RÉPUBLIQUE
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ANDRA
Agence nationale pour la gestion des déchets radioactifs

National Inventory
of radioactive materials and waste

2023 ESSENTIALS

Every five years*, Andra publishes a new edition of the ***National Inventory of radioactive materials and waste.*** The content of this inventory is periodically updated and expanded by including the results of the forecasting and evaluation work set out in the National Radioactive Materials and Waste Management Plan (PNGMDR).

Following the publication of PNGMDR 2022-2026, the scope of the ***National Inventory*** will change in its next edition, to be published during the last quarter of 2023, in order to:

- Anticipate the needs for storage and disposal capacity and help to provide an overview of the choices to be made;
- Improve the clarity of the information on the management of radioactive materials and waste.

By the time this new edition comes out, Andra will update, as it does each year, the ***National Inventory*** **Essentials**, which present the annual trend in the inventory of radioactive materials and waste produced in France. The 2023 **Essentials** supply an update of the France-wide material and waste inventory as of December 31 2021.

The ***National Inventory*** is a valuable tool for guiding French policy on radioactive waste and materials management.

You can view all of the data from the ***National Inventory*** on the dedicated website at **inventaire.andra.fr** and as *open data* at **data.gouv.fr**.

* Under the terms of Article L542-12 of the French Environment Code, as amended by Act 2020-1225 of 7 December 2020.

01

Radioactive materials and waste and their management methods

02

Inventory of radioactive materials at end of 2021

03

End 2021 inventory of radioactive waste

Figures given in this document have been rounded. They are based on declarations made by holders of radioactive materials and waste and reflect the situation on 31 December 2021.

01

Radioactive materials and waste and their management methods

SECTORS USING RADIOACTIVITY

Various economic sectors use radioactive materials and produce radioactive waste. Since this radioactivity can present a risk to health and environment, radioactive materials and waste are subject to special management procedures.

In France, radioactive materials and waste management principles are governed by a strict regulatory framework, established at national level (Act 2006-739 of 28 June 2006, giving rise to the National Radioactive Materials and Waste Management Plan (PNGMDR) in particular, and at international level (see European Council Directive 2011/70/Euratom of 19 July 2011).

Radioactivity

Radioactivity is a natural phenomenon which has existed since the origin of the universe when atoms first formed. It is the phenomenon whereby, during their decay, some atoms - called radionuclides - expel energy in the form of radiation and/or particles. Radioactivity can also be created artificially by human activity.

NUCLEAR POWER INDUSTRY

Mainly nuclear power plants for electricity production, as well as facilities dedicated to producing nuclear fuel (mining and processing of uranium ore, chemical conversion and enrichment of uranium concentrate), reprocessing spent fuel and recycling a portion of the materials extracted from spent fuel.

NON-NUCLEAR POWER INDUSTRY

Rare earth mining and the fabrication of sealed sources, as well as various other applications such as weld inspection, medical equipment sterilisation, food sterilisation and preservation, etc.

DEFENCE

Mainly deterrence activities, including nuclear propulsion for certain ships and submarines, as well as associated research and activities of the armed forces.

RESEARCH

Research for civil nuclear applications, in addition to research in the fields of medicine, nuclear and particle physics, agronomy, chemistry and biology, among others.

HEALTHCARE

Diagnostic and therapeutic activities (scintigraphy and radiotherapy, among others).

RADIOACTIVE MATERIALS AND THEIR MANAGEMENT METHODS

Radioactive materials

A radioactive material is a radioactive substance for which subsequent use is planned or intended, after processing if necessary (Article L. 542-1-1 of the French Environmental Code).

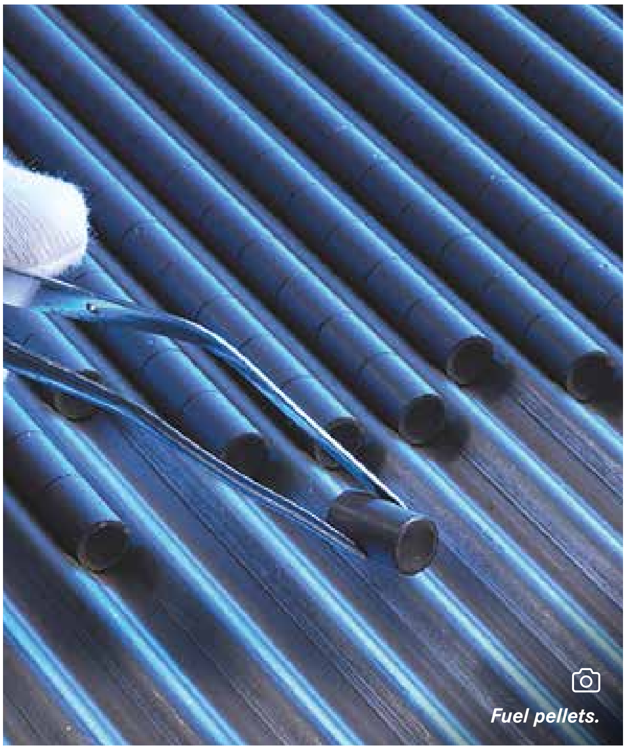

Yellow Cake

NATURAL URANIUM

- **Mined natural uranium**: uranium is a naturally-occurring radioactive metal found as an ore in certain rocks. It is mined, processed and formed into a solid uranium concentrate known as *Yellow Cake*. There are no longer any open uranium mines in France; all uranium is sourced from abroad.
- **Enriched natural uranium**, obtained by increasing the uranium-235 concentration of natural uranium, is used to manufacture fuel for nuclear reactors.
- **Depleted uranium,** obtained during the natural uranium enrichment process – this is transformed into a solid, chemically stable, incombustible, insoluble and non-corrosive material in the form of a black powder. This material is used to manufacture uranium and plutonium mixed oxide fuel (MOX).

URANIUM FROM SPENT FUEL REPROCESSING

Reprocessed uranium (RepU), recovered during the reprocessing of spent fuel, can be used to make new fuel.


Fuel pellets.

NUCLEAR FUEL

Nuclear fuel is mainly used in nuclear power plants to generate electricity.

The term covers:

- **Enriched natural uranium fuel** (ENU) made from uranium oxide;
- **Enriched reprocessed uranium fuel** (ERU) made from uranium oxide produced by the enrichment of reprocessed uranium;
- **MOX fuels, made from mixed uranium and plutonium powder** used in some nuclear power plants.

It may also refer to:

- **fuel** used in research reactors;
- **fuel for defence purposes,** used for deterrence activities and in onboard reactors for nuclear propulsion;
- **fuel for fast neutron reactors (FNR)** made from mixed uranium and plutonium oxide, for the Phénix and Superphénix reactors, now permanently decommissioned and no longer used.

This fuel may be new, in use, spent and awaiting reprocessing, or in the form of scrap.

PLUTONIUM

Plutonium is an artificial radioactive element generated by the operation of nuclear reactors. Like uranium, it is recovered when spent fuel is reprocessed. It is then used to manufacture uranium and plutonium mixed oxide fuel (MOX).

