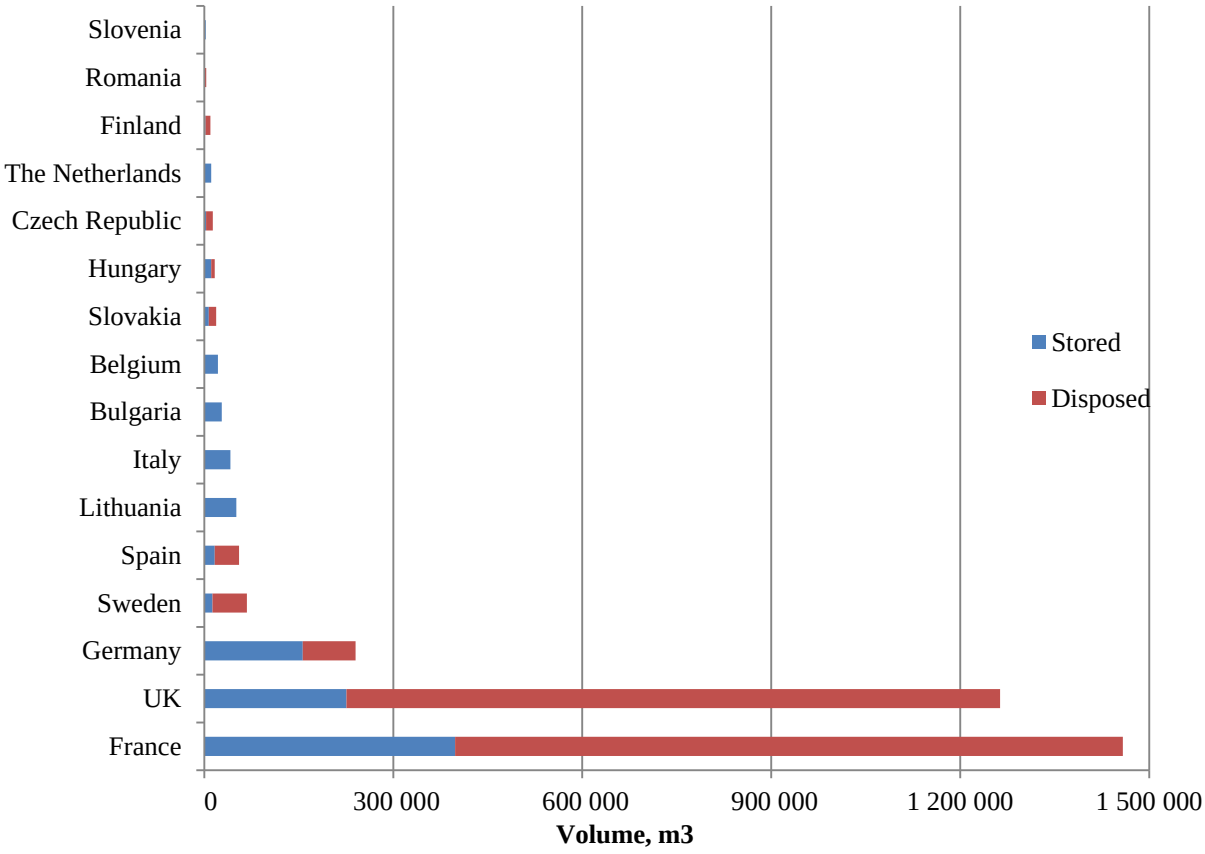


Figure 3. Volumes of radioactive waste in Member States with nuclear power programme, end of 2013

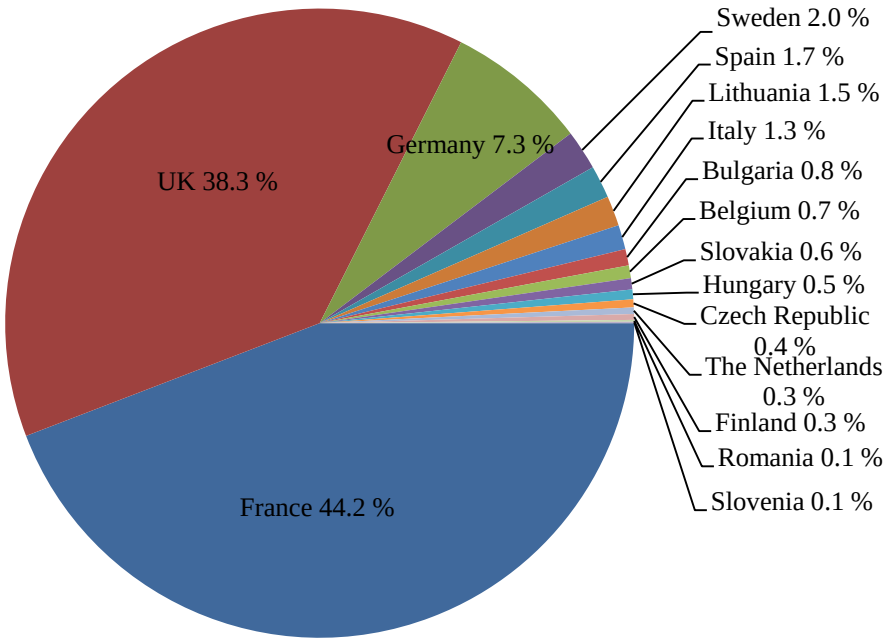


Figure 4. Distribution of total volumes of radioactive waste in Member States with nuclear power programme, end of 2013

Twelve Member States have no nuclear programme, although six of them are operating or have operated research, training or demonstration reactors. The total volume of radioactive waste and the distribution among the Member States without nuclear power programmes is shown in Figures 5 and 6.

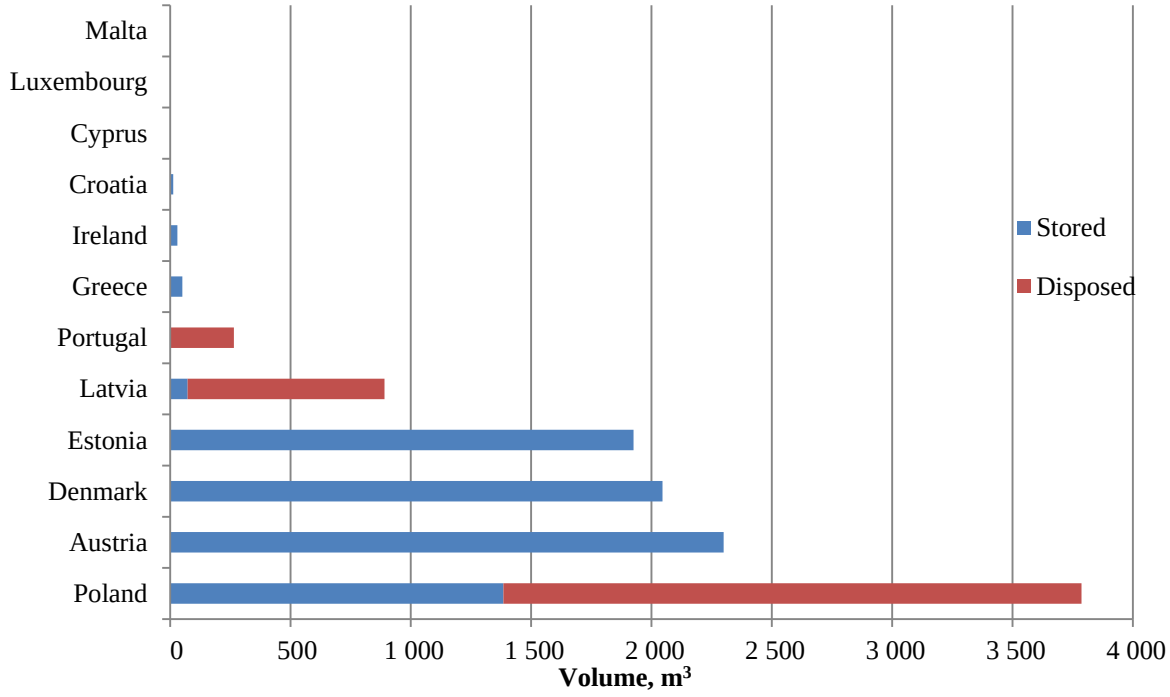


Figure 5. Total volume of radioactive waste in Member States without nuclear power programme, end of 2013

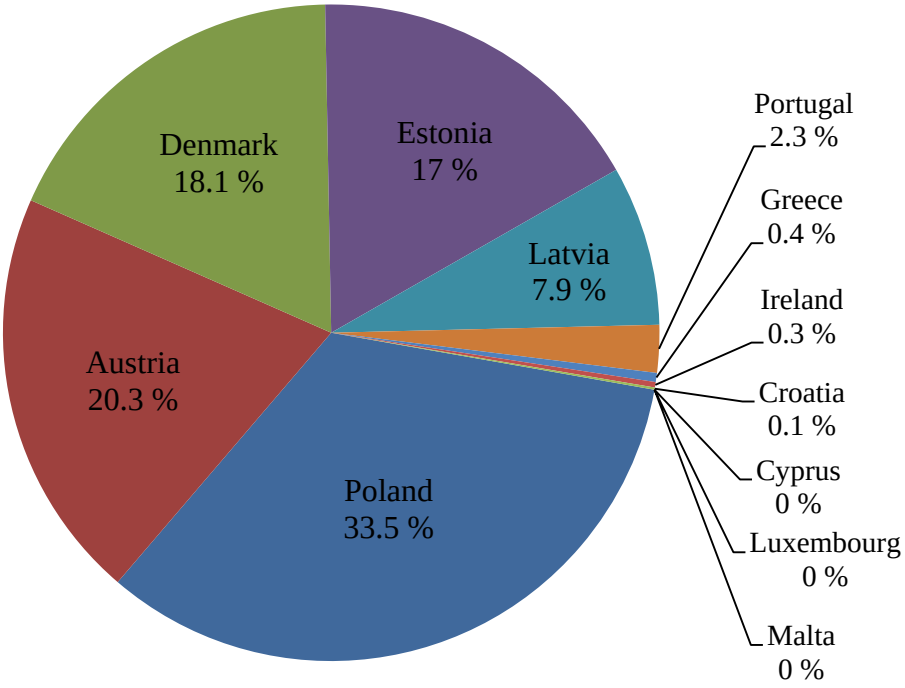


Figure 6. Distribution of total volumes of radioactive waste in Member States without nuclear power programme, end of 2013

The total estimated volume of **stored radioactive waste** is 997 000 m^3. LLW makes almost half of this amount (43%), while VLLW together with ILW make 24% and 33% correspondingly. HLW fraction in the overall radioactive waste in storage is 0.6%. Distribution of stored radioactive waste is shown in Figure 7.

