France

The following report presents the French National Profile for use in the International Atomic Energy Authority (IAEA) Status and Trends project.

1. National Framework for management of radioactive waste and spent fuel

In France, the management of radioactive waste is governed by the act of 28 June 2006 on the sustainable management of radioactive materials and waste, codified in the French Environment Code, and its implementing decrees. This act establishes a road map for the management of all radioactive waste, notably by imposing the adoption every three years of a national plan for the management of radioactive materials and waste (PNGMDR).

Some radioactive substances are materials, while others are waste. As defined by the Environment Code, radioactive materials are substances for which subsequent use is planned or envisaged. This chiefly concerns fuels in use or spent fuels, natural, enriched, depleted or reprocessed uranium, plutonium and thorium. Radioactive waste consists of radioactive substances for which no subsequent use is planned or envisaged.

It entrusts to the National agency for radioactive waste management (Andra), a public body, the mission of managing radioactive waste in the long term, with particular responsibility for designing and operating disposal facilities.

In France, the main stakeholders in radioactive materials and waste management are:

- the producers of radioactive materials and waste, in particular Areva, CEA and EDF;
- the French National Radioactive Waste Management Agency (Andra), which is the manager for radioactive waste and whose duties include the design and operation of storage facilities and the disposal repositories, the performance of studies and research into storage and deep geological disposal, the collection of radioactive waste for which the parties responsible have defaulted, and providing public information;
- research institutes working in the field of radioactive materials and waste management, other than Andra: CEA, CNRS and the Institute for Radiation Protection and Nuclear Safety (IRSN);
- the Ministries responsible for energy, the environment and research. In particular, at the Ministry for Ecology, Sustainable Development and Energy (MEDDE), the General Directorate for Energy and Climate (DGEC) drafts policy and implements the Government's decisions concerning the civil nuclear sector, except for those dealing with nuclear safety and radiation protection;
- the French Nuclear Safety Authority (ASN), an independent administrative authority which regulates nuclear safety and radiation protection for civil nuclear facilities and activities; the Defence Nuclear Safety Regulator (ASND) performs the same role for Defence-related matters.
- the Institute for Radiation Protection and Nuclear Safety (IRSN) provides the nuclear safety regulators with technical support;
- the Parliamentary Office for the Evaluation of Scientific and Technical Choices (OPECST) whose role is to inform Parliament of the consequences of scientific and technological choices, so that it can take informed decisions;
- the National Assessment Commission (CNE) which carries out an annual assessment of research and forwards its report to Parliament;
- the National Assessment Commission for financing the cost of decommissioning of basic nuclear installations and of managing spent fuels and radioactive waste (CNEF). It assesses the control made by the administrative authority to ensure that the updated provisions are able to meet the gross costs, as evaluated by the licensees, along with management of the dedicated assets;

- representatives of civil society, environmental protection associations and representatives of elected officials, who take part in the debates organised to promote transparency and consultation. In this field, it is important to underline the role of the High Committee for Transparency and Information on Nuclear Security (HCTISN), the local information and monitoring committee (CLIS), set up for the Meuse – Haute-Marne underground laboratory, and the local information committees set up for each of the basic nuclear installations (BNI) and grouped into a National Association of Local Information Committees and Commissions (ANCCLI).

Under the control of the State, radioactive waste management is financed by the nuclear licensees, in accordance with the polluter-pays principle.

An arrangement to ring-fence secure financing of long-term nuclear costs, instituted by the 28th June 2006 Act and codified in the Environment Code, provides for the creation of a portfolio of dedicated assets by the nuclear licensees during the period of operation. To do this, the licensees are required to assess the long-term costs, including the cost of decommissioning and the costs linked to management of the spent fuels and radioactive waste. They must be able, today, to guarantee coverage of future costs by creating dedicated assets with a high level of security.

These operations are closely monitored by the State, through an administrative authority formed by the Ministers responsible for the economy and for energy.

Therefore, in order to carry out its oversight duties, the administrative authority receives a three-yearly report from the licensees assessing the long-term costs, the methods and choices made for management of the dedicated assets and a quarterly inventory of these dedicated assets. In addition, an extra-Parliamentary commission, the National Assessment Commission for financing the cost of decommissioning of Basic Nuclear Installations and of managing spent fuels and radioactive waste (CNEF), assesses the oversight performance of the administrative authority and submits a three-yearly report on its assessments to Parliament, as well as to the High Committee for Transparency and Information on Nuclear Safety (HCTISN).