MATERIALS PRODUCED BY RARE EARTH MINING

Rare-earth metals (which occur naturally in the Earth's crust) are extracted from ores such as monazite and used in numerous applications (e.g. electronic equipment, automotive catalytic converters, etc.).

When processed, they produce the following materials:

- **thorium**, a by-product of concentration, which is stored pending possible future use;
- **materials in suspension**, from the processing and neutralisation of chemical effluent, which is composed of rare-earth residues that will be reused.


Madagascar monazite.

Radioactive material management methods

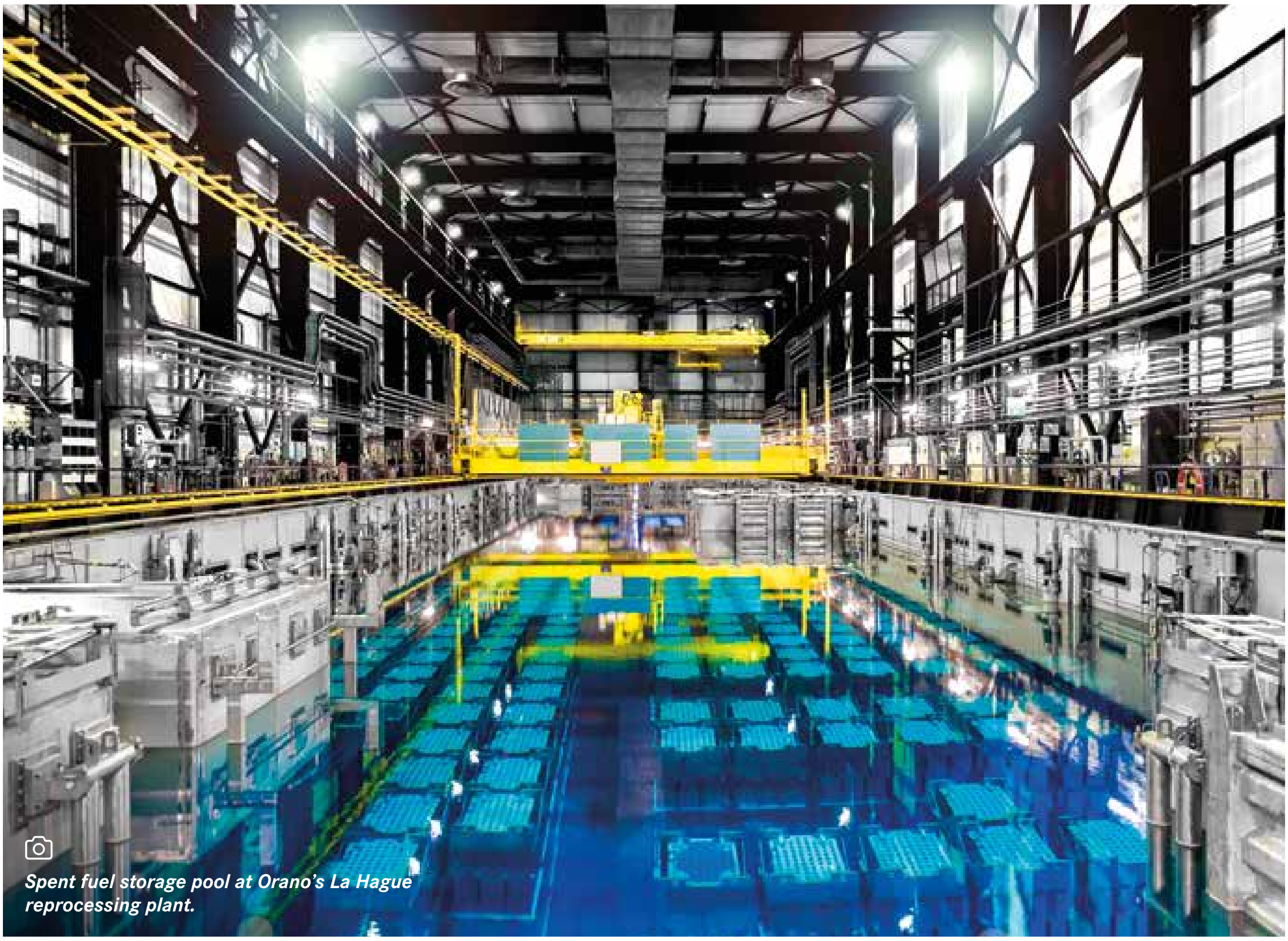
Radioactive materials are stored in facilities suited to their characteristics until they can be used or reused. For some materials, such as plutonium from reprocessing spent uranium oxide fuel, a process enabling their reuse in industry has already been in place for more than thirty years.

The PNGMDR (National Radioactive Materials and Waste Management Plan) 2022-2026 requires the owners of radioactive materials to prepare recovery plans. It also emphasises the need to support research into this recovery.

Storage

The storage of radioactive materials or waste is the operation consisting in temporarily placing these radioactive substances in a surface or near-surface facility specially designed for this purpose, with the intention of retrieving them at a later date.

Article L. 542-1-1 of the French Environmental Code.



Spent fuel storage pool at Orano's La Hague reprocessing plant.

RADIOACTIVE WASTE AND ITS MANAGEMENT METHODS

Radioactive waste consists of radioactive substances for which no subsequent use is planned or intended (Article L. 542-1-1 of the French Environmental Code).

In general, radioactive waste contains a mix of radionuclides (i.e. radioactive isotopes: caesium, cobalt, strontium, etc.). Depending on the waste's composition, its radioactivity may vary in intensity and persist for different periods of time. Waste is classified into six categories.

The origin of radioactive waste

Radioactive waste is produced during the operation of facilities using radioactive substances, and also when these facilities are dismantled.

Radioactive waste categories and associated management solutions

Radioactive half-life / Activity**	**Very short-lived (VSL)** (half-life < 100 days)	**Mainly short-lived (SL)** (half-life ≤ 31 years)	**Mainly long-lived (LL)** (half-life > 31 years)
Very low level waste (VLLW) < 100 Bq/g	VTC Management through radioactive decay	TFA Surface disposal (Industrial facility for grouping, storage, and disposal)	
Low-level waste (LLW) between a few hundred Bq/g and one million Bq/g		FMA-VC Surface disposal facility (Aube and Manche disposal facilities)	FA-VL Near-surface disposal facility under study
Intermediate-level waste (ILW) in the range of one million to one billion Bq/g			MA-VL Deep geological disposal facility under development (Cigeo project)
High-level waste (HLW) on the order of several billion Bq/g	Not applicable	HA Deep geological disposal facility under development (Cigeo project)	

* Half-life of the radioactive elements (radionuclides) contained in the waste.
** Radioactive waste activity level.

Waste may sometimes be classified in a particular category but managed using an alternative management solution due to other characteristics, such as its chemical composition or physical properties.

RADIOACTIVE HALF-LIFE

Radioactive half-life expresses the time it takes for the initial activity of a given radionuclide to be halved. A distinction is drawn between:

- very short-lived waste, which contains radionuclides with a half-life shorter than 100 days. This waste can only be directed to a conventional waste management solution after a period of more than ten times the radionuclide half-life, i.e. around 3 years;
- short-lived waste, whose radioactivity comes mainly from radionuclides with a half-life less than or equal to 31 years;
- long-lived waste, which contains a significant quantity of radionuclides with a half-life of more than 31 years.