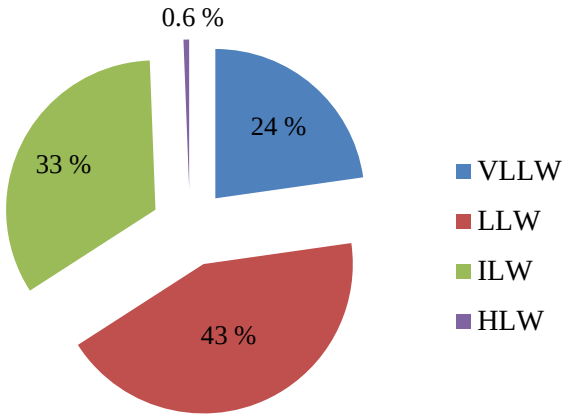


Figure 7. Distribution of stored radioactive waste in the European Union by class, end of 2013

Member States having nuclear power programmes are large contributors to the overall radioactive waste inventory of the European Union. The spent fuel and radioactive waste amounts are in line with the size of the nuclear programme. Amounts of stored radioactive waste in Member States with nuclear power programmes are shown in Figure 8.

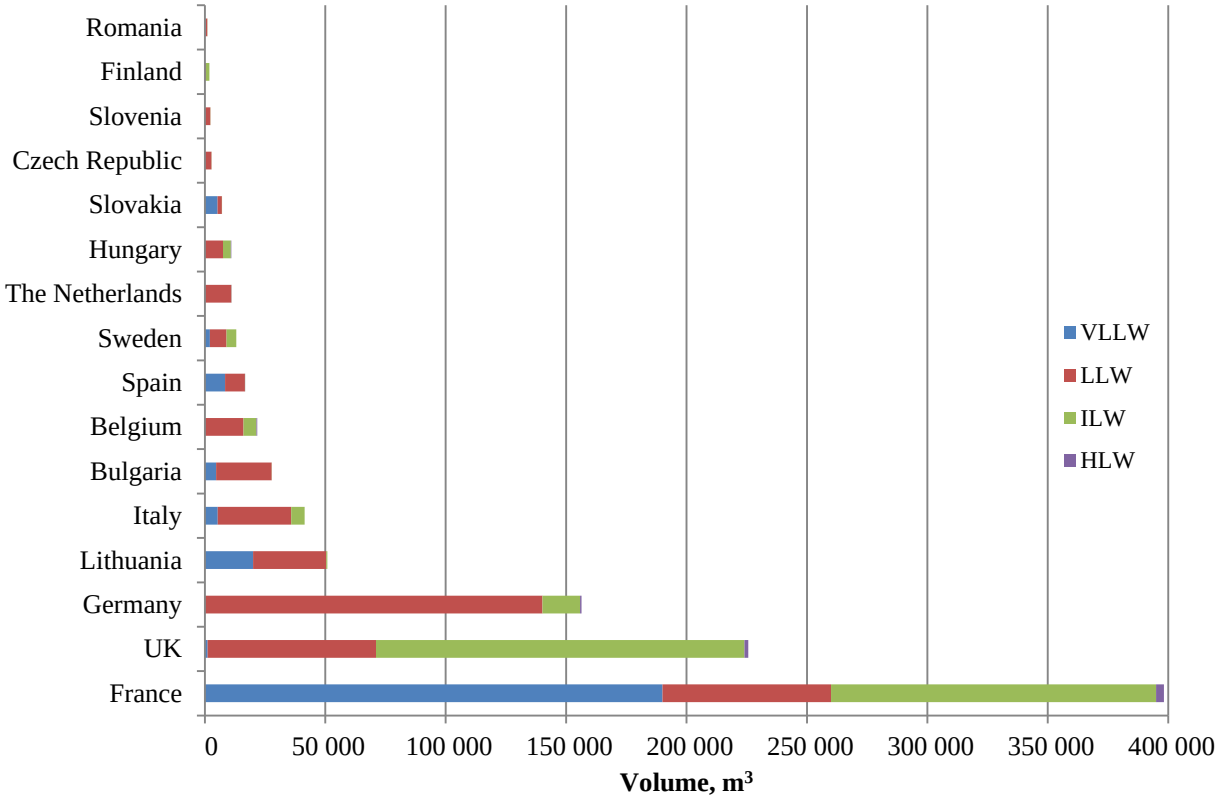


Figure 8. Volumes of stored radioactive waste by class in Member States with nuclear power programme, end of 2013

Other countries having a small nuclear programme (i.e. only research reactors) or no nuclear programme at all have very little contribution to the overall European Union radioactive waste in storage (see Figure 9). The amounts of stored radioactive waste in those Member States are shown in Figure 10.

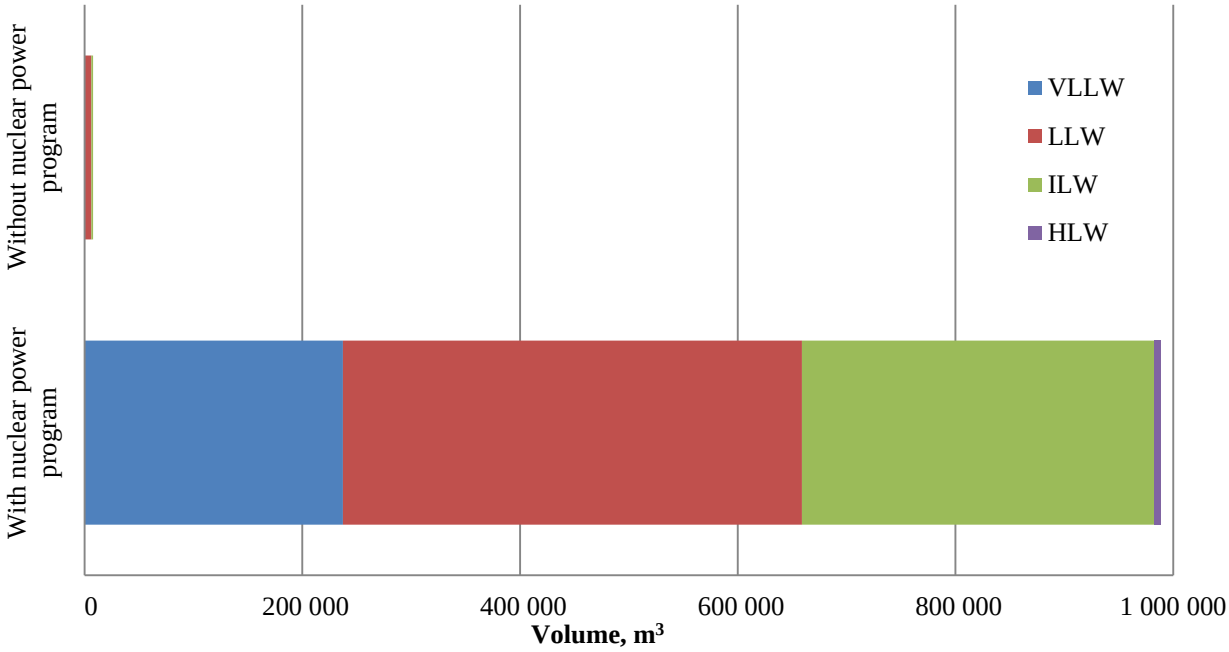


Figure 9. Volumes of stored radioactive waste by class in Member States with and without nuclear power programme, end of 2013

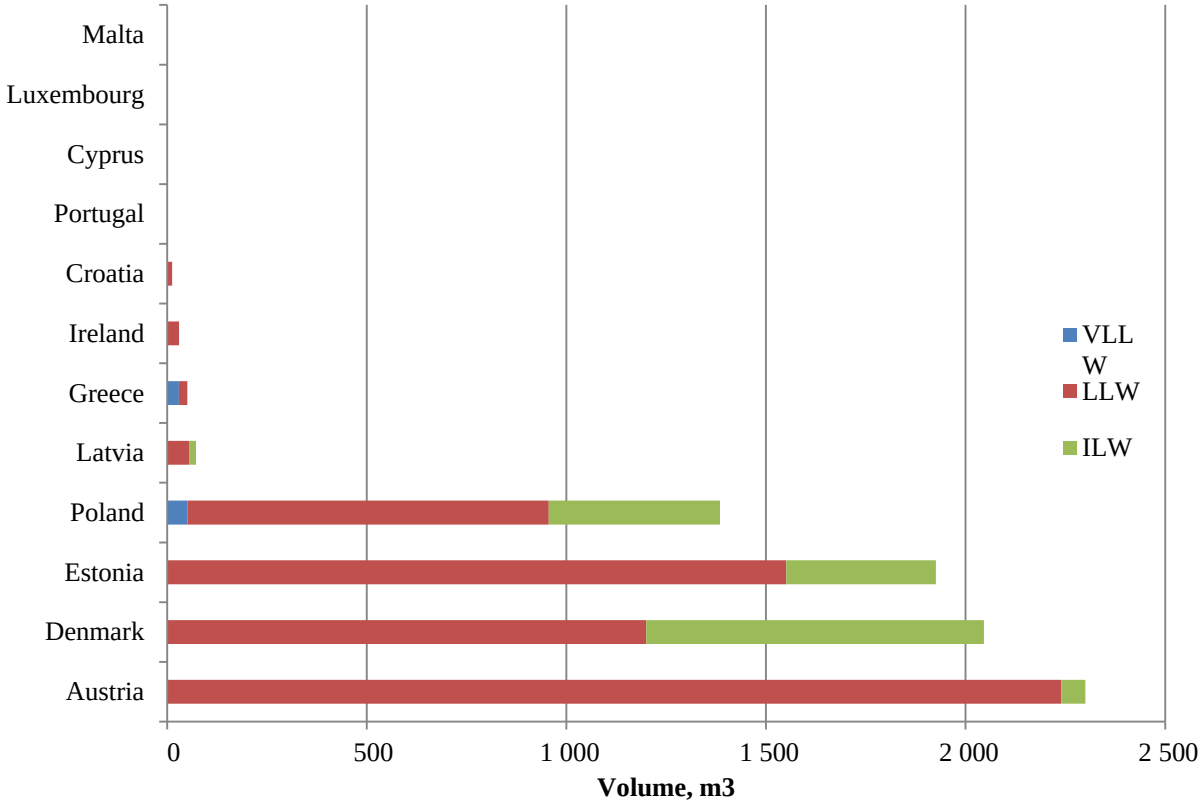


Figure 10. Volumes of stored radioactive waste by class in Member States without nuclear power programme, end of 2013

Currently, twelve Member States[8] have radioactive waste disposal facilities either in operation or closed (nuclear power programme countries: Czech Republic, Finland, France, Germany, Hungary, Romania, Slovakia, Spain, Sweden, UK; non-nuclear programme countries: Latvia and Poland) although based on the information from the national programmes and reports it is expected that more repositories will be built in coming years. The total quantity of the **disposed radioactive waste** as of end 2013 equals 2 316 000 m^3. This consists almost entirely of LLW (87%).