2. National legal and regulatory framework

There are three types of civil nuclear activity and installation, subject to different regulations and corresponding to a graded approach:

- Basic nuclear installations (BNI): above certain criteria defined by ministerial decree (based in particular on the activity and radionuclides concerned), an installation using radioactive materials is regulated as a "basic nuclear installation" (BNI) and is therefore placed under the supervision of the Nuclear Safety Authority (ASN). The act of 13 June 2006 and its implementing decrees define the regulatory framework within which these installations are designed, operated and decommissioned.

- Installations classified for the protection of the environment (ICPE): below the BNI criteria and above other criteria, a facility using nuclear materials is regulated as an installation classified for the protection of the environment (ICPE) and is placed under the supervision of the prefects. These installations are governed by the provisions of the Environment Code. Fuel cycle front-end and very low-level waste management installations are especially concerned.

- Activities handling radioactive materials that do not appear on the BNI or ICPE list fall under the Public Health Code and are placed under the supervision of the ASN. These are activities that handle very low quantities of radioactive waste. Medical activities are especially concerned.

The act of 13 June 2006 established the Nuclear Safety Authority (ASN), tasked with regulating radiation protection and nuclear safety for basic nuclear installations and the activities that fall under the Public Health Code, independent of the government and nuclear operators.

At the European level, the council directive of 19th July 2011 established a community framework for the safe and responsible management of spent fuel and radioactive waste. It reaffirms the responsibility of each State for the management of its radioactive waste. This directive, in particular, requires that the Member states set up a national programme for management of spent fuel and

radioactive waste, as is already the case in France, with the drafting of the PNGMDR and the National Inventory.

The national framework for the management of radioactive materials and waste is defined by the Programme Act 2006-739 of 28th June 2006, concerning the sustainable management of radioactive materials and waste and dealing with the definition of a management policy for radioactive materials and waste, for improving transparency and for financing and economic support. The Act specifies that the management of radioactive materials and waste must comply with the following fundamental principles:

- protection of the individual health and the environment;
- reduction in the quantity and harmfulness of radioactive waste;
- prevention or mitigation of the burden borne by future generations;
- the polluter-pays principle, which applies in environmental law.

The PNGMDR organises the implementation of research and studies into the management of materials and waste, in accordance with the three directions defined by the Act:

- reducing the quantity and harmfulness of the waste, in particular by reprocessing spent fuels and processing and packaging radioactive waste;
- storage as a preliminary step, in particular with a view to fuel and waste reprocessing, or to disposal of the waste;
- after storage, deep geological disposal as a permanent solution for ultimate waste that cannot be disposed of on the surface or at shallow depth, for nuclear safety or radiation protection reasons.

In the field of transparency, the Act in particular gives the National Assessment Commission the task of assessing research into the management of radioactive materials and waste. It also makes provision for regular information and consultation by the French High Committee for Transparency and Information on Nuclear Security (HCTISN). Finally, it requires that the PNGMDR be transmitted to Parliament, which refers the assessment to the Parliamentary Office for the Evaluation of Scientific and Technical Choices, and be made public.

3. Radioactive waste management, decommissioning and spent fuel strategy and current practices and technologies

3.1 Existing management modes

This section provides an overview of the existing management routes as at the end of 2012. It underlines the areas for improvement for management of radioactive materials and waste, in order to deal with:

- radioactive materials;
- radioactive waste (processing, disposal).

3.1.1 Management of radioactive materials

A radioactive material is defined as being a radioactive substance for which subsequent use is planned or envisaged, if necessary after processing. These materials can be used in France or abroad.

<u>Spent fuel</u>

All the spent fuel present on French soil is intended to be reprocessed. The uranium (reprocessed) and the extracted plutonium can be reused.

<u>Uranium</u>

- Natural uranium: Used by the enrichment plants to produce the two types of substances: enriched uranium and depleted uranium.