ACTIVITY LEVEL

Activity reflects the number of disintegrations of nuclei produced per second (and hence the radiation per second). It is expressed in becquerels: 1 becquerel corresponds to one decay per second.

Radioactive waste is said to be:

- very low-level, when its activity level is less than 100 becquerels per gramme;
- low-level, when its activity level is between a few hundred becquerels per gramme and one million becquerels per gramme;
- intermediate-level, when its activity level is between one million and one billion becquerels per gramme;
- high-level, when its activity level is about several billion becquerels per gramme.

Description of radioactive waste categories

HA HIGH-LEVEL WASTE

- High: several billion Bq/g
- Long to very long (up to several hundreds of thousands of years)
- Disposal in deep geological formation under development[1]

This waste mainly comes from the reprocessing of spent fuel[2] (after use in a nuclear reactor). It is made up of highly radioactive residues from the chemical dissolution of spent fuel. This waste is encapsulated in glass, then conditioned in stainless steel containers.

HLW waste package.

MA-VL INTERMEDIATE-LEVEL LONG-LIVED WASTE

- Intermediate: one million to one billion Bq/g
- Long to very long (up to several hundreds of thousands of years)
- Disposal in deep geological formation under development[1]

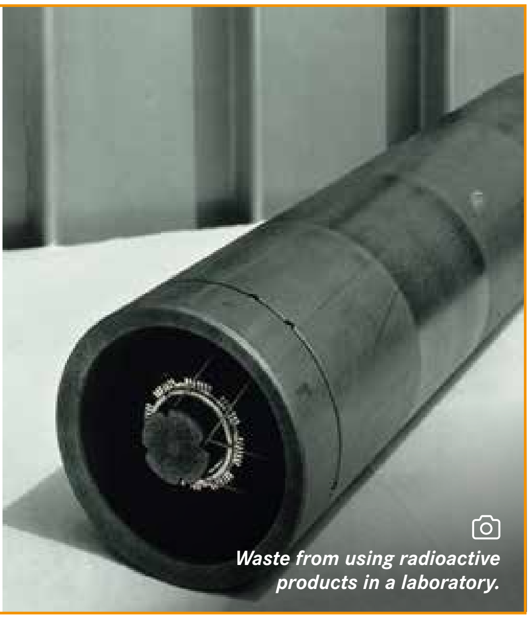
This is primarily waste from the metal structures that surround the fuel (hulls and end fittings), which come from the reprocessing of spent fuel[2] and, to a lesser extent, technological waste from the use and maintenance of nuclear facilities, waste from the treatment of liquid effluent (bituminised sludge) and activated waste from inside nuclear reactors.

Hulls from the zirconium alloy cladding that covers fuel pellets.

FA-VL LOW-LEVEL LONG-LIVED WASTE

- Low: a few tens to several hundreds of thousands of Bq/g
- Long to very long (up to several hundreds of thousands of years)
- Disposal under development

This includes:
- graphite waste from the operation and dismantling of the first nuclear plants;
- radium-bearing waste, chiefly from non-power-generating industrial activities, such as the extraction of rare-earth metals;
- other types of waste, such as certain items of legacy waste conditioned in bitumen, uranium conversion residues from the Orano Malvési plant (see page 21), and operating waste from the La Hague reprocessing plant.



Waste from using radioactive products in a laboratory.

Activity level.
Time needed for radioactivity to decay (to a level that presents no risks to human health or the environment). This time depends on the half-life.
Final waste management method.

FMA-VC

LOW-AND INTERMEDIATE-LEVEL SHORT-LIVED WASTE

Low to intermediate: a few hundreds to one million Bq/g

Short (up to around 300 years)

Existing surface disposal[3]

This principally comes from operations (the processing of liquid effluent or filtration of gaseous effluent, etc.), maintenance (clothing, tools, gloves, filters, etc.) and the dismantling of nuclear plants, fuel cycle facilities and research centres. A small portion of it also comes from medical research.

Waste from using radioactive products in a laboratory.

TFA

VERY LOW-LEVEL WASTE

Very low: less than 100 Bq/g

Not a determining factor[4]

Existing surface disposal[5]

This mainly comes from the operation, maintenance and dismantling of nuclear plants, fuel cycle facilities and research centres.

VLLW usually consists of inert waste (concrete, rubble, earth, etc.) or metal and plastic waste.

Rubble waste from dismantling

VTC

VERY SHORT-LIVED WASTE

Very low to intermediate

Very short (up to around three years)

Management through decay

This mostly comes from the medical and research sectors.

Medical waste may constitute liquid or gaseous effluent, or contaminated solid or liquid waste generated by the use of radionuclides in this field.

Decay tanks.

1 Cigéo project, whose licence application was filed in January 2023.
2 Reprocessing spent fuel makes it possible to separate recoverable materials (plutonium and uranium) from the final waste that constitutes HLW and ILW-LL. These materials can be recycled to produce new fuel. The waste is stored at reprocessing sites pending disposal.
3 Disposal facilities in the Aube (CSA) and Manche (CSM).
4 In view of their very low activity, time is not a criterion in the classification of this waste category.
5 Industrial facility for grouping, storage and disposal in the Aube (Cires).

Radioactive waste management methods

In order to adequately confine the waste and isolate it from humans and the environment, France has decided to manage it in dedicated disposal facilities with characteristics suitable for its radioactivity level and lifetime, potentially after a storage period.

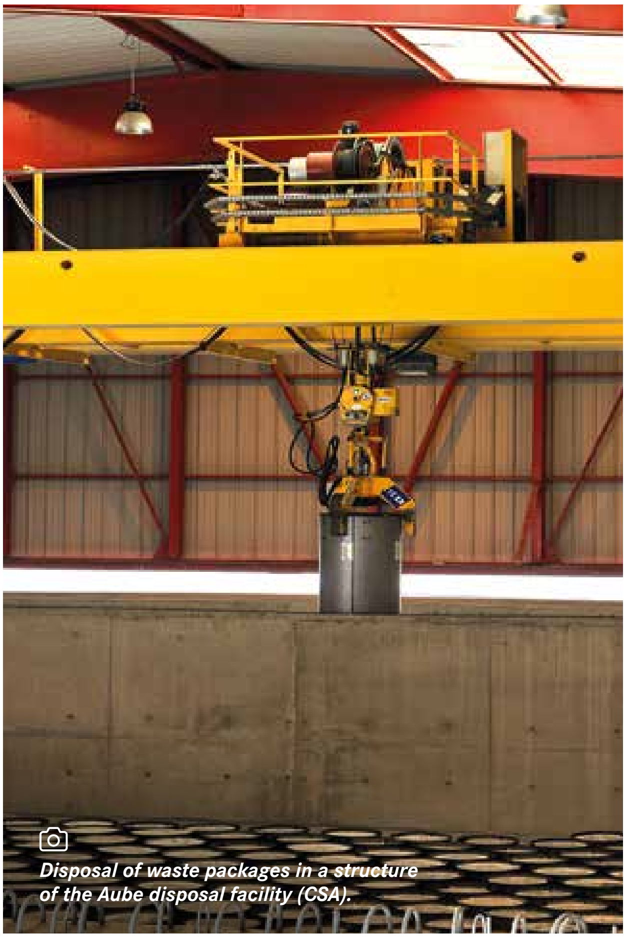
- surface disposal facilities: two facilities operated by Andra in the Aube department have been used since 2003 for the disposal of very low-level waste (VLLW) and since 1992 for the disposal of low- and intermediate-level waste, mainly short-lived (LILW-SL). There is also the Manche disposal facility, which was in operation from 1969 to 1994 and is currently in the closure phase;
- the near-surface disposal facility, under development, for the disposal of low-level long-lived waste (LLW-LL);
- the deep geological disposal facility, the Cigéo project, for the disposal of high-level (HLW) and intermediate-level long-lived waste (ILW-LL).