A number of Member States (both with and without nuclear power plants) have dedicated disposal sites for institutional radioactive waste. In some cases, the disposal of waste undertaken in the past at several sites is now being reconsidered and there are plans for the retrieval of the waste disposed of several decades ago. As a result change of radioactive waste inventories can be expected after retrieval for processing and subsequent storage and/or disposal.

Distribution of the disposed of radioactive waste in Member States as of end of 2013 is shown in Figure 11.

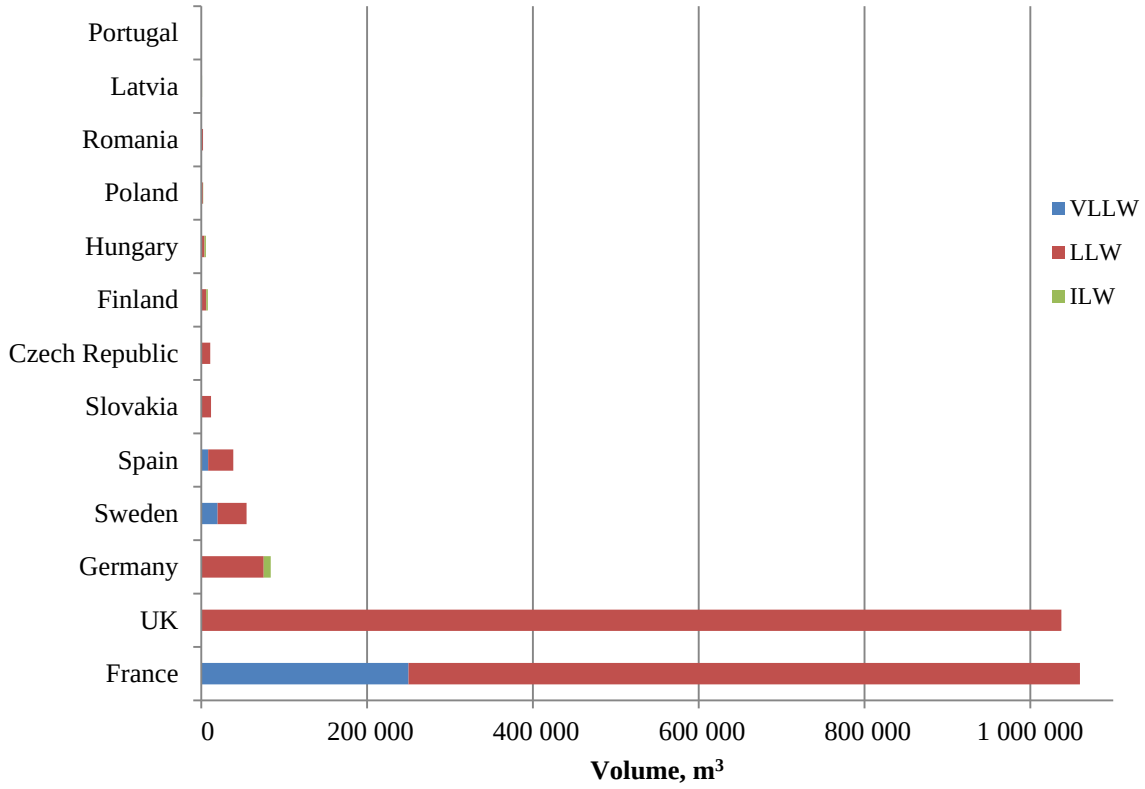


Figure 11. Volumes of radioactive waste disposed of in the European Union, end of 2013

[8] Bulgaria and Lithuania categorised and using these past disposal (RADON type) facilities as storage facilities. See Table 8 of the Staff Working Document (2017)159 on Progress of Implementation of Council Directive 2011/70/Euratom.

Evolution of the total radioactive waste volumes (per waste category) is given in Table 2. In all radioactive waste categories an overall increase over time is noted. However, the radioactive waste volumes decreased between two reporting dates (2004-2007). This decrease can be due to different activities resulting in reduction of volumes, like compaction of the solid waste or treatment of large quantities of liquid waste.

Table 2. Evolution of radioactive waste inventory since the end of 2004

Waste Category	Total amount (m^3)			
	2004	2007	2010	2013
VLLW	210 000	280 000	414 000	516 000
LLW	2 228 000	2 435 000	2 356 000	2 453 000
ILW	206 000	288 000	321 000	338 000
HLW	5 000	4 000	5 000	6 000

The evolution of total radioactive waste volumes for the period 2004-2013 is illustrated in Figure 12.

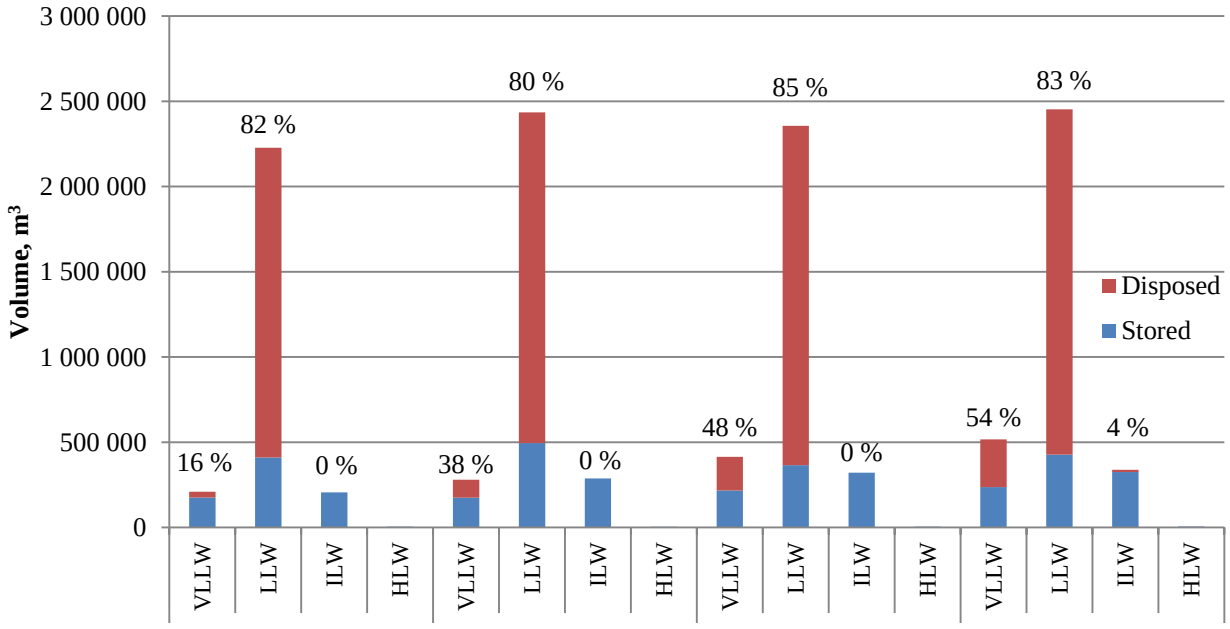


Figure 12. Evolution of total radioactive waste volumes since the end of 2004 (with the fraction of waste disposed of indicated)

Evolution of the stored radioactive waste volumes (per waste category) is presented in Table 3. There are currently no operational deep geological disposal facilities for ILW and HLW. Consequently, the amounts of stored ILW and HLW are steadily increasing over time.

The amounts of VLLW and LLW in storage are affected by differences in generation and disposal rates. During different time periods, their respective amounts in storage may therefore increase or decrease.

Table 3. Evolution of stored radioactive waste in the 2004-2013 period

Waste Category	Amount in Storage (m3)			
	2004	2007	2010	2013
VLLW	176 000	175 000	217 000	237 000
LLW	411 000	495 000	365 000	428 000
ILW	206 000	288 000	321 000	326 000
HLW	6 000	4 000	5 000	6 000

Table 4 shows **the evolution of radioactive waste disposal over time**. The increase in disposed of LLW is levelling over the time period since 2004. Contrary to this, the disposal of VLLW shows a steady increase.

Table 4. Evolution of radioactive waste disposals in the 2004-2013 period

Waste Category	Amount in Disposal (m^3)			
	2004	2007	2010	2013
VLLW	34 000	105 000	197 000	279 000
LLW	1 817 000	1 940 000	1 991 000	2 025 000
ILW	0	0	0	12 000
HLW	0	0	0	0

From Table 4 it can be also seen that some Member States have declared disposals of ILW. These disposals, in accordance with the IAEA classification, consist mainly of highly active disused radioactive sealed sources containing short-lived radionuclides.