- Enriched uranium: This is intended for the fabrication of fuels, to produce electricity of nuclear origin.
- Depleted uranium:
  - Used for the fabrication of the MOX fuel utilised in some EDF reactors.
  - Can be re-enriched, which can be economically advantageous if the price of natural uranium rises or in the event of developments in enrichment techniques.
  - In the longer term, it could be reusable on a large scale in 4th Generation fast neutron reactors.
- Recycled uranium from reprocessed spent fuel (URT) : Extracted from spent fuels, re-enriched to produce enriched recycled uranium (URE) used in the fabrication of fuel;

Plutonium

Contained in spent fuel assemblies, extracted when they are reprocessed and used for the fabrication of the MOX fuel utilised in some EDF reactors.

Thorium

Could be used in various types of reactors as a fuel in a thorium cycle, but not for several decades yet, given the amount of research and development work still necessary. Other applications are currently under development, in particular for the treatment of certain cancers.

3.1.2 Waste management by radioactive decay

Waste management by radioactive decay is for waste in which the radionuclides have a half-life of less than 100 days, originating mainly from nuclear medicine departments and research laboratories. After storage for radioactive decay, they are sent to management routes dedicated to conventional waste.

This is also an intermediate step in the management of certain radioactive waste produced in the basic nuclear installations, in particular waste containing tritium. This management method requires the construction of appropriate storage facilities.

3.1.3 Reusing radioactive waste

Recycling reusable materials extracted from waste is an area for particular focus, pursuant to the fundamental principles laid down in Article L.541-1 of the Environment Code. In France, there are two recycling alternatives for reusing radioactive waste in the nuclear facilities, commissioned in the 2000s:

- Centraco smelting facility for recycling ferrous metal waste in the form of radiation shielding materials integrated into concrete containers for the fabrication of radioactive waste packages;
- the lead recycling route which, after decontamination, enables the lead to be made into shielding material.

3.1.4 Incinerating radioactive waste

Waste incineration provides a real answer to the management of a broad spectrum of VLL and LL-SL radioactive waste. It is for example, a way of preserving disposal site resources by reducing the volume of ultimate radioactive waste by a factor of 10 to 20. The Centraco incinerator, which entered service in 1999, can thus process solid waste (gloves, overshoes, plastics, etc.) and aqueous and organic liquid waste, in particular oils and solvents, resulting from the day to day operation of nuclear facilities or from small producers of waste outside the nuclear power generating sector (hospitals, etc.).

3.1.5 Disposal of very low level (VLL) waste

The management policy for the VLL waste produced by nuclear facilities in France is not based on clearance levels, in other words a level below which a material is no longer subject to the regulations

and can be considered as conventional. It is dependent on the origin of the waste within the facility. All contaminated or activated waste, or waste that is liable to be so, is considered to be radioactive waste and must follow specific, rigorous management, including disposal in a facility dedicated to radioactive waste. A disposal facility, located in the industrial centre for collection, storage and disposal (Cires) operated by Andra, has been accepting this type of waste since 2003.

At the end of 2013, the total volume placed in the Cires was about 250,000 m^3, or 38% of the authorised regulation capacity (650,000 m^3) and the latest production estimates indicate that needs will approximately double the inventory of waste to that originally identified to be disposed of in this facility.

3.1.6 Disposal of low and intermediate level, short lived waste (LL/ILW-SL)

"Short-lived" low and intermediate level waste (in which the radioactivity mainly comes from radionuclides with a half-life of less than 31 years) has, since 1969, been disposed of in dedicated surface repositories.

Between 1969 and 1994, the Manche waste disposal facility received 527,000 m^3 of waste packages and entered the surveillance phase in 2003. The leaktightness of the facility is based on the installation of a cover, the long-term stability of which requires consolidation (reducing the steepness of the slopes) which will take place over a period of about fifty years. Steps have been taken to ensure that records and memory of the facility and the waste emplaced in it are kept for future generations.

At the end of 2013, the total volume of packages emplaced in the Aube waste disposal facility (CSA) was about 280,000 m^3, or 28% of the authorised regulation capacity (1,000,000 m^3). Efforts made at source to reduce the amount of LL/ILW-SL waste produced, and the commissioning of a VLL waste repository in the Cires, plus the smelting and incineration routes, have enabled the lifetime of the repository to be extended.

