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PIERRE-MARIE A WORD FROM ABADIE Andra CEO

After a busy year in 2018, Andra is approaching the future with determination, while maintaining its open attitude towards society. Andra's CEO gives an update on the main highlights and explains its forthcoming challenges.

A dvancing without haste but with resolve was the approach taken by Andra in 2018, in a context that was at times tense, with the debate over the Aube disposal facility's impact on health and the illegal occupation of land owned by Andra in Lejuc wood by opponents of the Cigeo project. We dealt with these events coolly and calmly, reassured by the knowledge that we are firmly supported by the government and that the high standard of our work is recognised by national and international experts (ASN¹, CNE², IAEA³).

Good progress was made with the Cigeo project in 2018. The ASN confirmed its positive assessment of the disposal facility's safety options report, setting a clear path for Andra leading up to the submission of the construction licence application. This meant that we could make a start on the remaining studies and consolidate the structure of our construction licence application, while continuing our local consultations under the watchful eye of France's National Public Debate Commission (CNDP). Several topics were debated during the year: Cigeo's intersite connection, the water cycle, and transport infrastructure. The future is also starting to take shape at our other facilities, those still in operation (commissioning of the package inspection unit at the Aube facilities) and those in the closure phase (the important work done on the Manche disposal facility cap).

With these achievements under our belt, what do we envisage happening next? Following on from 2018, we plan to maintain our rigorous approach to current and future projects, while making even greater efforts with education, dialogue and openness to society. 2019 is the year of the public debate on the new National Radioactive Materials and Waste Management Plan (PNGMDR).



Andra is an agency in motion, resilient and adaptable to any situation that arises

The challenges involved are many and sometimes complex.

In the case of very low-level waste (VLLW), we need to think carefully about our future needs, since the forthcoming decommissioning of various nuclear facilities is likely to generate large volumes of waste, exceeding the capacity of the Cires waste collection, storage and disposal facility in Aube. Meanwhile, low-level long-lived waste (LLW-LL) raises long-term safety issues, so solutions need to be found that are coherent and proportionate to the risks posed by this type of radioactive waste. Finally, regarding the most hazardous waste, which Cigeo is designed to take, the public debate will be an opportunity to revisit the justifications for the disposal facility in the light of current energy policy and to work together on the adaptability, governance and phasing of the project.

Local consultations will also continue in 2019. Although our scientific and technical expertise is recognised, we still have an obligation to explain our actions and we still need to consult on the topics that can be discussed. Andra's commitment to the areas where its sites are located will continue in 2019 and the years to come. This is particularly the case in Meuse and Haute-Marne, where a project like Cigeo can represent a socioeconomic opportunity for local stakeholders, who are already planning ahead to build a future with Cigeo.

Finally, in 2018 we undertook a major internal reflection process, examining our identity and *raison d'être*: an agency in motion, resilient and adaptable to any situation that arises. An open agency, that listens to those around it, contributes to societal debates, and invests in its host communities. An agency that adds a human dimension to its scientific rigour and expertise. And lastly, an agency whose employees are committed to fulfilling the mission assigned by the State on behalf of the French people: to deal with the legacy of the past and deliver a safer future.

¹ French Nuclear Safety Authority (ASN).

² National Assessment Board (CNE) for research and studies into the management of radioactive materials and waste.

³ International Atomic Energy Agency.

ANDRA

French National Radioactive Waste Management Agency

4 sites



HAUTE-MARNE Centre



PREPARATION FOR CIGEO

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2018 HIGHLIGHTS



Feb

LOCAL AREA

End of the illegal occupation of Lejuc wood and start of its remediation.





Geothermal potential at the Cigeo site: France's Court of Cassation dismisses the associations' claims.



June site

Opening of the package inspection facility at the Aube disposal facility.



March

CONSULTATION

Launch of a new local consultation stage for the Cigeo project. First two topics discussed: the water cycle and transport infrastructure development.

LOCAL AREA

Announcements to strengthen dialogue and consultation during the meeting of the High-level Committee at the Ministry of Ecology.





Delivery of the first large waste items from dismantling the Chinon A power plant to Andra's Cires waste collection, storage and disposal facility in Aube.



July NATIONAL INVENTORY

Publication of the 2018 edition of the National Inventory of Radioactive Materials and Waste.





Samples taken from the bituminous membrane of the Manche disposal facility cap.

Nov OPERATION

Construction of the phase 10 disposal vaults at the Aube disposal facility with installation of locally manufactured underground drift components.