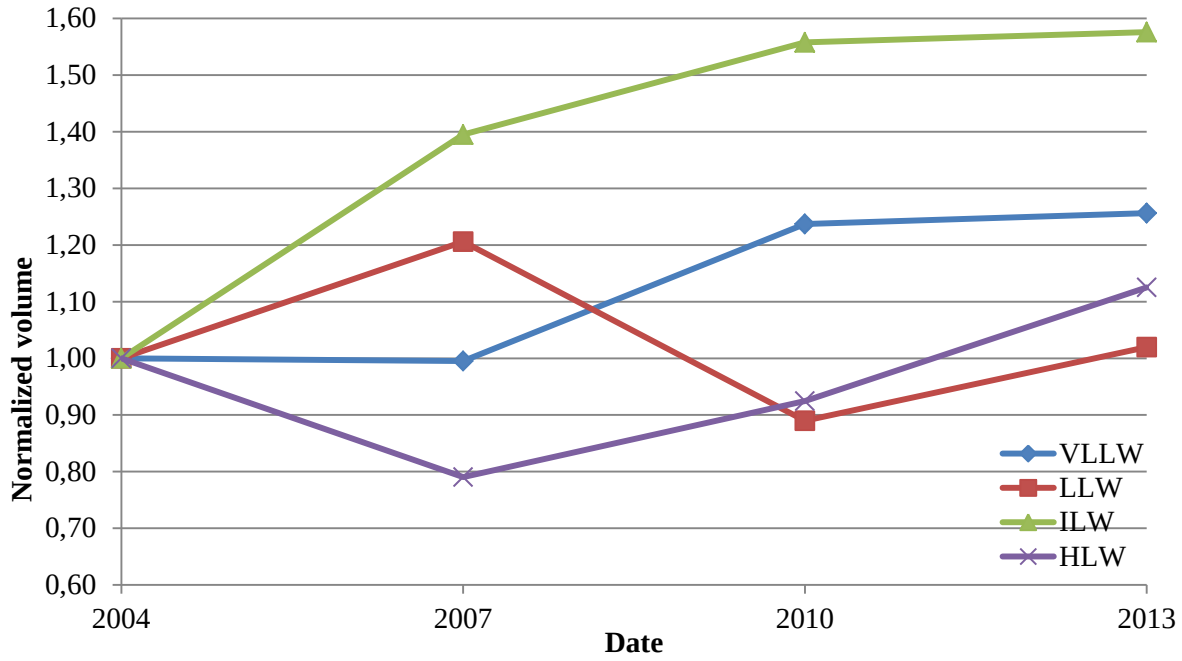


Figure 13. Normalised[9] evolution of stored radioactive waste amounts in European Union since the end of 2004

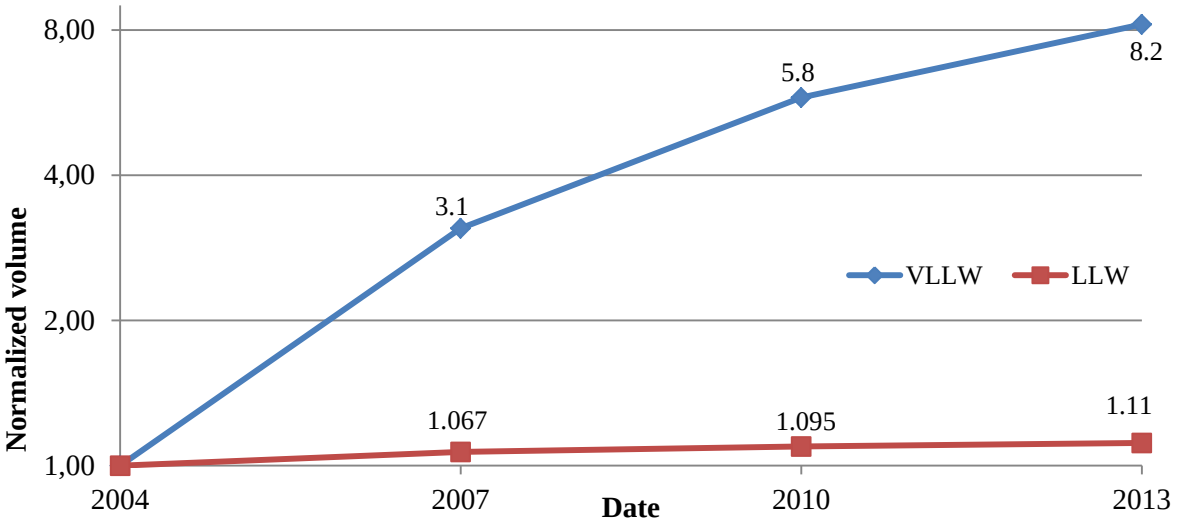


Figure 14. Normalised[10] evolution of disposed of radioactive waste in European Union since the end of 2004

The overall evolution of radioactive waste generated in the European Union (normalized sum of radioactive waste both stored and disposed) until the end of 2013 is shown in Figure 15. The amounts of the individual waste classes are increasing (LLW to a lesser extent) with different rate. One exception is HLW where data reported in 2004 are significantly higher than in the following reporting periods.

9 The chart shows increase factors of radioactive waste volumes over the time in comparison to the 2004 volumes.

10 The chart shows increase factors of radioactive waste volumes over the time in comparison to the 2004 volumes.

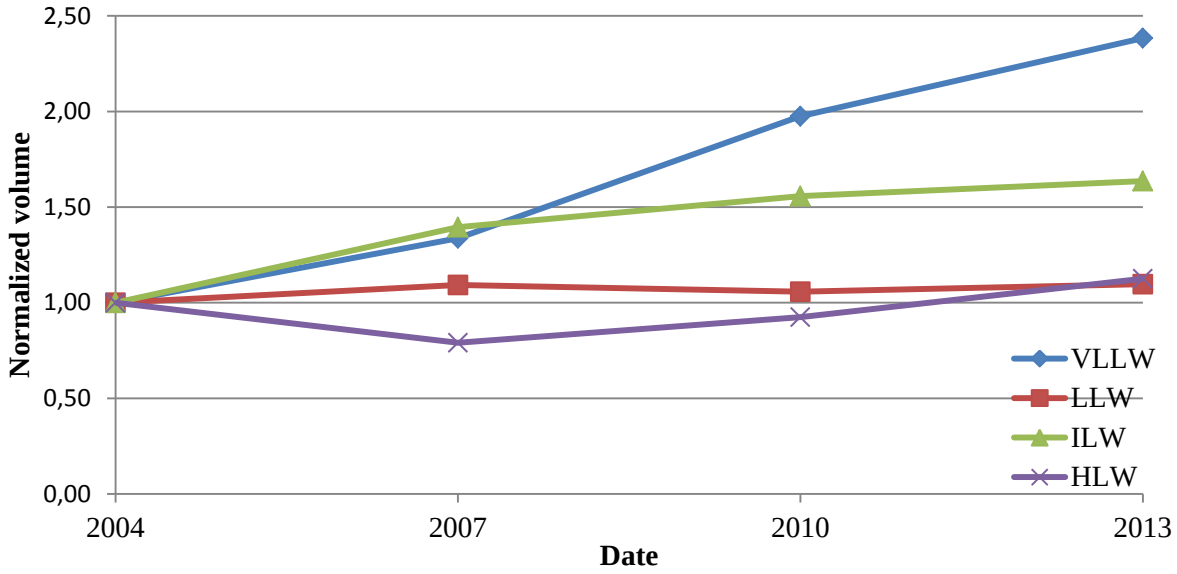


Figure 15. Normalized[11] evolution of radioactive waste volumes (both stored and disposed)

From the information presented above the following **trends concerning the inventory of radioactive waste and spent fuel in the European Union** can be observed:

Radioactive waste

At the end of 2013, 54 % of the total VLLW volume is reported as disposed of and the amount of VLLW disposed has steadily increased. The volume of stored VLLW shows a steady increase of about 20 % over the time period 2004 – 2013. This shows that the disposal rate of VLLW needs to increase further to keep pace with its generation.

At the same time 83 % of LLW is reported as disposed. With 17 % of the LLW amount generated still in storage, and no reported systematic increase in the amounts in storage between 2004 and 2013, the overall LLW amounts of waste generated and disposed is generally in equilibrium. This, however, is dominated by those countries with large LLW inventories, whereas a number of Member States with smaller inventories do not yet dispose of their LLW.

For ILW the situation is very different. Less than 4 % is reported as disposed, and in some cases such ILW will be retrieved as current disposal facilities do not meet present safety requirements. Consequently, there is a steady increase in ILW in storage.

For HLW and spent fuel declared as waste, the first facility for disposal of such material is expected around 2022 in Finland, with further facilities in France (around 2025) and Sweden (around 2030). Therefore, one should expect that the amounts of HLW and spent fuel in storage are increasing steadily in line with their generation. The reported data show a different situation in the period from 2004 to 2007. The reason is related to very high HLW volumes reported by Germany and Belgium for 2004. These volumes are 1450 m^3 higher for Germany

[11] The chart shows percentage increase of radioactive waste volumes over the time.

in 2004 than in the subsequent reporting. For Belgium the corresponding volume is 350 m^3. The other Member States show more consistent data with respect to the expected constant or increasing amount of HLW.

Based on the Member State strategy, spent fuel is stored pending either disposal or reprocessing. During reprocessing, uranium and plutonium are recovered, with generation of radioactive waste (mainly HLW and ILW), which is currently stored until disposal facilities become available.

Spent Fuel

At the end of 2013 more than 54 000 tHM of spent fuel was stored in the European Union (20% increase since 2007[12]) and around 800 tHM of spent fuel (about 1.5 %) was sent for reprocessing outside the European Union with the expected returns of resulting radioactive waste from reprocessing. These amounts include both spent fuel coming from power and non-power (e.g. research, isotope production) reactors. It is foreseen to return around 1100 m^3 of radioactive waste from spent fuel reprocesing outside the European Union by 2030.

Table 5. Spent fuel in storage on Member States' territory in the European Union for 2004-2013 period

Spent Fuel in storage, tHM			
2004	2007	2010	2013
38 100	44 900	53 300	54 300

Most recent reported amounts of spent fuel stored in individual Member States are shown in Figure 16. Some Member States have smaller inventories of spent fuel (or none) in storage than that generated by the nuclear power plants, as part of it or all of it has been reprocessed. On the other end, countries with neither past, nor current reprocessing have comparably high spent fuel inventories.

Given that today there is no disposal route available for spent fuel (first disposal facilities to become operational in 2022-2030) and that not all Member States have their spent fuel reprocessed, there is a continual increase in the amount of spent fuel in storage (Figure 16).

[12] See footnote 4.