3.2 The management routes to be implemented: current needs and future outlook

This part presents the long-term management methods under development for certain waste categories which do not yet have a solution, in particular waste containing tritium, sealed radioactive sources, low level, long-lived waste (LLW-LL) and high and intermediate level, long-lived waste (HLW/ILW-LL). It also looks at the case of very small quantities of waste which cannot at present be linked to any long-term solution under development.

3.2.1 Management of low level, long-lived (LLW-LL)

Low level, long-lived radioactive waste (LLW-LL) requires specific management, appropriate to its long lifetime, which rules out disposal in Andra's facilities in the Aube. This waste in particular comprises graphite waste from the operation and future decommissioning of EDF's graphite moderated, gas-cooled, natural uranium type reactors, radium-bearing waste, mainly from the processing of ores containing rare earths, some of the bitumen packages on the Marcoule nuclear site and uranium conversion residues from the Areva plant in Malvési. Pending their disposal, possibly following processing, the packages of LLW-LL waste are currently stored in facilities on the sites of the producers.

In 2008, the search for a disposal site capable of taking LLW-LL type waste was unsuccessful. Therefore, in order to learn the experience feedback lessons, working groups were set up, in particular in the HCTISN and within the framework of the Aarhus Convention. They submitted their recommendations in order improve preparations for the search for the future LLW-LL disposal site.

Two concepts are being envisaged for final disposal of LLW-LL waste: Reworked Cover Disposal (SCR) in an outcropping geological layer by excavation and then backfill, and Intact Cover Disposal (SCI), excavated underground in a layer of clay at a greater depth. Various scenarios are being studied for each type of LLW-LL waste. In particular, the possibility of processing and sorting of part of this waste (graphite waste and drums of bitumen packages) is being examined in order to optimise LLW-LL waste management.

3.2.2 Management of High and Intermediate Level, Long-lived waste (HLW/ILW-LL)

The management of HLW/ILW-LL waste is studied according to the three complementary focal points identified in the 28th June 2006 Act on the sustainable management of radioactive materials and waste, now codified in the Environment Code: reversible disposal in a deep geological layer, storage and the separation and transmutation of long-lived radionuclides. In addition, research is being carried out into the processing and packaging of the waste.

The Environment Code identifies deep geological disposal as the solution for the long-term management of ultimate radioactive waste which cannot be disposed of on the surface or at shallow depth, for nuclear safety or radiation protection reasons. The 28th June 2006 Act requires commissioning of a reversible deep geological disposal facility in 2025. The underground installations in the planned repository, called Cigéo (French acronym for industrial centre for geological disposal) would be located in a layer of clay, at a depth of about 500 m. The research being carried out by Andra in the underground laboratory in the Meuse and Haute Marne départements has produced significant results concerning the feasibility and safety of such a repository.

Storage allows the safe management of HLW/ILW-LL waste pending the opening of a long-term management facility. The waste packages are stored in facilities on the sites of the producers.

4. Radioactive waste classification, waste and spend fuel quantities (inventory)

4.1 Radioactive waste classification

With regard to radioactive waste, the usual French classification relies on two main parameters, when defining the appropriate management method:

- **the activity level**, which corresponds to the number of disintegrations per unit of time of the radioactive elements contained in the waste. In other words, this refers to the level of radioactivity. Depending on the quantity and nature of the radioactive substances contained in the waste, it can be very low, low, intermediate or high level;
- **the radioactive half-life** of the radionuclides contained in the waste. The radioactive half-life corresponds to the time needed for half the quantity of atoms in a radioactive element to have decayed. The half-life varies with the characteristics of each radionuclide. After 10 half-lives, the level of radioactivity of an element is divided by about 1000. This period of ten half-lives is generally considered to represent the lifetime of a radionuclide. A particular distinction is made between waste for which the radioactivity comes primarily from radionuclides with a half-life of less than 31 years (waste referred to as short-lived – SL) and waste for which the radioactivity comes primarily from radionuclides with a half-life of more than 31 years (waste said to be long-lived - LL).