)ec EXPERIMENTATION

Tests at Andra's Underground Research Laboratory of the reference solution for the high-level radioactive waste disposal cell planned for Cigeo (optimisation and monitoring).



The High-Level Committee meets at Andra's Meuse/Haute-Marne Centre for a progress update on the Cigeo project.

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BUYING LOCAL

200 participants in the 'Buy local' day at Andra's Meuse/ Haute-Marne Centre. A highlight of the day was the signing of an agreement with Poma to install a test bench for Cigeo's ramp transfer system in Haute-Marne.



ANDRA'S MISSION

Andra works with commitment and responsibility to fulfil the general interest mission assigned to it by the State on behalf of the French people: to manage the radioactive waste produced by current and previous generations and to make that waste safe for future generations.



Operating

the two existing surface disposal facilities in Aube: the Aube disposal facility for low- and intermediate-level short-lived waste (LILW-SL), and the Cires waste collection, storage and disposal facility for very low-level waste (VLLW).



Monitoring

the Manche disposal facility (CSM), France's first surface disposal facility for low- and intermediate-level radioactive waste, now closed.



Researching and developing

disposal solutions for waste for which no disposal facilities currently exist:

low-level long-lived waste (LLW-LL);
high-level (HLW) and intermediate-level long-lived waste (ILW-LL): the Cigeo project.



Fulfilling a public service mission to:

• collect legacy radioactive objects held by private individuals (old luminous clocks, radium objects for medical use, natural salts for laboratory work, certain minerals, etc.);

clean up sites polluted by radioactivity, e.g. Marie Curie's old laboratories;
produce the National Inventory of Radioactive Materials and Waste in France, every three years. The most recent edition was published in 2018.



Sharing and promoting Andra's expertise worldwide



Preserving the memory of its facilities



Informing and communicating with all sectors of the public

FOCUS ON

Afnor certification renewal



In September 2018, Afnor renewed Andra's triple certification: ISO 9001 (quality management), ISO 14001 (environmental management) and OHSAS 18001 (occupational health and safety management). Regular renewal of these certifications ensures Andra can run all its activities and projects in compliance with the highest quality, environmental and safety standards.

ORGANISATION CHART

AS AT 01/05/2019



ANDRA'S GOVERNANCE

Andra is a public establishment supervised by the Ministries of Energy, Research and the Environment. Its main governance body is the Governing Board. To fulfil its mission, Andra's Governing Board is supported in making informed choices and decisions, by various committees. We take a closer look at the societal, technical and scientific committees.





system planned for the Cigeo project

Industrial Committee

Andra's Industrial Committee was set up by decision of the Governing Board on 13 October 2011. It examines all questions put before it by the Board related to Andra's activity and industrial projects, especially the Cigeo project.

Scientific Council

Andra's Scientific Council was set up by the Ministerial Decree of 30 December 1992. Its members are appointed by joint order of the Ministers for the Environment and Research. France's High Commissioner for Atomic Energy, appointed in application of Article L. 332-4 of the Research Code, is an ex officio member.

The Scientific Council examines the research and development strategy, research programmes and results presented by Andra.

The Scientific Council also relies on specialist committees in certain areas: the Guidance and Monitoring Committee (COS) of Andra's Meuse/Haute-Marne Underground Research Laboratory and the Guidance and Monitoring Committee of the Perennial Observatory of the Environment (COS-OPE).



Ethics and Society Committee

The Ethics and Society Committee was created in 2016 and reports to Andra's Governing Board. It issues opinions and makes recommendations on ethical and societal issues related to radioactive waste management. One of its particular responsibilities is to ensure Andra respects its commitments concerning public participation in decision-making about the Cigeo project. It also evaluates the actions implemented in response to society's ethical and democratic concerns about the governance of Cigeo. In 2018, the Ethics and Society Committee published two reports on Cigeo's governance.

The first report proposed ideas for wider public participation in the development of the project's governance, to give it greater democratic legitimacy.



This enhanced participation could be based on concrete proposals accessible to as many people as possible, collected by an oversight committee consisting of citizens and stakeholders. It would foster consensus and the development of shared governance system. The Ethics and Society Committee is also encouraging Andra to prepare an assessment of the public participation process, drawing on a variety of contributions. In the second report, the Ethics and Society Committee set out its views on the composition of Cigeo's governance. It emphasised that various different sectors of the public should be involved and recommended a two-tier system of representation, at national and local level, which would be better able to take account of different points of view. It also recommended that information should be sent out more regularly, as the project phases progress and problems emerge.