The initial choice of management solution depends on the waste characterisation studies and the processing and conditioning methods. The final decision is based on the characteristics of the produced package.

Disposal

The disposal of radioactive waste is the operation consisting in placing these substances in a facility that has been specially designed to hold them on a potentially permanent basis [...], without the intention to retrieve them at a later date.

Article L. 542-1-1 of the French Environmental Code.



Disposal of waste packages in a structure of the Aube disposal facility (CSA).

In the case of very short-lived waste (VSLW), radioactivity decreases significantly within a few months, or even a few days or hours. It is therefore stored on site until radioactive decay has occurred, then disposed of using the conventional waste solution suitable for its physical, chemical and biological characteristics.

Lastly, certain items of radioactive waste cannot yet be treated and conditioned in a way that makes them suitable for an identified management solution, generally due to their special physical or chemical characteristics. Such waste is conventionally referred to as 'waste without a specific disposal solution' (DSF). After being processed, conditioned or characterised, where appropriate, DSF is subjected to the appropriate management process.

FOCUS

Production of radioactive materials and waste by the nuclear power sector in France

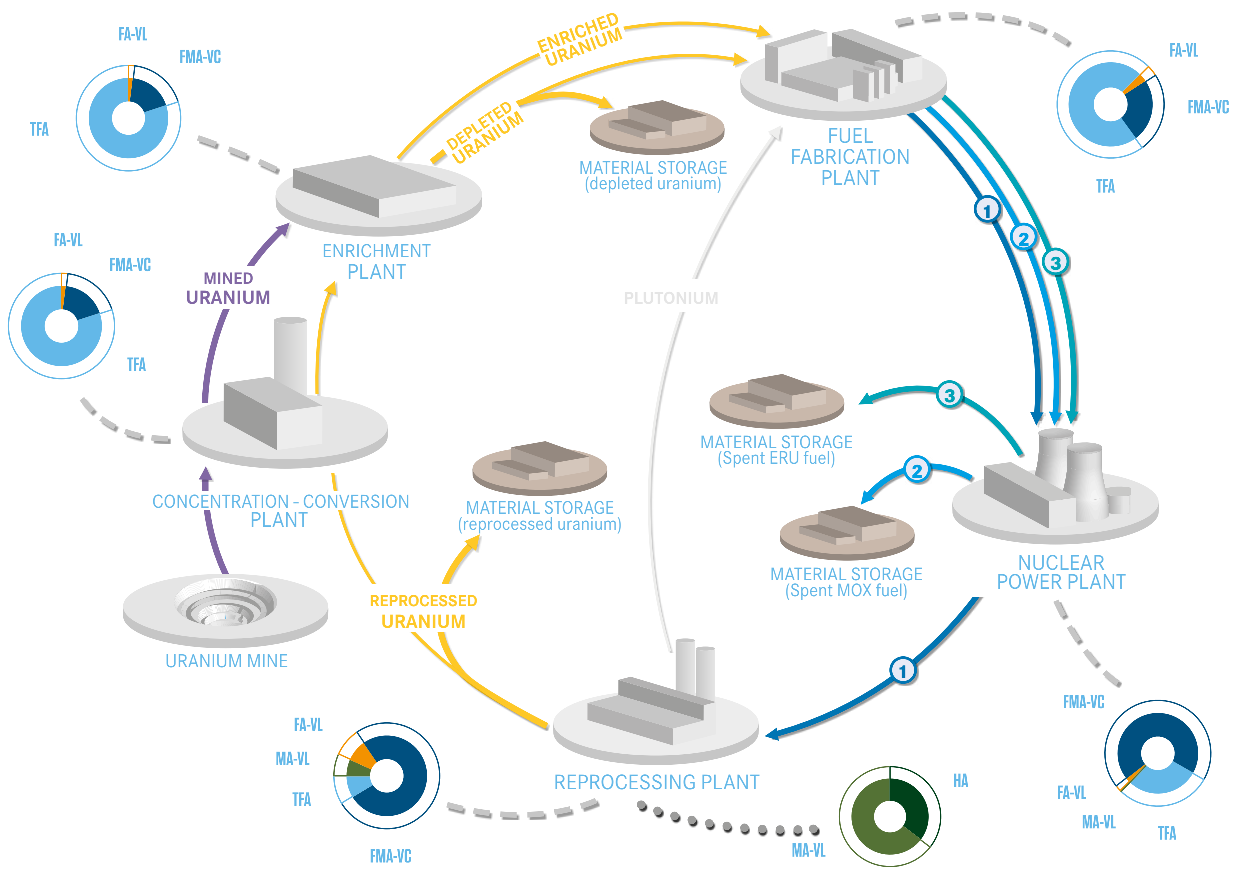
Most radioactive materials and waste produced by the nuclear power sector result from the operation of the facilities that manufacture, use and then reprocess nuclear fuel.

This includes both the operation of the facility and its dismantling.

Most of the waste produced by the operation of these plants is taken to Andra's industrial facilities in the Aube (Cires and CSA). Intermediate-level long-lived waste (ILW-LL) and high-level waste (HLW) is also produced and stored at the production sites, pending the creation of a disposal facility designed to receive it: Cigéo. The nuclear power sector generates a small amount of low-level long-lived waste (LLW-LL), for which a repository is also under development.

Dismantling nuclear installations also produces waste, the vast majority of which is very low-level waste (VLLW).

Radioactive materials are currently either recovered or stored pending future reuse. For example, reprocessed uranium (RepU) could be used in nuclear power reactors in the form of enriched reprocessed uranium (ERU). To improve material recycling performance, research is being conducted into the possible recovery in pressurized water reactors (PWR) and, *ultimately*, in fast breeder reactors (FBR), of the materials contained in spent MOX and ERU fuel assemblies.



① Enriched natural uranium oxide fuel (ENU)
② Uranium and plutonium mixed oxide fuel (MOX)
③ Enriched recycled uranium oxide fuel (ERU)
Operating and dismantling waste - Inventory at the end of 2021
Residual waste after reprocessing spent fuel - Inventory at the end of 2021

02

End 2021 inventory of radioactive materials

MATERIALS RECORDED

Andra performs an annual inventory of all France-wide radioactive materials on 31 December every year, based on the information provided by the holders of these materials. These are substances for which later use is planned or envisaged, if necessary after reprocessing, with the exception of sealed sources, which are registered by the French Institute for Radiological Protection and Nuclear Safety (IRSN) in accordance with Article R. 1333-154 of the French Public Health Code.