This classification comprises the following main categories:

- **high-level waste** (HLW), mainly from spent fuels after reprocessing. It is conditioned in glass packages;
- **intermediate level, long-lived waste** (ILW-LL), also mainly from spent fuels after reprocessing and activities involved in the operation and maintenance of fuel reprocessing plants. This comprises structural waste, hulls and end-pieces making up the nuclear fuel cladding, conditioned in cement-encapsulated or compacted waste packages, along with technological waste (used tools, equipment, etc.) or waste resulting from the treatment of effluents, such as bituminised sludges;
- **low level, long-lived waste** (LLW-LL), mainly graphite waste and radium-bearing waste. Graphite waste comes primarily from the decommissioning of the gas-cooled reactors. Radium-bearing waste is mainly produced by the nuclear industry unrelated to power generation (such as the processing of ores containing rare earths). This category also comprises other types of waste,

such as certain legacy bitumen packages, uranium conversion treatment residues from the Areva plant in Malvési, and so on;

- **low level and intermediate level, short-lived waste** (LL/ILW-SL), mainly from the operation, maintenance and decommissioning of nuclear power plants, fuel cycle facilities, research centres and, to a far lesser extent, from medical research activities;
- **very low level waste** (VLLW), mainly from the operation, maintenance and decommissioning of nuclear power plants, fuel cycle facilities and research centres;
- **very short lived waste**, mainly from the medical and research sectors. This waste is stored on the site on which it was used, to allow radioactive decay, before disposal through a conventional route corresponding to its physical, chemical and biological characteristics.

This classification enables each waste category to be associated with one or more management solutions, as summarised in the following table.

	Very short lived waste *containing radionuclides with a halflife of < 100 days*	Short lived waste *in which the radioactivity comes mainly from radionuclides with a half-life ≤ 31 years*	Long lived waste *containing mainly radionuclides with a half-life > 31 ans*
Very low level (VLL)	**Management by radioactive decay on the production site**	***Recycling or dedicated surface disposal*** *(Industrial centre for collection, storage and disposal (Cires) disposal facility in the Aube département)*	
Low level (LL)	*then disposal through routes dedicated to conventional waste*	***Surface disposal*** *(Aube waste disposal facility)*	***Shallow depth disposal*** *(being studied pursuant to the Act of 28 June 2006)*
Intermediate level (IL)			
High level (HL)	Not applicable[1]	***Deep geological disposal*** *(being planned pursuant to the 28th June 2006 Act)*	

Hundreds Bq/g
Millions Bq/g
Billions Bq/g

[1]The category high level, very short lived waste does not exist.

This usual waste classification is a simplified guide to the orientation of radioactive waste and the identification of its disposal solutions. It does not however take into account of certain complicating factors which lead to a management solution being chosen which is different from the waste's particular category. Other criteria, such as stability, or the presence of toxic chemical substances and even attractiveness of the waste, must be considered.

4.2 Waste and spend fuel quantities (inventory)

The radioactive waste taken into account for the statements set out in this chapter is that which is to be dealt with by Andra in disposal facilities dedicated to management of such waste.

The following are not quantified:

- residues from treatment of uranium ores that are disposed of on certain former mining sites. The National Inventory lists 20 sites on which the residues are disposed of ;
- the waste "disposed of in situ" that was disposed of in the past close to nuclear facilities or plants. It usually takes the form of mounds, backfills or lagoons ;
- waste dumped at sea ;
- radioactive substances located on sites that have accommodated activities involving handling of radioactivity ;

- very short-lived (VSL) waste that is managed on site during its decay period and then disposed of by conventional methods. This waste is not sent to a radioactive waste disposal facility.

Summary information for radioactive waste inventory is provided in Table 1. Table 2 provides a summary of waste disposed.

TABLE 1: Radioactive Waste in Storage at the end of 2013:

Waste Class	Proced	Volume (m^3)	RO %	FF/FE %	RP %	NA %	DF %	DC/RE %	ND %
Total of All classes	Y	~398,000	0%	0%	0%	0%	0%	0%	100%
VLLW	Y	190,000	0%	0%	0%	0%	0%	0%	100%
LILW-SL	Y	70,000	0%	0%	0%	0%	0%	0%	100%
LLW-LL	Y	91,000	0%	0%	0%	0%	0%	0%	100%
ILW-LL	Y	44,000	0%	0%	0%	0%	0%	0%	100%
HLW	Y	3,200	0%	0%	0%	0%	0%	0%	100%

RO – Reactor Operations
FFE – Fuel Fabrication/Enrichment
RP – Fuel Reprocessing
NA – Nuclear Applications
DF – Defense Waste
DC/RE – Decommissioning/Remediation
ND - Not Determined