Technical Committee for Underground Works

The Technical Committee for Underground Works was created in March 2018 and consists of independent experts responsible for examining reports on Andra's activities in underground construction and structures.

The Technical Committee for Underground Works was set up as the Cigeo project was entering its detailed design phase. Keen to gather specialist skills at this key stage, Andra drew inspiration from the practices of other operators engaged in similar underground construction work, such as the Grand Paris Express project.

Set up for a period of five years, the Technical Committee for Underground Works has 11 external members from France and abroad, who are independent of Andra and possess recognised expertise. Together they cover the areas of expertise necessary for Cigeo's construction: mining structures and underground and nuclear construction projects. They are responsible for evaluating studies conducted by Andra and specialist engineering companies that it commissions, but also for issuing critical opinions on the technical options chosen.



7 TOPICS

addressed as a priority by the Technical Committee for Underground Works

- Underground structure design (including geotechnics and soil-structure interaction)
- Underground construction work and the construction methods used
- Design and construction of deep vertical structures (shafts)
- Ventilation and nuclear safety of the facility during the construction and operation phases
- Safety and control of fire risk in underground structures
- Disposal facility closure
 structures
- Management of contemporaneous
 construction work/nuclear operation



FINANCES 2018

BUDGET



INVESTMENT



TURNOVER

€288,893 к



Grants, taxes and contributions are included in the calculation of turnover

COSTS



SOURCES OF INCOME



The Cigeo project is financed by the three main players in nuclear power generation (EDF, CEA and Orano) through a tax for the research and a special contribution for the facility design studies and preparatory work.

FOCUS ON

- At the Assises des Délais de Paiement event on payment timescales, held in Paris in May 2018, Andra was nominated for the Public Sector award alongside the Ministry of Culture and the Ministry of the Armed Forces. This recognition reflects Andra's efforts in this area as part of its CSR policy.
- In 2018 Andra fully digitalised its procedures for responding to calls for tender in the case of contracts worth over 25,000 euros. This is part of a general public procurement modernisation initiative.

OUR TEAMS IN 2018



Creation of the Social and Economic Committee

A year after reforms to the French Labour Code were adopted, Andra is one of the first public agencies to set up a Social and Economic Committee. In existence since 1 October 2018, it merges the former staff representation bodies: staff representatives (DP), works council (CE), and health, safety and working conditions committee (CHSCT). Particular attention has been given to occupational health and safety.

FOCUS ON

First recruitment day for interns

Keen to develop its educational initiatives, in May 2018 Andra held its first recruitment day for interns. At the end of the event, 24 students were selected to join Andra at the start of the 2018 academic year. This compares with around 20 in 2017. The event will be repeated in 2019 with a recruitment target of 30 interns.

Corporate social responsibility (CSR): Andra takes action

Knowing that a good working environment promotes performance and collective success, Andra is pursuing an ambitious human resources and CSR policy. In 2018 this was reflected in the organisation of two 'cleaning days' spent tidying and organising its workspaces, and in the setting up of a crèche.





HO1 PREPARATION FOR CIGEO

16 •	DESIGN

- 17 SAFETY
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DESIGN

CIGEO: THE CONSOLIDATION PHASE

With the construction licence application in sight, the Cigeo project remained on track in 2018. Andra worked hard to consolidate the design studies and make progress with structuring the application to be submitted to the ASN, while preparing for the disposal facility's construction.

For several years, the Cigeo project has progressed incrementally, paving the way for submission of the construction licence application.

In 2016, Cigeo entered its final design phase with the detailed engineering design and submission of the safety options report, which presents the main choices made in terms of safety. Andra will specify these in its construction licence application.

In 2017, the detailed engineering design work continued and improvements were incorporated into the project.

In 2018, Andra consolidated its programme of studies, taking into account feedback from the ASN on the safety options report. In parallel, Andra continued to make progress with regulatory

documentation such as the declaration of public utility and the project impact study, and with structuring the construction licence application for Cigeo.

Preparing for disposal facility construction In 2018, Andra's teams also made progress with another important task for the project: preparation for the disposal facility's construction phase and commissioning. If Cigeo is given the go-ahead, new skills will be required for the work to be done. Andra must therefore start anticipating its future needs now by setting up a new organisational structure for the project, identifying the necessary human resources and preparing for the signature of future construction contracts.