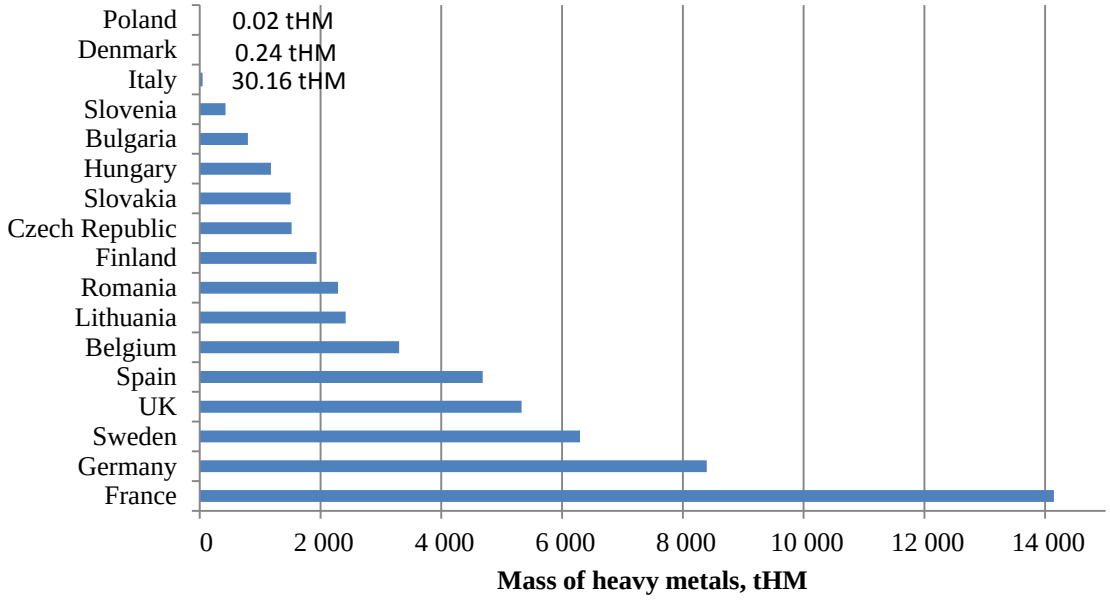


Figure 16. Spent fuel in storage, end of 2013

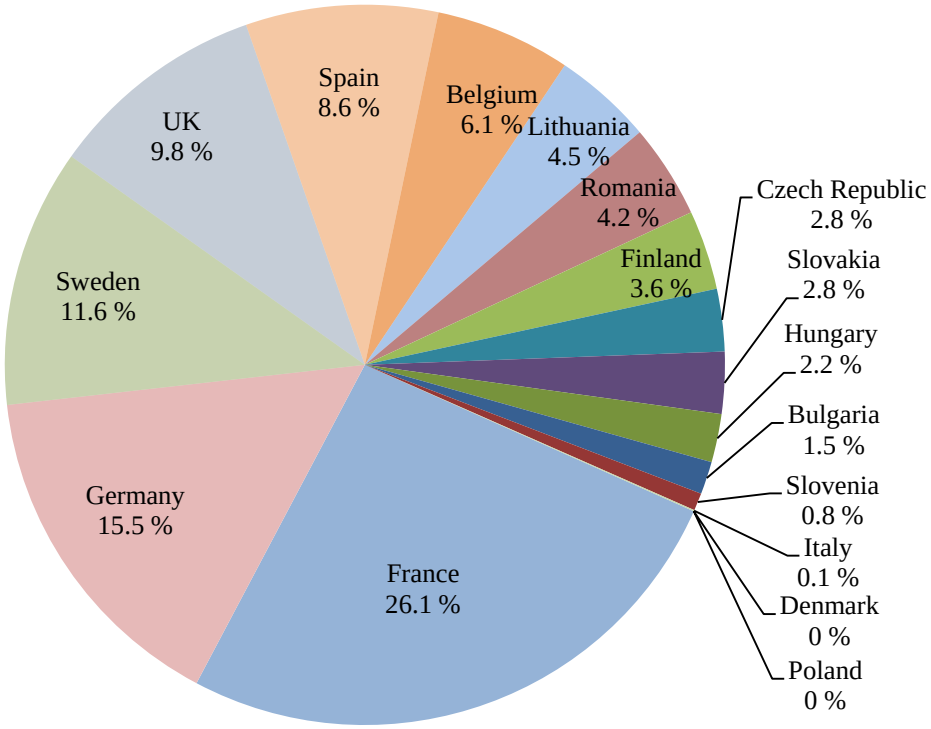


Figure 17. Member States' contribution to the overall spent fuel inventory in the European Union, end of 2013

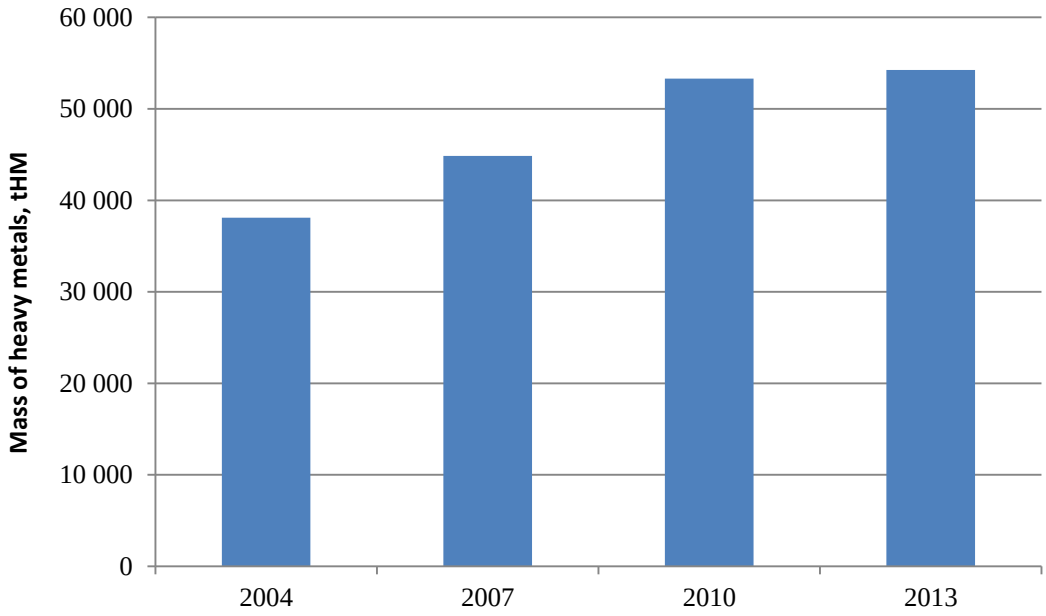


Figure 18. Evolution of spent fuel in storage in Member States since the end of 2004

6. Projections of future spent fuel and radioactive waste arisings

In order to establish future trends Member States were asked to report **future estimates of volumes of radioactive waste**. Two different reporting approaches were used by the Member States for estimating future radioactive waste arisings:

- One approach was to provide the data along with the reference waste classes for the end of the useful life of existing facilities and sites, including decommissioning and site remediation.

- The other approach was to provide the amounts of radioactive waste for the different reference waste classes for specified future dates, namely 2020, 2030 and in some cases also 2040.

The ends-of-operation of planned facilities are not certain, and correspondingly the estimates in this report include mainly existing facilities and sites. In the majority of the Member States that consider new facilities (e.g. nuclear power plant) detailed data has not been provided.

An example of the first reporting approach could be the United Kingdom. It provides data adjusted to the IAEA reference waste categories for the end of the useful life of the respective sites and facilities presently in operation, including waste from decommissioning and site remediation. A few Member States provide the same data and also future waste arisings data for specified years. Most Member States however do not provide data for the end of the useful life, but only for specified future years. Consequently, it is not possible to project the future overall arisings as the data reported is not consistent. All Member States reported data are available in the tables in the Annex.

With regards to **spent fuel**, an increase from present 54 000 tHM in storage to 64 000 tHM in 2030 is estimated noting, however, that the majority of the new build inventories has not been reported.

Annex: Spent fuel and radioactive waste inventory data

"-" in the tables below means no data was received from the Member State or no such practice exists

"0" in the table means that the data with value "0" was received from the Member State

Table I.1. Overall European Union radioactive waste inventory and the future prospects as at the end of 2013

		2013		2020		2030		2040		2050		Other date	
		Volume, m^3	Decom. Share, m^3	Volume, m^3	Decom. Share, m^3	Volume, m^3	Decom. Share, m^3	Volume, m^3	Decom. Share, m^3	Volume, m^3	Decom. Share, m^3	Volume, m^3 (date)	Decom. Share, m^3
Austria	VLLW	-	-	-	-	-	-	-	-	-	-	-	-
	LLW	2240	900	2781	1390	3120	1980	3660	2480	3710	2480	-	-
	ILW	60	30	63	33	68	38	71	41	74	44	-	-
	HLW	-	-	-	-	-	-	-	-	-	-	-	-
Belgium	VLLW	0	-	-	-	-	-	-	-	-	-	-	-
	LLW	16067	-	-	-	-	-	-	-	-	-	-	-
	ILW	5371	-	-	-	-	-	-	-	-	-	-	-
	HLW	285	-	-	-	-	-	-	-	-	-	-	-
Bulgaria	VLLW	4700	-	-	-	42000	-	-	-	-	-	-	-
	LLW	23000	-	-	-	90200	-	-	-	-	-	-	-
	ILW	10	-	-	-	10	-	-	-	-	-	-	-
	HLW	0	-	-	-	1100	-	-	-	-	-	-	-
Croatia	VLLW	-	-	-	-	-	-	-	-	-	-	-	-
	LLW	12.5	0	113.75	100	1546.25	100	1548.25	100	4561.25	4540	-	-
	ILW	-	-	-	-	-	-	-	-	-	-	-	-
	HLW	-	-	-	-	-	-	-	-	41	41	-	-
Cyprus	VLLW	-	-	-	-	-	-	-	-	-	-	-	-
	LLW	-	-	-	-	-	-	-	-	-	-	-	-