TABLE 2: Radioactive Waste Disposed (as disposed volume) at the end of 2013:

Waste Class	Proced	Volume (m^3)	RO %	FF/FE %	RP %	NA %	DF %	DC/RE %	ND %
Total of All classes	Y	~1,060,000	0%	0%	0%	0%	0%	0%	100%
VLLW	Y	250,000	0%	0%	0%	0%	0%	0%	100%
LILW-SL	Y	810,000	0%	0%	0%	0%	0%	0%	100%

RO – Reactor Operations
FFE – Fuel Fabrication/Enrichment
RP – Fuel Reprocessing
NA – Nuclear Applications
DF – Defense Waste
DC/RE – Decommissioning/Remediation
ND - Not Determined

The National Inventory sets out the sources of radioactive waste on the basis of five economic sectors that lead to production, holding or management of radioactive waste.

Nuclear power sector: This includes mainly the nuclear power plants, together with the nuclear fuel production and processing plants (extraction and processing of uranium ore, chemical conversion of uranium concentrates, fuel enrichment and manufacturing, spent fuel processing and recycling).

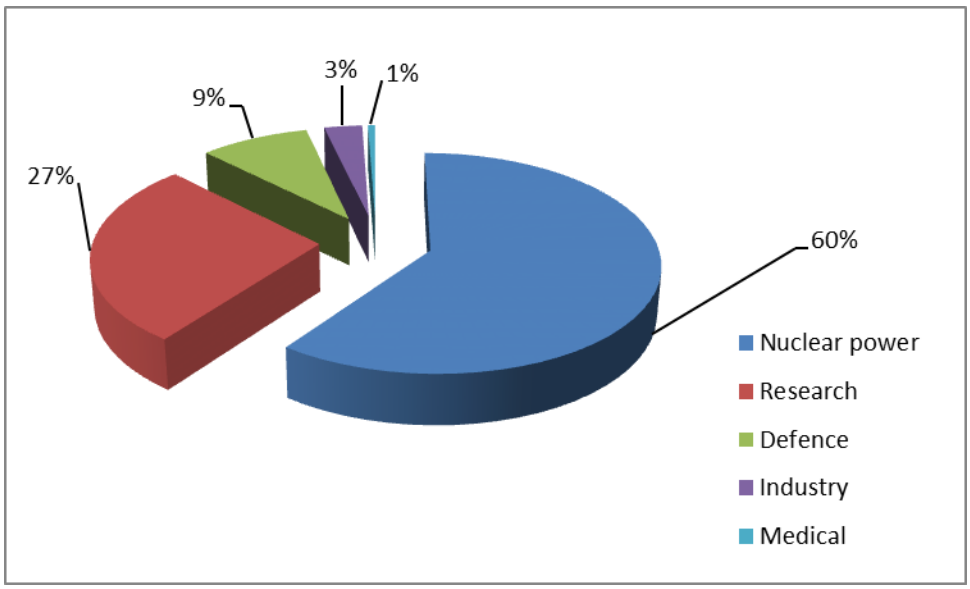
Research sector: This includes research in the civil nuclear field, medical research laboratories, particle physics, agronomics, chemistry, etc.

Defence sector: This covers mainly activities linked to nuclear deterrents, including the nuclear propulsion systems of certain ships and submarines, together with the corresponding research activities.

Industry sector (other than nuclear power plants): This covers mainly extraction of rare earth elements and production of sealed sources, together with various applications such as welding inspections, sterilisation of medical equipment, sterilisation and preservation of foodstuffs, etc.

Medical sector: This includes therapeutic, diagnosis and research activities.

Breakdown of the total volume of waste (in storage and disposed) by economic sector:



The France has developed a matrix which allows a summary level translation from French waste classes to IAEA waste classes, provided as Table 5.