IN BRIEF



A consolidated digital approach

Cigeo is a very large project and its design, construction and operation are therefore a challenge in terms of data management. In view of this, Andra has introduced two digital tools. One is a 3D model (a BIM¹ tool) that makes it easier for the different parties involved in construction to work together. The other is a secure database containing all the technical data, which is designed to facilitate real-time management of the facilities throughout their lifecycle (PLM²). In 2018, Andra merged these tools with the aim of improving the overall consistency and effectiveness of the Cigeo project.

The 'digital twin' produced by this merger will integrate increasingly sophisticated data and technologies – for example a display interface using virtual reality glasses – as the project progresses.

¹ Building Information Modelling.
 ² Product Lifecycle Management.



THE CIGEO DISPOSAL FACILITY PROJECT



SAFETY

POSITIVE ASSESSMENT BY THE ASN OF THE SAFETY OPTIONS FOR CIGEO

In January 2018, the ASN published its opinion on the Safety Options Report for Cigeo submitted by Andra. This was a key step that paves the way for submission of the construction licence application, planned for 2020.

Having spent more than a year and a half examining the report, the ASN delivered its opinion on the safety options for the Cigeo deep geological disposal project for radioactive waste, submitted by Andra in April 2016. The safety options are based on more than 20 years' scientific and technological study. They aim to ensure the safety of workers, the public and the environment throughout Cigeo's operating life and after its closure.



ILW-LL disposal principle

A mature project

ASN's opinion highlighted the technical maturity of the project as a whole, and considered the safety options proposed by Andra to be satisfactory for the vast majority (more than 80%) of the planned waste. Several positive points were mentioned in particular: Andra's detailed knowledge of the geology of the site chosen for Cigeo, its knowledge of the facility components (waste packages, cells, drifts, shafts), and its approach to safety.

Points requiring further study or evidence

Further evidence is required for some points before the construction licence application is submitted by Andra in 2020. In particular these include the disposal facility architecture, the dimensioning of the facility to withstand natural hazards, monitoring of the facility and management of post-accident situations.

Bituminised waste under close surveillance

Finally, the ASN identified bituminised waste packages as a point requiring vigilance.



As a result of this opinion, an international review has been launched (see Focus below) and Andra and the radioactive waste producers have begun studies of two options: treatment of the packages before disposal in Cigeo to neutralise their chemical reactivity; and reinforcement of the disposal zones designed for these packages to eliminate the risk of runaway exothermic reactions.



FOCUS

Launch of an international review of bituminised waste management

In 2018, following the publication of its opinion on Andra's safety options report, the ASN set up a panel, jointly with the Ministry of Ecological and Inclusive Transition, to review bituminised waste management. Composed of national and international academic and non-academic experts, this review panel will evaluate scientific knowledge related to the characterisation and behaviour of bituminous waste, and the pertinence of studies done by Andra and the radioactive waste producers, investigating two possibilities: neutralisation of the chemical reactivity of this waste, and modification of the design of Cigeo. Following a kick-off meeting organised by Andra in September 2018, the experts began a series of in-depth hearings with stakeholders. The review should reach completion in 2019.

LOCAL AREA

THE HIGH-LEVEL COMMITTEE MONITORS THE LOCAL INTEGRATION OF THE CIGEO PROJECT

The High-Level Committee, which is responsible for monitoring accompanying measures for the Cigeo project in Meuse/Haute-Marne, met on two occasions in 2018. At these meetings, announcements were made that strengthen dialogue and consultation, and a progress report on the project was given.

Chaired by a member of the government, the High-Level Committee (CHN) brings together elected officials (parliamentary representatives, presidents of regional, departmental and local councils, mayors), senior managers from Andra and the nuclear operators (EDF, Orano and the CEA), as well as prefects, representatives of devolved State services and managers from the public bodies involved. It meets twice a year to monitor the work being done by Andra to prepare for Cigeo's arrival in the area and to mobilise the nuclear operators involved in local economic and social development.

Strengthening dialogue and consultation

The first meeting of 2018 was held in March, chaired by Sébastien Lecornu, Secretary of State to the Minister for Ecological and Inclusive Transition.

During this meeting, Andra recounted the history of the Cigeo project, gave an interim briefing on progress made with the design studies, presented the dialogue and consultation work it had carried out carried out and gave an account of its involvement in supporting and developing the local economy.

The Secretary of State announced that further dialogue and consultation tools would be introduced, including the launch of a shared resources platform accessible to all citizens online, a public debate as part of the process of examining the National Radioactive Materials and Waste Management Plan (PNGMDR), and the setting up of special working groups on local taxes applicable to Cigeo and on modernising highway infrastructure.