For fissile materials, the material holders are organisations involved in the nuclear fuel cycle, all operators of nuclear reactors (nuclear power, defence and research facilities) and chemical industry stakeholders that hold radioactive materials as part of their activities (e.g. mining rare-earth metals).

The foreign materials present on French territory referred to in Article L. 542-2-1 of the Environmental Code are also counted in the records. These foreign materials are intended to be returned to the original owner countries.

Unit of measurement

The unit used to present the quantities of radioactive materials is the tonne of heavy metal (tHM), a unit which represents the quantity of uranium, plutonium or thorium contained in the materials, except in the case of fuel for defence purposes, which is expressed in tonnes of assemblies (t).

Uranium hexafluoride crystals.

INVENTORY OF RADIOACTIVE MATERIALS

The table below shows the inventory of radioactive materials at the end of 2021, the difference with the previous year and the share of materials belonging to foreign countries (foreign materials are intended to be returned to the original owner countries).

INVENTORY OF RADIOACTIVE MATERIALS (IN tHM, EXCEPT SPENT FUEL FOR DEFENCE PURPOSES, WHICH IS SHOWN IN TONNES OF ASSEMBLIES)

N°	Material category	As of end 2021	2021/2020 trend	Foreign share
1	ENU fuels before use	733	+121	
2	ENU fuels in use in nuclear power plants	3970	-100	
3	Spent ENU fuels pending reprocessing	11200	+100	0.3%
4	ERU fuels before use	-	-	
5	ERU fuels in use in nuclear power plants	-	-1	
6	Spent ERU fuels pending reprocessing	630	+3	
7	Mixed uranium-plutonium fuels before use or under manufacture	11	-16	
8	Mixed uranium-plutonium fuels in use in nuclear power plants	215	-108	
9	Spent mixed uranium-plutonium fuels pending reprocessing	2390	+160	
10	Non-irradiated mixed uranium-plutonium fuel scrap awaiting reprocessing[1]	337	+22	
11	Non-irradiated uranium fuel scrap awaiting reprocessing	-	-	
12	Spent FBR fuels pending reprocessing	125	+2	
13	Research reactor fuels before use	0.04	-	
14	Fuel in use in research reactors	1	-	
15	Other civil spent fuel	61	+1	2%
16	Spent fuel for defence purposes	202 tonnes	+4 tonnes	
17	Non-irradiated separated plutonium, in all its physical-chemical forms	65	+5	24%
18	Mined natural uranium, in all its physical-chemical forms	37800	-2000	
19	Enriched natural uranium, in all its physical-chemical forms	3290	-100	
20	Enriched uranium from spent fuel reprocessing, in all its physical-chemical forms[2]	-	-	
21	Uranium from spent fuel reprocessing, in all its physical-chemical forms[2]	34200	+100	8%
22	Depleted uranium, in all its physical-chemical forms	324000	-	
23	Thorium, in the form of nitrates and hydroxides	8510	-50	
24	Materials in suspension (by-products of rare earth ore processing)	5	-	
25	Other materials[3]	70	-	

The published inventory consists of rounded values. The differences were calculated on the basis of the rounded inventory values.

The differences, consistent with those observed since 2020, can be explained by:
- A year of operation of the nuclear power plant fleet;
- Less production at Melox plant caused by operating problems, offset by additional ENU fuel.

In the current framework of nuclear power generation, processed radioactive materials are intended to be used as fuel. The difference in inventory levels corresponds to a year of operation of the nuclear power plant fleet, in line with the recorded production capacities of the fuel cycle plants.

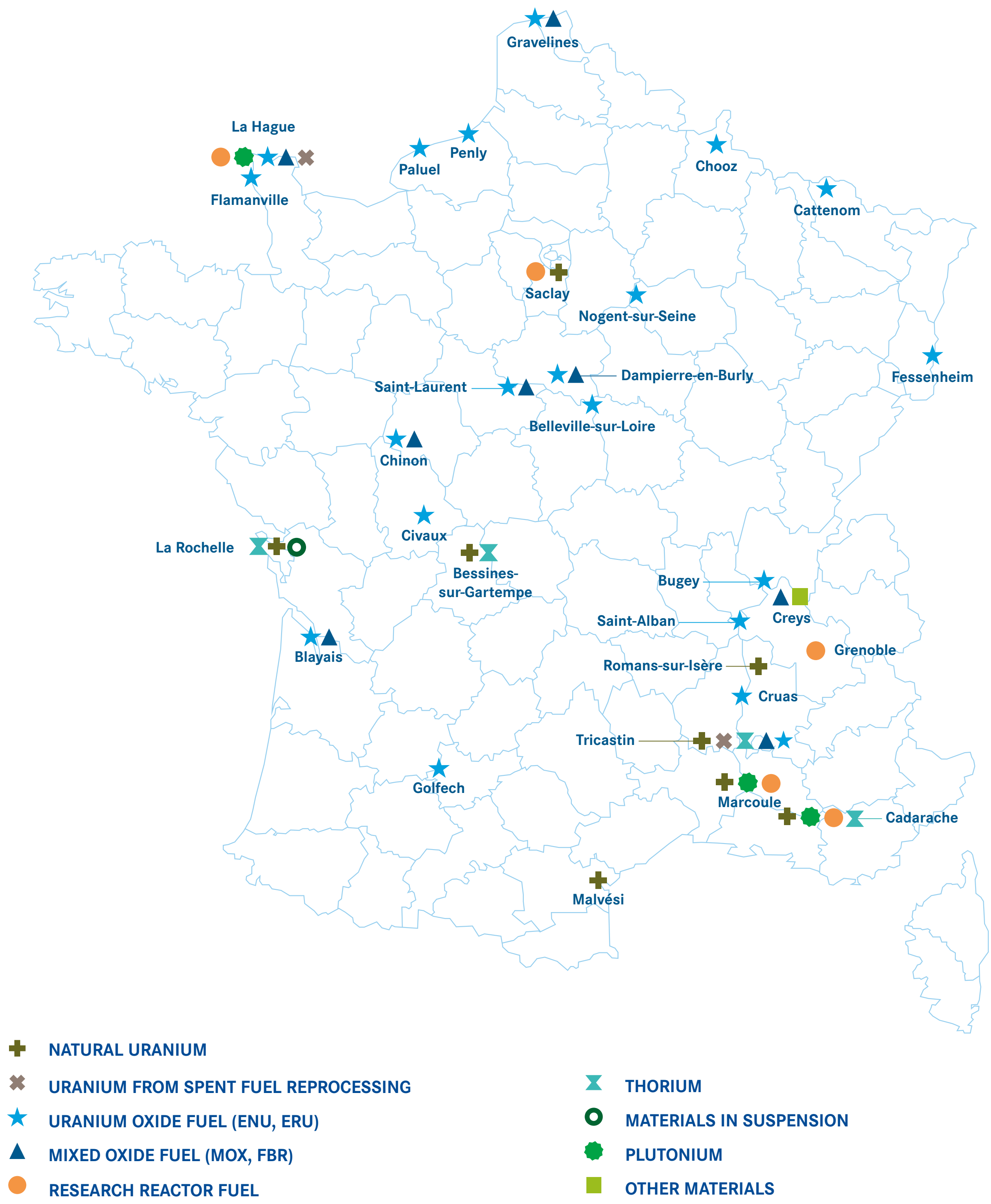
1 *The scrap from non-irradiated mixed uranium-plutonium fuel awaiting reprocessing will eventually be reprocessed and recycled in nuclear power reactors.*