		2013		2020		2030		2040		2050		Other date	
		Volume, m^3	Decom. Share, m^3	Volume, m^3	Decom. Share, m^3	Volume, m^3	Decom. Share, m^3	Volume, m^3	Decom. Share, m^3	Volume, m^3	Decom. Share, m^3	Volume, m^3 (date)	Decom. Share, m^3
	ILW	-	-	-	-	-	-	-	-	-	-	-	-
	HLW	-	-	-	-	-	-	-	-	-	-	-	-
Czech Republic	VLLW	-	0	-	0	-	0	-	0	-	0	-	-
	LLW	13580.2	0	-	0	-	0	-	0	-	1120	-	-
	ILW	30 t	0	-	0	-	0	-	0	-	0	-	-
	HLW	-	0	-	0	-	0	-	0	-	0	-	-
Denmark	VLLW	-	-	-	-	-	-	-	-	-	-	5000 - 10000	-
	LLW	1200	-	-	-	-	-	-	-	-	-		-
	ILW	846 t	-	-	-	-	-	-	-	-	-		-
	HLW	-	-	-	-	-	-	-	-	-	-		-
Estonia	VLLW	-	-	-	-	-	-	-	-	-	-	-	-
	LLW	1550.9	1379	1552.8	1379	1555.5	1379	1558.2	1379	1560.9	1379	-	-
	ILW	374.6	357	375	357	375.6	357	376.2	357	376.8	357	-	-
	HLW	-	-	-	-	-	-	-	-	-	-	-	-
Finland**	VLLW	-	-	-	-	-	-	-	-	-	-	-	-
	LLW	6404	-	7661	-	15383	-	31705	-	33327	-	-	-
	ILW	3421	-	4526	-	10002	-	12707	-	12852	-	-	-
	HLW	-	-	-	-	-	-	-	-	-	-	-	-
France	VLLW	440000	-	650000	-	1100000	-	-	-	-	-	2200000	-
	LLW	880000	-	1000000	-	1200000	-	-	-	-	-	1900000	-

		2013		2020		2030		2040		2050		Other date	
		Volume, m^3	Decom. Share, m^3	Volume, m^3	Decom. Share, m^3	Volume, m^3	Decom. Share, m^3	Volume, m^3	Decom. Share, m^3	Volume, m^3	Decom. Share, m^3	Volume, m^3 (date)	Decom. Share, m^3
	ILW	135000	-	140000	-	173000	-	-	-	-	-	252000	-
	HLW	3200	-	4100	-	5500	-	-	-	-	-	10000	-
Germany	VLLW	-	-	-	-	-	-	-	-	-	-	-	-
	LLW	215585	-	232800	-	298900	-	322300	-	342700	-	350200 (2080)	-
	ILW	23966	-	25900	-	34000	-	36600	-	38800	-	39700 (2080)	-
	HLW	568	-	700	-	700	-	700	-	700	-	700 (2080)	-
Greece	VLLW	29.344	-	-	-	-	-	-	-	-	-	62.344	33
	LLW	21.202	-	-	-	-	-	-	-	-	-	23.602	5
	ILW	-	-	-	-	-	-	-	-	-	-	12	12
	HLW	-	-	-	-	-	-	-	-	-	-	-	-
Hungary	VLLW	-	-	-	-	-	-	-	-	-	-	-	-
	LLW	11475	0	11949	0	14007	310	16323	310	17359	310	65590 (2100)	57330
	ILW	4918	0	5121	0	6003	0	6996	0	7440	0	28110 (2100)	6370
	HLW	201	0	266	0	400	0	523	0	610	0	1019 (2100)	243
Ireland	VLLW	0	0	0	0	0	0	0	0	0	0	0	0
	LLW	< 30	0	< 30	0	< 30	0	< 30	0	< 30	0	< 30	0
	ILW	0	0	0	0	0	0	0	0	0	0	0	0

		2013		2020		2030		2040		2050		Other date	
		Volume, m^3	Decom. Share, m^3	Volume, m^3	Decom. Share, m^3	Volume, m^3	Decom. Share, m^3	Volume, m^3	Decom. Share, m^3	Volume, m^3	Decom. Share, m^3	Volume, m^3 (date)	Decom. Share, m^3
	HLW	0	0	0	0	0	0	0	0	0	0	0	0
Italy	VLLW	5311	900	10036	5625	17870	13460	22467	18057	22467	18057	22467 (2065)	18057
	LLW	30545	4499	38087	12043	48927	22883	54579	28534	56279	30233	58659 (2065)	32614
	ILW	5540	150	5911	521	11463	6073	13713	8322	13713	8322	13713 (2065)	8322
	HLW	0	-	0	-	38.1	-	38.1	-	38.1	-	38.1 (2065)	0
Latvia	VLLW	0	0	0	0	0	0	0	0	-	-	-	-
	LLW	858	0	1858	1000	1878	1000	1898	1000	-	-	-	-
	ILW	32.5	0	42.5	10	47.5	10	52.5	10	-	-	-	-
	HLW	0	0	0	0	0	0	0	0	-	-	-	-
Lithuania	VLLW	20000	3502	26000	8000	42000	35000	60000	50000	60000	50000	-	-
	LLW	30377	0	35816	1000	66130	12840	96130	27220	96130	27220	-	-
	ILW	500	0	1000	200	9000	7500	12000	10500	12000	10500	-	-
	HLW	0	0	0	0	0	0	0	0	0	0	-	-
Luxem-bourg	VLLW	-	-	-	-	-	-	-	-	-	-	-	-
	LLW	0.1	-	-	-	-	-	-	-	< 2	-	-	-
	ILW	-	-	-	-	-	-	-	-	-	-	-	-
	HLW	-	-	-	-	-	-	-	-	-	-	-	-

Malta	VLLW	-	-	-	-	-	-	-	-	-	-	-	-
	LLW	-	-	-	-	-	-	-	-	-	-	-	-
	ILW	-	-	-	-	-	-	-	-	-	-	-	-
	HLW	-	-	-	-	-	-	-	-	-	-	-	-
The Nether-lands	VLLW	- ***	-	-	-	-	-	-	-	-	-	-	-
	LLW	11000	- ***	-	-	-	-	-	-	-	-	-	-
	ILW	43.9	0	-	-	-	-	-	-	-	-	-	-
	HLW	41.7	0	-	-	-	-	-	-	-	-	-	-
Poland	VLLW	844	-	1020	-	1280	-	1540	-	1850	50	-	-
	LLW	2113	-	2250	-	2350	-	2350	-	2350	130	-	-
	ILW	830	-	850	-	880	-	910	-	940	-	-	-
	HLW	0	-	-	-	-	-	-	-	-	-	-	-
Portugal	VLLW	-	-	-	-	-	-	-	-	-	-	-	-
	LLW	234	0	269	0	339	0	423	13.5	493	13.5	-	-
	ILW	31	0	56	0	106	0	160	3.4	210	3.4	-	-
	HLW	-	-	-	-	-	-	-	-	-	-	-	-
Romania	VLLW	330	330	-	-	-	-	-	-	-	-	-	-
	LLW	2802	0	3760	500	7670	1000	12730	2000	17250	2000	32370 (2095)	16100
	ILW	4.5	4.5	60	60	285	60	960	60	1075	175	2235 (2095)	1320
	HLW	0	0	0	0	0	0	0	0	0	0	0 (2095)	0

Slovakia	VLLW	5511	5246	13726	12726	29000	29000	29000	29000	29000	29000	-	-
	LLW	13399	8273.773	23558	12015	38512	24648	41894	25136	44644	25136	-	-
	ILW	24.813	13.5	150	137	1200	1187	1900	1887	1900	1887	-	-
	HLW	-	-	-	-	-	-	-	-	-	-	-	-
Slovenia	VLLW	0	0	-	0	-	0	-	0	-	0	-	-
	LLW	2306	0	2562	0	2970	0	3336	0	4207	740	-	-
	ILW	37.6	0	40	0	2	0	6	0	0	0	-	-
	HLW	0	0	-	0	-	0	-	0	-	0	-	-
Spain	VLLW	16777	2200	26223	9371	44018	24133	101955	81452	101955	81452	101955 (2090)	81452
	LLW	38481	2196	44372	5229	55856	12608	85939	42438	85939	42438	85939 (2090)	42438
	ILW	31	27	31	27	45	41	365	361	365	361	365 (2090)	361
	HLW	12	0	12	0	12	0	12	0	12	0	12 (2090)	0
Sweden	VLLW	21717	-	24000	-	26000	-	28000	-	30000	-	-	-
	LLW	41911	-	32000	-	97000	-	110000	-	157000	86000	157000 (2076)	86000
	ILW	4000	-	9000	-	12000	-	13000	-	15500	-	**15500 (2076)**	-
	HLW	6296*	-	7500*	-	9500*	-	11000*	-	12600*	-	**12600***	-

UK	VLLW	1170	-	-	-	-	-	-	-	-	-	2840000	-
	LLW	1107500	-	-	-	-	-	-	-	-	-	2457600	-
	ILW	153000	-	-	-	-	-	-	-	-	-	458000	-
	HLW	1550	-	-	-	-	-	-	-	-	-	1410	-

* Spent fuel either in storage or directly disposed of (Mass of heavy metal, tHM)

** No HLW expected as spent fuel will be disposed of directly. Finland reported the amounts of spent fuel stored without the information on the overall inventory of spent fuel.