FOCUS ON



Flamanville EPR in the spotlight

Enabling local stakeholders from the area affected by the Cigeo project to find out about other large infrastructure projects in France and to benefit from feedback from those projects is the aim of a series of local workshops offered by Andra. Following workshops on the LGV Sud Europe Atlantique high-speed rail line and the Millau viaduct, the third, held in June 2018, was on the EPR nuclear reactor in Flamanville, one of the largest construction projects under way in France. From employment, training and housing to transport and economic development, this third generation reactor has mobilised all aspects of local public policy. By revealing the challenges involved and giving a behind-the-scenes look at the project, the workshop shed valuable light on actions that could be taken to facilitate Cigeo's integration into the region.



Supporting development in the region The second meeting, held in September 2018, focused on economic support for the region. The Secretary of State highlighted the work done by stakeholders and expressed the desire for this to continue, with the aim of ensuring the regional economic and social fabric benefits fully from the activity generated by Cigeo.

During the meeting, Meuse prefect and Cigeo project coordinator Muriel Nguyen presented the work done on the regional development contract (CDT) which is designed to prepare Meuse and Haute-Marne for the Cigeo project's arrival. In particular, this document includes development work to be done before Cigeo is built (rail link, roads, connection to water and fibre optic networks) to make it more attractive, initiatives to foster training and economic development, and work to enhance the region's natural and historic heritage. Finally, Andra has drawn up an up-to-date list of the design studies for the Cigeo project and the local consultations, and presented a timetable for the preliminary development work to be carried out in the region before Cigeo arrives. As required by the government, this timetable includes the submission of an application for a declaration of public utility (DUP) at the end of the public debate on the PNGMDR.





Information day for CLIS members

In December 2018, Andra gave an updated presentation of progress with the Cigeo project to around thirty members of the Local Information and Oversight Committee (CLIS) of Andra's Underground Research Laboratory. The programme included, among other things, finalising the design studies, preparing the construction licence application and regulatory documentation, preparatory work prior to construction and the provisional project timeline. The participants then visited Lejuc wood, which is the planned location for one of Cigeo's surface facilities: the Shaft Zone. During the visit, they were able to see the route of the future intersite connection, which will link the Shaft Zone to the second surface facility: the Ramp Zone.



Official visits

Sébastien Lecornu, former Secretary of State to the Minister of State for Ecological and Inclusive Transition, visited Meuse/Haute-Marne on several occasions in early 2018. He had tours of Andra's facilities and met local stakeholders affected by the siting of the Cigeo project in the area. He reaffirmed the French government's support for the project during these visits.

Emmanuelle Wargon, who replaced him in late 2018, picked up where he left off, visiting Andra's Meuse/Haute-Marne Centre in January 2019.



CLEARANCE AND REMEDIATION OF LEJUC WOOD

In February 2018, the authorities cleared Lejuc wood, owned by Andra, which had been illegally occupied by opponents of the Cigeo project. In a calmer atmosphere, Andra was able to begin remediation work on the wood.

Lejuc wood, in Mandres-en-Barrois (Meuse), may be chosen as the site of one of Cigeo's two surface installations: the Shaft Zone. This would be used as the operational base for excavation and construction of the underground structures. It would also house infrastructure and buildings associated with the facility's construction, then its operation and maintenance.

Restoration of order and cleanup

Lejuc wood had been occupied since the summer of 2016 by opponents of the project, sometimes leading to outbreaks of violence.

The occupation was found to be illegal by the courts, and was brought to an end on 22 February 2018 when the authorities intervened, enabling order and peace to be restored. Andra immediately began work to clean the site and remove litter and other material accumulated by the occupants (nearly 225 tonnes were removed in a single week), and also to fill trenches that had been dug. The removal of the protesters from the wood also enabled Andra to comply with the August 2016 court ruling requiring partial reforestation.

CIGEO: END OF THE COURT CASE ON THE SITE'S GEOTHERMAL POTENTIAL

In May 2018, France's Court of Cassation found against the associations accusing Andra of deliberately underestimating the geothermal potential of the Cigeo site. This ruling brings an end to five years of legal proceedings.

One of the criteria taken into account when the Cigeo site was chosen was the ASN's requirements concerning geothermal potential, which should be neither exceptional nor of particular interest. Geothermal engineering, which consists of extracting heat from the subsoil for various uses such as heating homes, could be a valuable resource for future generations, and this could increase the risk of intrusion into the disposal facility.