2 *Uranium from spent fuel reprocessing will be enriched to form enriched uranium from spent fuel reprocessing, which will then be used to make enriched reprocessed uranium oxide fuel (ERU).*

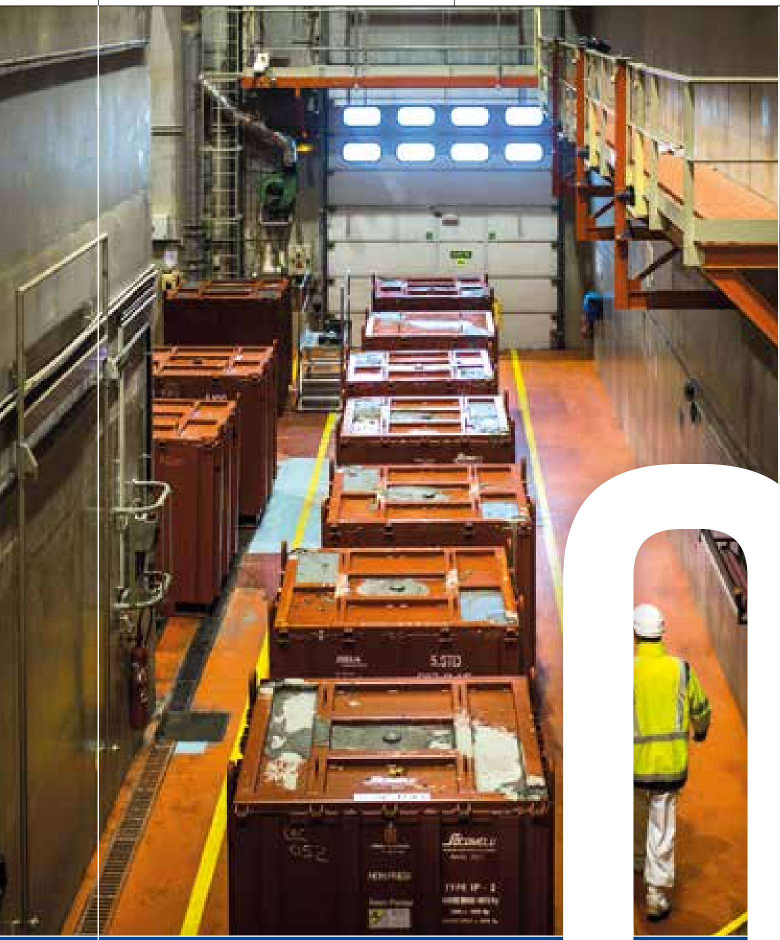
3 *The second Superphénix core, which was not and will not be irradiated, was classified in the “Other materials” category as it does not correspond to either “fuel before use” or “spent fuel”.*

FOCUS

Location of radioactive materials on French territory as of 31/12/2021



National defence fuels are not shown on this map. In order to protect information that if disclosed may harm the interests identified in Article L. 124-4 of the French Environment Code, the corresponding material locations cannot be communicated.



03

End 2021 inventory of radioactive waste

Andra performs an annual inventory of France-wide radioactive waste as on 31 December of every year, based on the information provided by the waste holders. There are more than 1,000 waste holders across all economic sectors, a minority of which hold the majority of radioactive waste.

Foreign waste referred to in Article L. 542-2-1 of French Environmental Code, which is to be returned to foreign customers, is included in this inventory if present on French territory on the reference date.

WASTE ALREADY DISPOSED OF OR DUE TO BY MANAGED BY ANDRA

Stated waste volumes are those of conditioned waste, i.e. waste that the producers do not intend to process further before disposal. This conditioned waste constitutes the primary packages.

For inventory purposes, a uniform counting unit has been adopted: the "conditioned equivalent volume".

For waste that has not yet been conditioned, the conditioned equivalent volume is estimated.

In the specific case of the Cigeo geological disposal project (which is designed to receive high-level waste (HLW) and intermediate level long-lived waste (ILW-LL)), additional conditioning, in the form of disposal packages, may be necessary, particularly for handling or retrievability purposes. Only the volume of primary packages is taken into account in this document.

The data below corresponds to radioactive waste already disposed of at Andra facilities, or due to be managed by the Agency.

Conditioning

Conditioning is the operation consisting in placing waste in a container suited to its radioactivity level and half-life, then immobilising it, if necessary, in an immobilisation or embedding material.

Disposal of LILW-SL waste packages at the Aube disposal facility.

INVENTORY AND DIFFERENCE IN VOLUMES (IN m³) OF WASTE ALREADY DISPOSED OF OR DUE TO BE MANAGED BY ANDRA

Category	End of 2021 inventory	2021/2020 trend
HLW	4320	+130
ILW-LL	39500	-3400
LLW-LL	103000	+9200
LILW-SL	981000	+10000
VLLW	633000	+47000
DSF	304	+9
Total	~ 1,760,000	+60000

The published inventory consists of rounded values. The differences were calculated on the basis of the rounded inventory values.

The differences between the quantity of waste at the end of 2020 and that at the end of 2021 can be accounted for by:

- Ongoing waste generation for all categories;
- The re-categorisation of a portion of the IL-LL bituminised waste as LL-VL following the improvement in knowledge and the inclusion of its radiological decay, in accordance with a more realistic disposal management date.

END-2021 VOLUMES (m^3) OF WASTE PRESENT ON THE SITES OF THE PRODUCERS/HOLDERS AND DISPOSED OF IN THE ANDRA FACILITIES

Category	Total	At producer/ holder sites	Disposed of at Andra facilities	Existing disposal capacity
HLW	4320	4320	-	-
ILW-LL	39500	39500	-	-
LLW-LL	103000	103000	-	-
LILW-SL	981000	91000	890000	1,530,000
VLLW	633,000	203,000	430,000	650,000
DSF	304	304	-	-
Total	~ 1,760,000 m^3	~ 441,000	~ 1,320,000	2,180,000
		25%	75%	