Table 3: Spent Fuel in Storage (MTHM)

Type	Current Amount (NPP) tHM	Current Amount (Research Reactors) tHM
Total Spent Fuel Storage		118
Wet storage (AR)	4,226	
Wet storage (AFR)	9,720	
Dry storage (AR)	-	
Dry storage (AFR)	-	
Total spent fuel held in storage for other countries (amounts also included above)	30	-

AR = “at reactor site”, including fuel pools at NPP
AFR = “away from reactor site”

Table 4: Spent Fuel sent for reprocessing (MTHM)

Type	Current Amount (NPP) tHM	Current Amount (Research Reactors) tHM
Total amount Spent Fuel sent to Reprocessing and Recycling (in your country)	9,720	9
Total amount Spent Fuel sent to Reprocessing and Recycling (in another country)	-	-
Total amount of Spent Fuel received from another country for reprocessing and recycling	30	-
Total amount of Spent Fuel returned to country of origin for storage/disposal	-	-

AR = “at reactor site”, including fuel pools at NPP
AFR = “away from reactor site”

Table 5: Translation Matrix

	Distribution %			
Waste Class Name	VLLW	LLW	ILW	HLW
VLLW	100.0	0.0	0.0	0.0
LILW-SL	0.0	100.0	0.0	0.0
LLW-LL	0.0	0.0	100.0	0.0
ILW-LL	0.0	0.0	100.0	0.0
HLW	0.0	0.0	0.0	100.0

There are some difficulties to transferring RW inventory data from the French classification into the IAEA classification, especially about LLW with long-lived radionuclides.

Figures with French classification :

Waste Class Name	Volume (m^3)
HLW	3,200
ILW-LL	44,000
LLW-LL	91,000
LILW-SL	880,000
VLLW	440,000

Figures with IAEA classification :

Waste Class Name	Volume (m^3)
HLW	3,200
ILW	135,000
LLW	880,000
VLLW	440,000

Those figures should be used only in the context of the Status & Trends report to compare with other countries.

5. Tabulation of processing, storage and disposal facilities

Summary information for spent fuel and radioactive waste disposal, storage and treatment facilities is provided in Table 6. Table 7 provides a summary of major sources of waste produced in France.

TABLE 6: Processing, Storage & Disposal Facilities

PROCESSING, STORAGE AND DISPOSAL FACILITIES								
TYPE	PLANNED	CONS TRUCTION	COMMI SSIONING	IN OPERATION	SHUT DOWN	DECOMMI SSIONING	OTHER	TOTAL
SPEND FUEL STORAGE				5				**5**
WASTE DISPOSAL HLW & ILW-LL	1							**1**
WASTE DISPOSAL LLW-LL	1							**1**
WASTE DISPOSAL ILW-SL				1	1			**2**
WASTE DISPOSAL VLLW				1				**1**

TABLE 7: Summary of Major Sources of Waste

SUMMARY OF MAJOR SOURCES OF WASTE								
TYPE	PLANNED	CONS TRUCTION	COMMI SSIONING	IN OPERATION	SHUT DOWN	DECOMMI SSIONING	OTHER	TOTAL
RESEARCH REACTORS		2		10	17	13		**42**
NUCLEAR POWER REACTORS		1		58	12			**71**
SPENT FUEL REPROCESSIN G & RECYCLING				5	3	7		**15**
CONVERSION	1	2		3	2	2		**10**
ENRICHMENT		1		1		1		**3**
URANIUM FUEL FABRICATION				1	1	2		**4**

6. Trends and Future Prospects

Table 8 provides information on spent fuel and waste management trends and future prospects.

TABLE 8: TRENDS & FUTURE PROSPECTS

Type	Current amount	Estimated Current amount when prepared for disposal	Current Disposal Capacity	Total forecast at 2030	Total forecast at 2050
Spent Fuel Storage	~14,000 tHM			~17,000 tHM	
Wet storage (AR)					
Wet storage (AFR)					
Dry storage (AR)					
Dry storage (AFR)	0 tHM			0 tHM	0 tHM
Total amount Spent Fuel sent to Reprocessing and Recycling	~10,000 tHM			~13,000 tHM	
Total amount Spent fuel disposed	0 tHM		0 tHM	0 tHM	0 tHM
Waste in storage:	(m^3)	(m^3)		(m^3)	(m^3)
VLLW	~190,000	~190,000		~190,000	
LILW-SL	~70,000	~70,000		~100,000	
LLW-LL	~91,000	~91,000		~120,000	
ILW-LL	~44,000	~44,000		~53,000	
HLW	~3,200	~3,200		~5,500	
Waste disposal:	(m^3)		(m^3)	(m^3)	(m^3)
VLLW	~250,000		650.000	~910,000	
LILW-SL	~810,000		1,527,225	~1,100,000	