A transparent scientific programme

Although various boreholes drilled before 2007 had led to the conclusion that there was no exceptional or particular geothermal resource, Andra wanted to confirm these results by drilling a deep borehole (to a depth of nearly 2,000 metres) as part of a programme involving 21 French laboratories (including IRSN). The data produced by this operation, which were made available to the scientific community, supported the previous findings.

Three concurring judgments

However, six associations challenged the results and served notice on Andra in late 2012 for concealment of the site's geothermal potential. Despite two further concurring expert opinions, they then took Andra to court in May 2013 on the same grounds. Rulings by the high court in Nanterre and then the Versailles court of appeal, in 2015 and 2017 respectively, both rejected the complaint. However, it was not until May 2018 that a third ruling against



the six associations, this time by the Court of Cassation, brought a definitive end to the proceedings.





IN GONDRECOURT, ANDRA CONTRIBUTES TO IMPROVING THE LOCAL ENVIRONMENT

In December 2018, Andra began operations on two sites that it owns near Gondrecourt-le-Château in Meuse: emptying of an old municipal landfill site and demolition of some derelict buildings on a brownfield site.

As the owner of several plots of land in the area surrounding its Meuse/Haute-Marne Centre, Andra regularly undertakes maintenance and remediation work as part of the management of its property and land. In December 2018, Andra carried out decontamination work at a former municipal landfill site between Gondrecourt-le-Château and Horville-en-Ornois, on land belonging to it. This site, where pollution is harming the environment, is where the future private rail siding (ITE) will be situated. This is a 14 km rail link between the Gondrecourt-le-Château site and Cigeo's package reception zone.

Decontamination of an old landfill site

The landfill site was in operation from 1985 to 1995, and currently contains 67,000 tonnes of waste (rubble, household waste, bulky items, commercial waste, car bodies, etc.) covered with soil. The objective of this operation, conducted in liaison with the local authorities, was to remove the waste before cleaning the soil. Andra was project coordinator, working with contractors with complementary skills: large specialist firms (especially for sorting the waste) but also local companies (for the earthworks). After a detailed analysis of the type of waste present, so that it could be sent for appropriate disposal, the site equipment was installed in October 2018 and the waste removal began in November. It continued for several months, with around thirty daily trips back and forth to approved recycling centres.

Remediation of a brownfield site

In parallel with this, Andra had two old industrial buildings demolished in 2018 that had been in danger of collapsing, on a brownfield site in Gondrecourt-le-Château. Once occupied by a furniture factory, the site has become an annex to Andra's Underground Research Laboratory and is used store equipment and conserve rock samples from the geological surveys. This is the second phase of work following asbestos removal and the dismantling and deconstruction of several buildings since 2015.





Opening of the 'Cœur de Meuse' business centre

After one year under construction, the 'Cœur de Meuse' business centre opened in October 2018. The new 1,400 m² building, a project of the Meuse Chamber of Commerce and Industry, is in the immediate vicinity of the Meuse TGV station. Andra rents 500 m² of office space and meeting rooms in the centre, to accommodate teams from its Châtenay-Malabry and Meuse/Haute-Marne sites, as well as employees and regular contractors.



Redevelopment of the shaft sinking zone continues

Redevelopment of the shaft sinking zone, an area of land containing the shafts of Andra's Underground Research Laboratory in Meuse/ Haute-Marne, continued in 2018 with the construction of new buildings to accommodate Andra's contractors (electricians, mechanical engineers), a garage for the bottom machinery and offices. Begun in September 2016, the shaft sinking zone redevelopment will, in late 2019, produce a 3,700 m² U-shaped architectural complex surrounding a central island.

CIGEO, AN OPPORTUNITY FOR LOCAL BUSINESSES

In October 2018, the latest 'Buy Local' day organised by Andra and the association Energic S/T 52-55 took place at the Meuse/Haute-Marne Centre, bringing together 150 local businesses. Its aim was to publicise Andra's future needs and enable Andra to get to know its suppliers better.

With several hundred direct jobs and a dynamic procurement policy towards local businesses, Andra plays an active role in the local economic life of the areas where its sites are located. As part of this strategy and in preparation for Cigeo's arrival in Meuse/Haute-Marne, Andra is working in cooperation with the association Energic S/T 52-55, an energy skills centre and cluster based in Meuse and Haute-Marne. Together, the two partners organise an annual event called 'Buy local', which aims to familiarise local industry with Andra's future needs and to help local businesses to access consultations and calls for tender linked particularly to the Cigeo project, in compliance with public procurement rules.