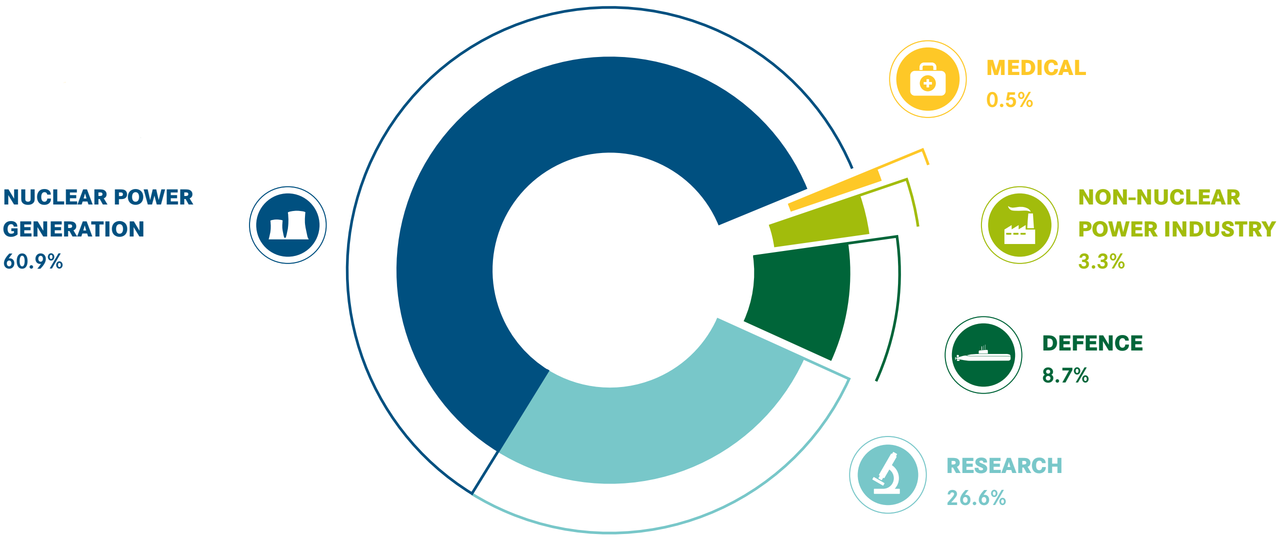
LILW-SL and LLW waste is stored at the production site for retrieval, conditioning or removal to Andra disposal facilities.

LLW waste at Cires

LLW waste is disposed of at the Cires facility. By end 2021, this facility had reached approximately 66% of its licensed disposal capacity of 650,000 m^3. In its current configuration, Cires will not be sufficient to dispose of the LLW waste volumes produced by dismantling in the coming years. Additional management solutions are therefore currently being studied.

The mid-term solution is to increase the licensed disposal capacity of Cires to more than 900,000 m^3, without changing the current footprint of the disposal zone and keeping the same safety level (Acaci project).
If licensed, this increase in capacity will allow Cires operation to be extended by ten or so years, i.e. up to around 2040.

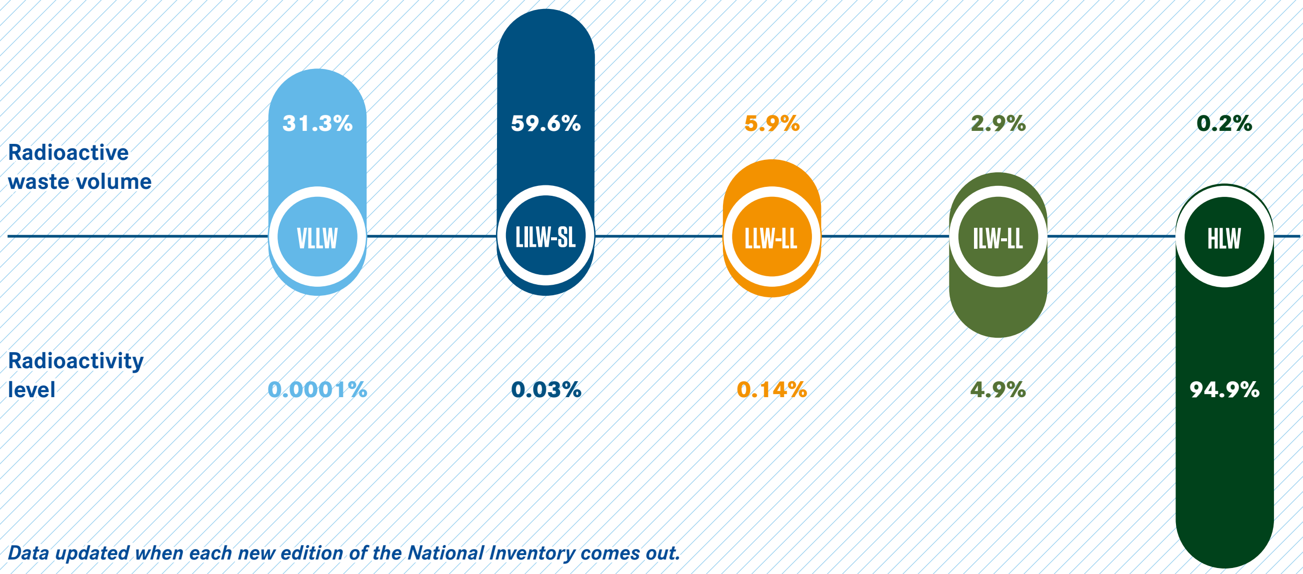
END-2021 BREAKDOWN BY ECONOMIC SECTOR OF WASTE VOLUME (CONDITIONED EQUIVALENT) ALREADY DISPOSED OF OR DUE TO BE MANAGED BY ANDRA



Percentages were calculated based on the exact figures, then rounded.

1 This waste has not yet been disposed of: the disposal solution for HLW and ILW-LL (Cigeo) is currently under development. The LLW-LL waste disposal solution is also under development. Waste without a specific disposal solution (DSF) will be directed to a management solution after any necessary treatment or characterisation.

THE BREAKDOWN OF VOLUMES AND RADIOACTIVITY LEVELS PRESENTED BELOW IS TAKEN FROM THE 2018 EDITION OF THE *NATIONAL INVENTORY*.



Data updated when each new edition of the National Inventory comes out.

VERY SHORT-LIVED WASTE

INVENTORY AND DIFFERENCE IN VOLUMES (m³) OF VERY-SHORT-LIVED WASTE MANAGED THROUGH DECAY

Category	End of 2021 inventory	2021/2020 trend
VSL	2,170	+152

These volumes are not included in the inventory.

THE SPECIFIC CASE OF WASTE FROM ORANO MALVÉSI

Some of the uranium conversion treatment residue (RTCU) from the Orano Malvési plant is legacy waste. Work is under way to find a safe, long-term management solution at the Malvési site for legacy RTCU waste, given its specific nature (large volumes, etc.). RTCU waste produced after 1 January 2019 was included in the LLW and LLW-LL management solutions, in accordance with Article 63 of the Order of 23 February 2017 (Decree No. 2017-231).

INVENTORY AND FORECASTS OF VOLUMES OF URANIUM CONVERSION TREATMENT RESIDUES STORED AT THE MALVÉSI SITE (m³)

	End of 2021 inventory	2021/2020 trend
Settling ponds	39,000	-34,100
ECRIN facility *(ex legacy RTCU)*	258,000	-24,000
Evaporation ponds *(ex nitrated effluents)*	372,000	-

These volumes are not included in the inventory.

The differences are due to the re-evaluation of the sludge volumes present in pond B6 and in the PERLE storage cell.