*** Not registered.

Table I.2. Spent fuel stored on Member States' territory

	SF in Storage on a Member State territory, tHM					
	2013	2020	2030	2040	2050	Other (Mass/date)
Austria	-	-	-	-	-	-
Belgium	3302	-	-	-	-	-
Bulgaria	796.5	-	1530	-	-	-
Croatia	-	-	-	-	-	-
Cyprus	-	-	-	-	-	-
Czech Republic	1521.3	2236	2612	2979	3377	-
Denmark	0.2379	-	-	-	-	-
Estonia	-	-	-	-	-	-
Finland	1933.9	2361	2658	2251	2561	-
France	14146	14256	16277	-	-	-
Germany	8397	9600	10500	10500	10500	-
Greece	0	0	0	0	0	-
Hungary	1177.509	1393.13	2063.56	2844.42	3323.42	4999.92 / 2086
Ireland	-	-	-	-	-	-
Italy	30.162	2.5	2.5	2.5	2.5	-
Latvia	-	-	-	-	-	-
Lithuania	2415.952	2415.95	2415.95	2415.95	2415.95	0 / after 2067
Luxembourg	-	-	-	-	-	-
Malta	-	-	-	-	-	-
The Netherlands	-	-	-	-	-	-
Poland	0.02346	-	-	0.3105	0.4255	-
Portugal	-	-	-	-	-	-
Romania	2289.056	3700	6600	10600	14300	20400.55 / 2080
Slovakia	1505.28	-	2289	-	3380	-
Slovenia	426	516	673	829	900	-
Spain	4685	5424	6679	6679	6679	0 / 2090
Sweden	6296	7500	9500	11000	4000	-
UK	5329	-	-	-	-	11772/ long-term (Date not available)

Table I.3. Spent fuel stored outside European Union territory

	SF in Storage outside EU territory, tHM					
	2013	2020	2030	2040	2050	Other (volume/date)
Austria	-	-	-	-	-	-
Belgium	-	-	-	-	-	-
Bulgaria	838	-	-	-	-	-
Croatia	-	-	-	-	-	-
Cyprus	-	-	-	-	-	-
Czech Republic	0.36	0	0	0	0	-
Denmark	-	-	-	-	-	-
Estonia	-	-	-	-	-	-
Finland	-	-	-	-	-	-
France	-	-	-	-	-	-
Germany	0	0	0	0	0	0
Greece	-	-	-	-	-	-
Hungary	-	-	-	-	-	-
Ireland	-	-	-	-	-	-
Italy	-	-	-	-	-	-
Latvia	-	-	-	-	-	-
Lithuania	0	0	0	0	0	0
Luxembourg	-	-	-	-	-	-
Malta	-	-	-	-	-	-
The Netherlands	0	-	-	-	-	-
Poland	-	-	-	-	-	-
Portugal	-	-	-	-	-	-
Romania	0	0	0	0	0	-
Slovakia	0	0	0	0	0	0
Slovenia	-	-	-	-	-	-
Spain	-	-	-	-	-	-
Sweden	0	0	0	0	0	-
UK	-	-	-	-	-	-

Table I.4. Radioactive waste stored on Member States' territory

		Volume as disposed (m^3)					
		2013	2020	2030	2040	2050	Other (volume/date)
Austria	VLLW	-	-	-	-	-	-
	LLW	2240	2781	3120	3660	3710	-
	ILW	60	63	68	71	74	-
	HLW	-	-	-	-	-	-
Belgium	VLLW	-	-	-	-	-	-
	LLW	16067	-	-	-	-	70500 / Unknown
	ILW	5371	-	-	-	-	11100 / Unknown
	HLW	285	-	-	-	-	4500 / Unknown
Bulgaria	VLLW	4700	-	-	-	-	-
	LLW	23000	-	-	-	-	-
	ILW	10	-	-	-	-	-
	HLW	0	-	-	-	-	-
Croatia	VLLW	-	-	-	-	-	-
	LLW	12.5	113.75	1546.25	1548.75	4561.25	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	41	-
Cyprus	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Czech Republic	VLLW	-	-	-	-	-	-
	LLW	2746.2	2600	2600	2600	2600	-
	ILW	30 t	35 t	45 t	55 t	65 t	-
	HLW	-	-	-	-	-	-
Denmark	VLLW	-	-	-	-	-	-
	LLW	1200	-	-	-	-	-
	ILW	846 t	-	-	-	-	-
	HLW	-	-	-	-	-	-

Estonia	VLLW	-	-	-	-	-	-
	LLW	1550.9	1552.8	1555.5	1558.2	1560.9	-
	ILW	374.6	375	375.6	376.2	376.8	-
	HLW	-	-	-	-	-	-
Finland	VLLW	-	-	-	-	-	-
	LLW	403.7	470	370	270	270	-
	ILW	1473.2	965.8	515.8	265.8	155.8	-
	HLW	-	-	-	-	-	-
France	VLLW	190000	-	-	-	-	-
	LLW	70000	-	-	-	-	-
	ILW	135000	-	-	-	-	-
	HLW	3200	-	-	-	-	-
Germany	VLLW	-	-	-	-	-	-
	LLW	140207	157400	151600	84900	15400	-
	ILW	15590	17500	17600	10200	2500	-
	HLW	568	700	700	700	700	-
Greece	VLLW	29.344	-	-	-	62.344	-
	LLW	21.202	-	-	-	23.602	-
	ILW	-	-	-	-	0.5	-
	HLW	-	-	-	-	-	-
Hungary	VLLW	-	-	-	-	-	-
	LLW	7560	5966	2268	140	140	-
	ILW	3240	2557	972	60	60	-
	HLW	201	266	400	523	610	-
Ireland	VLLW	0	0	0	0	0	0
	LLW	< 30	< 30	< 30	< 30	< 30	< 30
	ILW	0	0	0	0	0	0
	HLW	0	0	0	0	0	0
Italy	VLLW	5311	10036	7753	2189	1557	0 / 2065
	LLW	30545	38087	22511	1635	1684	0 / 2065
	ILW	5540	5911	11463	13713	13713	13713 / 2065
	HLW	0	0	38.1	38.1	38.1	38.1 / 2065

Latvia	VLLW	0	0	0	0	-	-
	LLW	55	1055	75	95	-	-
	ILW	17.5	27.5	32.5	37.5	-	-
	HLW	0	0	0	0	-	-
Lithuania	VLLW	20000	18000	2000	0	0	-
	LLW	30377	35816	15000	0	0	-
	ILW	500	1000	9000	12000	12000	-
	HLW	0	0	0	0	0	-
Luxembourg	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Malta	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
The Netherlands	VLLW	-	-	-	-	-	-
	LLW	11000	-	-	-	-	-
	ILW	43.9	-	-	-	-	-
	HLW	41.7	-	-	-	-	-
Poland	VLLW	51	50	50	50	50	-
	LLW	905	900	900	900	900	-
	ILW	429	450	480	510	540	-
	HLW	0	-	-	-	-	-
Portugal*	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Romania	VLLW	330	-	-	-	-	-
	LLW	672	1100	2000	1800	1600	950 / 2060
	ILW	4.5	60	285	960	1075	1075 / 2060
	HLW	0	0	0	0	0	0 / 2060

Slovakia	VLLW	5246	1000	0	0	0	-
	LLW	1804.4	2000	1600	1400	1000	-
	ILW	24.813	150	1200	1900	1900	-
	HLW	-	-	-	-	-	-
Slovenia	VLLW	-	-	-	-	-	-
	LLW	2306	2562	1519	1885	2021	-
	ILW	37.6	40	2	6	0	-
	HLW	-	-	-	-	-	-
Spain	VLLW	8412	6191	1986	29923	0	0 / 2090
	LLW	8221	9810	3294	18377	0	0 / 2090
	ILW	31	31	45	365	365	0 / 2090
	HLW	12	12	12	12	12	0 / 2090
Sweden	VLLW	2058	-	2000	-	2000	-
	LLW	6958	7000	7000	7000	7000	-
	ILW	4000	5000	12000	15500	10000	-
	HLW	-	-	-	-	-	-
UK	VLLW	1170	-	-	-	-	-
	LLW	69900	-	-	-	-	-
	ILW	153000	-	-	-	-	-
	HLW	1550	-	-	-	-	-

* All waste declared as disposed of.

Table I.5. Radioactive waste stored outside European Union territory (to be returned to Member States)

		Volume as disposed (m^3)					
		Current	2020	2030	2040	2050	Other (volume/date)
Austria	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Belgium	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Bulgaria	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	0	-	1100	-	-	-
Croatia	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Cyprus	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Czech Republic	VLLW	0	0	0	0	0	-
	LLW	0	0	0	0	0	-
	ILW	0	0	0	0	0	-
	HLW	0	0	0.5	0	0	-
Denmark	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Estonia	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-

		Volume as disposed (m^3)					
		Current	2020	2030	2040	2050	Other (volume/date)
	HLW	-	-	-	-	-	-
Finland	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
France	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Germany	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Greece	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Hungary	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Ireland	VLLW	0	0	0	0	0	0
	LLW	0	0	0	0	0	0
	ILW	0	0	0	0	0	0
	HLW	0	0	0	0	0	0
Italy	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Latvia	VLLW	0	0	0	0	0	-
	LLW	0	0	0	0	0	-
	ILW	0	0	0	0	0	-
	HLW	0	0	0	0	0	-

		Volume as disposed (m^3)					
		Current	2020	2030	2040	2050	Other (volume/date)
Lithuania	VLLW	0	0	0	0	0	0
	LLW	0	0	0	0	0	0
	ILW	0	0	0	0	0	0
	HLW	0	0	0	0	0	0
Luxembourg	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Malta	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
The Netherlands	VLLW	0	-	-	-	-	-
	LLW	0	-	-	-	-	-
	ILW	0	-	-	-	-	-
	HLW	0	-	-	-	-	-
Poland	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Portugal	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Romania	VLLW	0	0	0	0	0	-
	LLW	0	0	0	0	0	-
	ILW	0	0	0	0	0	-
	HLW	0	0	0	0	0	-
Slovakia	VLLW	0	0	0	0	0	0
	LLW	0	0	0	0	0	0
	ILW	0	0	0	0	0	0
	HLW	0	0	0	0	0	0

Slovenia	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Spain	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Sweden	VLLW	0	0	0	0	0	-
	LLW	0	0	0	0	0	-
	ILW	0	0	0	0	0	-
	HLW	0	0	0	0	0	-
UK	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-

Table I.6. Disposed of radioactive waste on Member States' territory

		Volume as disposed (m^3)					
		Current	2020	2030	2040	2050	Other (volume/date)
Austria	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Belgium	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Bulgaria	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	138200/2086
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Croatia	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Cyprus	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Czech Republic	VLLW	-	-	-	-	-	-
	LLW	10834	13864	19559	24959	30359	-
	ILW	0	0	0	0	0	-
	HLW	0	0	0	0	0	-
Denmark	VLLW	-	-	-	-	-	
	LLW	-	-	-	-	-	
	ILW	-	-	-	-	-	
	HLW	-	-	-	-	-	5000 - 10000
Estonia	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-

		Volume as disposed (m^3)					
		Current	2020	2030	2040	2050	Other (volume/date)
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Finland	VLLW	-	-	-	-	-	-
	LLW	5999.8	7191	15013	31435	33057	-
	ILW	1948	3561	9486	12441	12696	-
	HLW	0	0	-	-	-	-
France	VLLW	250000	-	-	-	-	-
	LLW	810000	-	-	-	-	-
	ILW	0	-	-	-	-	-
	HLW	0	-	-	-	-	-
Germany	VLLW	-	-	-	-	-	-
	LLW	75378	75378	147400	237400	327400	-
	ILW	8375	8375	16400	26400	36400	-
	HLW	0	0	0	0	0	-
Greece	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Hungary	VLLW	-	-	-	-	-	-
	LLW	3915	5983	11739	16183	-	65590/2100
	ILW	1678	2564	5031	6936	-	28110/2100
	HLW	0	0	0	0	0	1019/2100
Ireland	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Italy	VLLW	-	-	10117	20278	20910	22467/2065
	LLW	-	-	26416	52944	54595	58659/2065
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-