Raising the profile of future contracts

The 2018 'Buy local' day was held in the Technological Exhibition Facility at Andra's Meuse/Haute-Marne Centre. It was attended by 200 professionals from 150 local businesses, who came to find out more about Andra's short-term needs and the prospects for future contracts linked to its projects. The event also gave them an opportunity to present their skills and expertise to Andra's tier 1 suppliers, who may turn to them to expand their panel of subcontractors, making it easier to respond to Andra's calls for tender.

A policy of support that is bearing fruit

Andra's commitment to buying locally is part of an ongoing effort over the last ten years. In 2018, orders worth €25.3 million were placed with local businesses in the areas where Andra's sites are located, in Aube, Manche, Meuse and Haute-Marne. The majority of these contracts are for construction work, technical services, general services and intellectual services. For the redevelopment of the shaft sinking zone at Andra's Underground Research Laboratory (see p. 21), 68% of the work was awarded to local suppliers.

It was also a local business that built the new emergency shelter at the Laboratory, subcontracting 65% of the services to local suppliers.





Signature of a contract with POMA

At the 2018 'Buy local', Andra signed a contract with POMA, the French cable transport systems specialist. The contract provides for the installation in Haute-Marne of a full-scale test bench of the ramp transfer system, representing the technology that would be used to take radioactive waste from the surface to Cigeo's underground disposal installations.

This demonstrator, which will work on 70 metres of rail on a 12% slope, will be used to test the future ramp transfer system's braking systems. Construction will begin in 2019, and the first braking test results are expected in 2021.

The test bench was originally due to be built in the Auvergne-Rhône-Alpes region, but at Andra's request the work will take place in Haute-Marne, in a vacant industrial building. This decision is an example of Andra's policy of support for local economic development around its sites, with the support of the two public interest groups, in Meuse and Haute-Marne.





SPONSORSHIPS AT THE MEUSE/HAUTE-MARNE CENTRE

Through sponsorships, Andra provides active support for initiatives that contribute to the dynamism and development of the areas where its facilities are located. In 2018, 193 projects were supported by Andra's Meuse/Haute-Marne Centre.

These sponsorships are the practical embodiment of Andra's corporate social responsibility (CSR) policy and its desire to be fully involved in the life of the areas where its facilities are located or its employees live and work. Sponsorships are given in a clear and transparent manner and are governed by the sponsorship charter, which dictates the grant award principles to be followed and the themes to be supported by Andra:

- sharing scientific and technological culture;
- learning about and protecting biodiversity and the natural environment;
- passing on the memory of the sites and safeguarding heritage;
- initiatives promoting solidarity and social cohesion;
- support for the local community.

'Les filles, osez les sciences' exhibition

Organised at the initiative of the association Accustica with Andra's support, the travelling exhibition 'Les filles, osez les sciences' [Girls, give science a try], launched in Reims in November 2018, publicises science courses and jobs to attract girls into science and combat received ideas about gender and careers. In particular, the exhibition portrayed nine women of science from the Grand Est region of France. Andra was represented at the exhibition by two engineers from the Meuse/Haute-Marne Centre and the Aube facilities.



Helping to integrate people with disabilities

As part of its action to promote solidarity, Andra sponsored Amiph, an association based in Meuse running social and professional inclusion initiatives for people with disabilities. In particular, Amiph offers an IT workshop that covers 3D modelling and printing. Andra's support has enabled Amiph to buy a 3D printer, and a draft version of an educational model of Andra's Underground Research Laboratory has been created.



Renovation of a cultural space

Andra is committed to assisting the local community, and accordingly has supported the Joinville oh'IS cultural association which wants to convert a former cinema, La Lucarne, into an arts centre. The new arts centre offers shows by local and national artists and residences for artists and designers based in Haute-Marne. Plays, concerts, cabarets and children's shows are also on offer in the eclectic programme of this live arts venue in Joinville.

Géologia forum

As a historic partner of Géologia, the geoscience internship and job forum held each year by the École nationale supérieure de Géologie in Nancy, Andra attended the 11th edition held in November 2018. It welcomed to its stand nearly 120 geoscience students and professionals who had come to find out more about the Cigeo project and current and future jobs with Andra.



FOCUS ON

New lease of life for Val d'Osne Foundry

Set up in 1836, the Val d'Osne art foundry was one of the biggest French art foundries until the start of the twentieth century. Bought by Andra in 2014 as a brownfield site, it is one of 270 sites listed in 2018 by the Mission Stéphane Bern-Fondation du Patrimoine and is the subject of a preservation project begun by Andra in collaboration with the local community. Remediation work will start in 2019 with the site being made safe and cleaned up. It will continue with the

preservation of the three most iconic buildings: the blast furnace, the pavilion and the electrical power plant.