FOCUS

Mine waste and tailings which have been subjected to specific management methods (this waste is not counted in the inventories)

- **Waste disposed of inside or near the perimeter of nuclear facilities or plants.** The corresponding activity is of the order of a few becquerels per gramme (several thousands of tonnes).
- **Tailings from processing uranium ores** present on former mining sites. These are long-lived tailings with an activity level comparable to that of VLLW (approximately 50 million tonnes).

Former Bellezane mine.

- **Waste stored in conventional waste storage facilities (ISD).** Some of these facilities have received waste with low quantities of radioactivity, around a few becquerels per gramme (approximately 3,000 tonnes).
- **Waste containing high naturally occurring radioactivity managed through in situ disposal.** This waste is generated by the processing of raw materials that contain naturally-occurring radionuclides but are not used for their radioactive properties. Much of this is comparable to VLLW (around 50 million tonnes).

Tailings from treating very slightly radioactive materials were used as backfill at the La Pallice port in La Rochelle.

- **Defence disposal facilities in French Polynesia**: between 1966 and 1996, France carried out nuclear experiments in the South Pacific, on the territory of French Polynesia. The waste produced by these experiments and by the dismantling of the associated facilities was disposed of on the spot in shafts or dumped in French territorial waters.
- **Waste dumped at sea** : Dumping radioactive waste at sea was a management solution considered safe by the international scientific community, as the dilution and assumed duration of isolation provided by the marine environment were deemed sufficient. As a result, between 1946 and 1993, several countries dumped radioactive waste at sea. Several thousands of tonnes of waste were dumped in this way by France between 1967 and 1982. A permanent ban on dumping radioactive waste at sea came into effect in 1993.

Dumping radioactive waste packages at sea.

Disposal sites (except those at sea) undergo environmental monitoring, which makes it possible to check that the potential impact of this waste is under control.

Orflam Plast factory

In the 1930s, a monazite treatment factory, later to become the Orflam Plast factory, set up at Pargny-sur-Saulx to manufacture lighter flints from monazite. The factory operated until 1967 then closed for good in 1997. The extraction of monazite, a thorium-rich ore, led to the production of low-radioactivity tailings concentrating the radioactivity initially present in the monazite. These tailings polluted the site, which was cleaned up at a later date. Much of the waste and earth produced during the clean-up was removed to Cires. Another part, mostly consisting of very low-radioactivity rubble, was put in confinement on site (3000 m^3).

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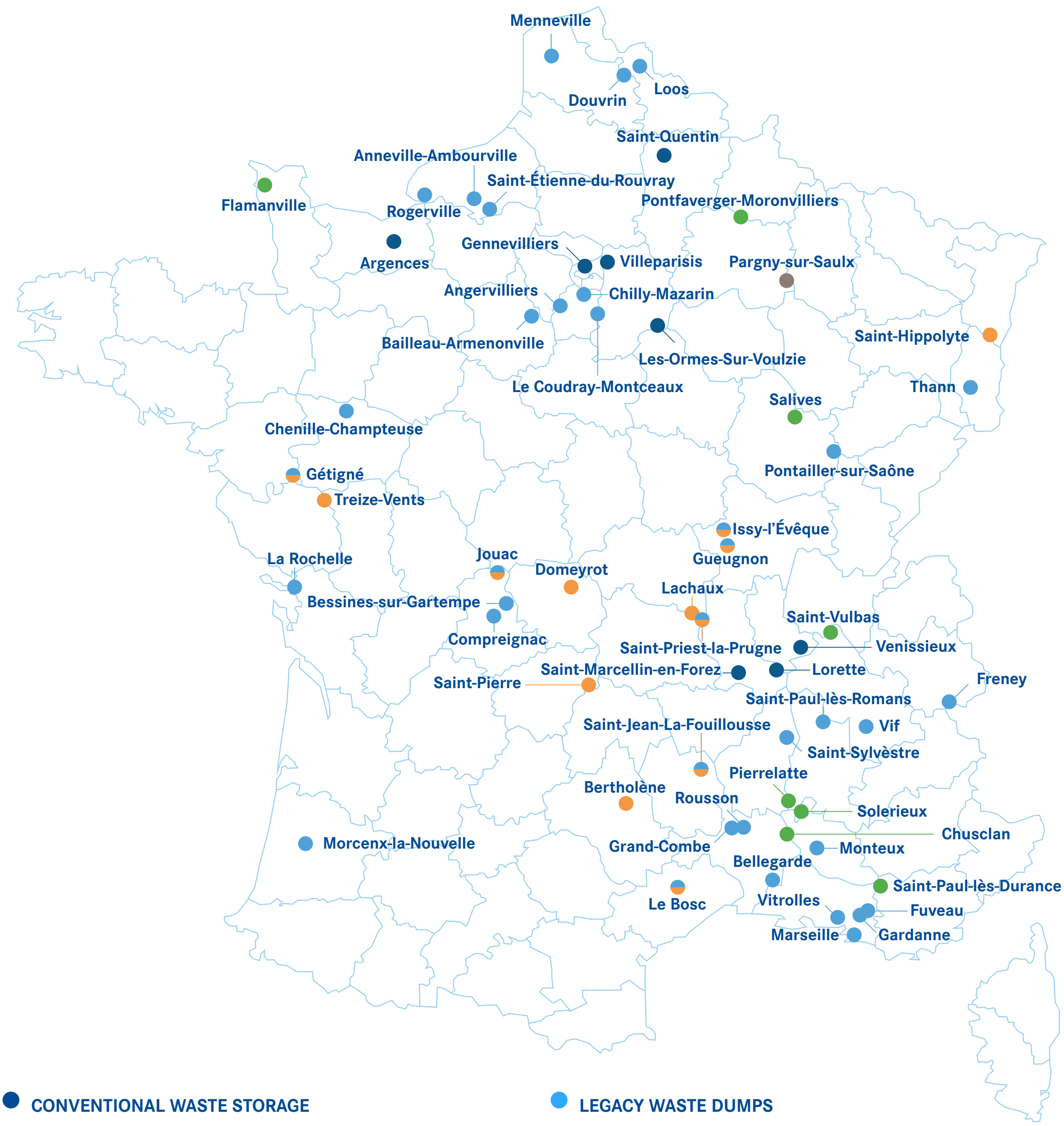
Locations of mine waste and tailings subjected to specific management methods (mainland France)



- CONVENTIONAL WASTE STORAGE FACILITIES WHICH HAVE RECEIVED RADIOACTIVE WASTE
- LEGACY WASTE DISPOSAL FACILITIES WITHIN OR CLOSE TO BASIC AND SECRET BASIC NUCLEAR INSTALLATIONS
- LEGACY WASTE DUMPS WITH HIGH NATURAL RADIOACTIVITY
- THE ORFLAM PLAST SITE
- URANIUM TAILINGS

The quantities declared by radioactive waste producers/holders can be consulted in the summary report of the *National Inventory*.

All the data on radioactive materials and waste can be consulted on **inventaire.andra.fr**

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inventaire.andra.fr, , the reference website for all France-wide radioactive materials and waste.