Latvia	VLLW	0	0	0	0	-	-
	LLW	803	803	1803	1803	-	-
	ILW	15	15	15	15	-	-
	HLW	0	0	0	0	-	-
Lithuania	VLLW	0	8000	40000	60000	60000	-
	LLW	0	0	51130	96130	96130	-
	ILW	0	0	0	0	0	12000/after 2067
	HLW	-	-	-	-	-	-
Luxembourg	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Malta	VLLW	-	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
The Netherlands	VLLW	- **	-	-	-	-	-
	LLW	-	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Poland	VLLW	793	970	1230	1490	1800	-
	LLW	1208	1350	3900	13300	22830	-
	ILW	401	400	400	400	400	-
	HLW	0	-	-	-	-	-
Portugal	VLLW	-	-	-	-	-	-
	LLW	234	269	339	423	493	-
	ILW	31	56	106	160	210	-
	HLW	-	-	-	-	-	-
Romania	VLLW	-	-	-	-	-	-
	LLW	2130	2660	5670	10930	15430	19930/2060
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-

Slovakia	VLLW	265	12726	29000	29000	29000	-
	LLW	11595	21558	36912	40494	43644	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-
Slovenia	VLLW	-	-	-	-	-	-
	LLW	0	0	1452	1452	2187	-
	ILW						-
	HLW	-	-	-	-	-	-
Spain	VLLW	8365	20032	42032	72032	101955	101955/2090
	LLW	30260	34562	52562	67562	85939	85939/2090
	ILW	-	-	-	-	-	365/2090
	HLW	-	-	-	-	-	12/2090
Sweden	VLLW	19659	-	-	-	-	-
	LLW	34953	50000	90000	110000	150000	157000/2076
	ILW	0	0	0	0	5500	15500/2076
	HLW	0	0	200*	4000*	8000*	12600*/2076
UK	VLLW	-	-	-	-	-	-
	LLW	1037600	-	-	-	-	-
	ILW	-	-	-	-	-	-
	HLW	-	-	-	-	-	-

* Spent fuel disposed of (Mass of heavy metal, tHM)

** Not registered.

Table I.7. Other radioactive waste on Member States' territory

	Waste type	Amount				
		2013	2020	2030	2040	2050
Austria	DSRS (number)	-	-	-	-	-
	NORM (m^3)	-	-	-	-	-
Belgium	DSRS (number)	-	-	-	-	-
	NORM (m^3)	-	-	-	-	-
	Radium extracting waste (m^3)	85 000	-	-	-	-
Bulgaria	DSRS (number)	-	-	-	-	-
	NORM (m^3)	-	-	-	-	-
Croatia	DSRS (number)	-	-	-	-	-
	NORM (m^3)	-	-	-	-	-
Cyprus	DSRS (number)	365	-	-	-	-
	NORM (m^3)	-	-	-	-	-
Czech Republic	DSRS (number)	33119	-	-	-	-
	NORM (m^3)	-	-	-	-	-
Denmark	DSRS (number)	-	-	-	-	-
	NORM (tons)	450 t	750 t	1250 t	1750 t	-
	Tailings and ore (tons)	4800 t	-	-	-	-
Estonia	DSRS (number)	-	-	-	-	-
	NORM (m^3)	23.7	26.7	30.7	34.7	-
Finland	DSRS (number)	-	-	-	-	-
	NORM (m^3)	-	-	-	-	-
France	DSRS (number)	2300000	-	-	-	-
	NORM (tons)	50000000 t				
	Uranium conversion treatment residues (m^3)	690000	635000	688000	-	-
	Products remaining after extraction of the uranium contained by the ore (tons)	50000000 t			-	-
Germany	DSRS (number)	-	-	-	-	-
	NORM (m^3)	-	-	-	-	-
Greece	DSRS (number)	6564	-	-	-	-
	NORM (m^3)	100	-	-	-	-
Hungary	DSRS (number)	35376	37251	41001	44751	48501
	NORM (m^3)	-	-	-	-	-

Ireland	DSRS (number)	26	< 50	< 50	< 50	< 50
	NORM (m^3)	-	-	-	-	-
Italy	DSRS (GBq)	1135464	-	-	-	-
	NORM (m^3)	-	-	-	-	-
Latvia	DSRS (number)	0	0	0	0	0
	NORM (m^3)	0	0	0	0	0
Lithuania	DSRS (number)	45000	50000	80000	80000	80000
	NORM (m^3)	67	67	67	67	67
Luxembourg	DSRS (number)	0.1 m^3	-	-	-	< 2 m^3
	Contaminated material (m^3)	0.1	-	-	-	-
Malta	DSRS (number)	15	-	-	-	-
	NORM (m^3)	-	-	-	-	-
	Uranium salts (kg)	2.23 kg	-	-	-	-
	Thorium salts (kg)	0.125 kg	-	-	-	-
The Netherlands	DSRS (number)	-	-	-	-	-
	NORM (m^3)	17000	-	-	-	-
Poland	DSRS (number)	-	-	-	-	-
	NORM (m^3)	-	-	-	-	-
Portugal	DSRS (number)	-	-	-	-	-
	NORM (m^3)	200	250	350	450	550
Romania	DSRS (number)	-	-	-	-	-
	NORM (m^3)	2679900	-	-	-	-
	Other (m^3)	25135	-	-	-	-
	Sterile and radioactive rock (m^3)	7072525	-	-	-	-
Slovakia	DSRS (number)	2266	-	-	-	-
	NORM (m^3)	-	-	-	-	-
Slovenia	DSRS (number)	-	-	-	-	-
	NORM (m^3)	1614443	1614443	1614443	1614443	-
Spain	DSRS (number)	2376	-	-	-	-
	NORM (m^3)	-	-	-	-	-
Sweden	DSRS (number)	-	-	-	-	-
	NORM (m^3)	-	-	-	-	-
UK	DSRS (number)	-	-	-	-	-
	NORM (m^3)	-	-	-	-	-

Table I.8. Radioactive waste disposed of at sea[13]

	Activity, GBq
Austria	-
Belgium	29 730.5
Bulgaria	-
Croatia	-
Cyprus	-
Czech Republic	-
Denmark	-
Estonia	-
Finland	-
France	354 000
Germany	203.5
Greece	-
Hungary	-
Ireland	-
Italy	185
Latvia	-
Lithuania	-
Luxembourg	-
Malta	-
The Netherlands	340 000
Poland	-
Portugal	-
Romania	-
Slovakia	-
Slovenia	-
Spain	-
Sweden	3255
UK	35 109 397

[13] The London Convention that entered into force in 1975 prohibits such practices and promotes the effective control of all sources of pollution of the marine environment.

Table I.9. Comparison of global European Union radioactive wastes in disposal (m^3, rounded to thousands)

	6th report[3] (2004*)	**7th report[4] (2007*)**	**EC internal data (2010*)**	**2013**	**2020****	**2030****	**2040****	**2050****
Total waste	**1 856 000 (1 851 000)**	**2 083 000 (2 045 000)**	**2 214 000 (2 188 000)**	**2 316 000**	**271 000**	**617 000**	**934 000**	**1 130 000**
VLLW	34 000	105 000	197 000	279 000	42 000	122 000	183 000	214 000
LLW	1 822 000 (1 817 000)	1 977 000 (1 940 000)	2 017 000 (1 991 000)	2 025 000	214 000	464 000	705 000	862 000
ILW	0	0	0	12 000	15 000	31 000	46 000	55 000
HLW	0	0	0	0	0	0	0	0

* Reviewed and updated data

** Not all Member States reported such information, thus the values given do not represent the overall EU situation

Table I.10. Comparison of global European Union spent fuel and radioactive wastes in storage (m^3, rounded to thousands)

	6th report[3] (2004*)	7th report[4] (2007*)	EC internal data (2010*)	2013	2020**	2030**	2040**	2050**
Total SF	38 000	45 000	53 000	54 000	49 000	64 000	50 000	51 000
Total radioactive waste	**800 000 (798 000)**	**546 000 (962 000)**	**585 000 (909 000)**	**997 000**	**339 000**	**286 000**	**217 000**	**91 000**
VLLW	176 000	33 000 (175 000)	32 000 (217 000)	237 000	35 000	14 000	32 000	4 000
LLW	401 000 (411 000)	222 000 (495 000)	133 000 (365 000)	428 000	269 000	217 000	128 000	43 000
ILW	217 000 (206 000)	287 000 (288 000)	415 000 (321 000)	326 000	34 000	54 000	56 000	43 000
HLW	6 000 (5 000)	4 000	5 000	6 000	1 000	1 000	1 000	1 000

* Reviewed and updated data (Significant changes are mainly due to inclusion of missing data for France and review of UK data)

** Not all Member States reported such information, thus the values given do not represent overall EU situation

Table I.11. Comparison of global European Union spent fuel and radioactive wastes (m^3, rounded to thousands)

	6th report[3] (2004*)	**7th report[4] (2007*)**	**EC internal data (2010*)**	**2013**	**2020****	**2030****
Total SF	38 000	45 000	53 000	54 000	49 000	64 000
Total radioactive waste	**2 655 000 (2 649 000*)**	**2 628 000 (3 007 000*)**	**2 799 000 (3 097 000*)**	**3 313 000**	**610 000**	**903 000**
VLLW	210 000	138 000 (280 000*)	229 000 (414 000*)	516 000	77 000	136 000
LLW	2 223 000 (2 228 000*)	2 199 000 (2 435 000*)	2 150 000 (2 356 000*)	2 453 000	483 000	681 000
ILW	217 000 (206 000*)	287 000 (288 000*)	415 000 (321 000*)	338 000	49 000	85 000
HLW	6 000 (5 000*)	4 000	5 000	6 000	1 000	1 000

* Reviewed and updated data (Significant changes are mainly due to inclusion of missing data for France and review of UK data)

** For 2020 and 2030 UK did not provide data thus the values given do not represent overall EU situation