193 local projects supported by the Meuse/Haute-Marne Centre



See Andra's sponsorship charter and the list

of projects supported in 2018





#02 INDUSTRIAL ACTIVITIES

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CUSTOMER RELATIONS

WORKSHOPS TO GET TO KNOW EACH OTHER BETTER

In November 2018, Andra brought together radioactive waste producers from the French nuclear power industry for the latest edition of the Andra Workshops. The aim was to inform, develop new ideas, but also enable Andra and its customers to get to know one another better.

Planned jointly with the participants (EDF, Orano and CEA), the day focused on the topic of collective intelligence. A number of round table discussions were held on major challenges for the sector, e.g. managing specific types of radioactive waste and dismantling nuclear facilities, while participatory workshops looked at improving customer relations between Andra and producers in the nuclear power industry. The producers enjoyed this opportunity for sharing and listening, and said how much they valued meeting teams from Andra and discussing common problems with other producers.



SHARING EXPERIENCE ON ACTIVATED WASTE

Andra is working with producers of activated waste¹ to ensure this type of waste can be processed at its disposal facilities. Two meetings were organised by Andra in 2018 for sharing views.

These discussions enable waste producers to share their thoughts and best practices concerning the best methods for determining the characteristics of activated waste.

In order to accept this waste at its disposal facilities, Andra needs details of the activity level and the inventory of radionuclides present. The producers are responsible for forwarding all the information to Andra. But finding out

the exact characteristics of radioactive waste can prove difficult for industrial companies and research laboratories for whom this expertise is not part of their core business. Hence the discussion meetings organised by Andra.

¹These producers used particle accelerators for medical applications or for research in nuclear physics. The materials at their facilities are subject to radiation from the accelerators, and this generates activated radioactive waste, i.e. waste that has radioactivity within the material itself.

FOCUS ON

Satisfaction levels among Andra's customers

In 2018, as every year, Andra conducted a survey among radioactive waste producers in the nuclear power and nonnuclear power industries to find out how satisfied they are with Andra's industrial activities and to understand their expectations. Overall, satisfaction has remained very high, though the waste producers expect even more in terms of expertise (in the case of nuclear power industry producers) and responsiveness (in the case of non-nuclear power industry producers).

Radioactive waste management



• Quality of communication with Andra



Adaptation to customers' specific needs



Update to the Radioactive waste collection guide

The 2018 edition of the Radioactive waste collection guide sets out the new technical specifications and conditions of acceptance by Andra for standard radioactive waste packages from non-nuclear power industry producers (hospitals, universities, research laboratories, industry, etc.), and the conditioning, treatment and storage methods for this type of waste. This new version applies to all packages produced from 1 July 2018. It is available on andra.fr.

ANDRA'S AUBE INDUSTRIAL FACILITIES

DISPOSAL OF THE FIRST LARGE WASTE ITEMS IN THE DEDICATED TRENCH AT CIRES

At Andra's Cires waste collection, storage and disposal facility, the trench specially designated for large waste items received its first large packages in 2018 from the dismantling of the Chinon A nuclear power plant.



Disposing of heat exchanger cylinders using the special gantry for the trench

Cires has been accepting very low-level waste (VLLW) since 2003, mainly from the dismantling of French nuclear facilities. Some of this waste consists of large items, e.g. the heat exchanger cylinders used at first-generation nuclear power plants, which performed the same function as the steam generators in current nuclear plants (PWRs).

An overhead crane for disposal

To make the disposal of these large, heavy waste items easier, Cires now has a special trench measuring 265 m in length and 23 m in width, which has been in operation since the end of 2017. In April 2018, the first heat exchanger cylinders from the Chinon A nuclear power plant, which is in the process of being dismantled, arrived on the site. Each measuring 13 m in length and weighing 18 t, they were emplaced by an overhead crane specifically designed for using this trench. Deliveries continued until June, and a total of 90 heat exchanger cylinders have now been disposed of.

FOCUS ON

Simplifying and streamlining the disposal of large waste items

Until 2017, there were major difficulties with disposing of large radioactive waste items at Cires: their size and weight made it difficult to transfer them to the bottom of the disposal trenches using the handling machinery because the access ramp had a 12% slope.

It was necessary to wait until the trench had been filled to ground level, which sometimes meant long disposal delays. These logistical and time constraints prompted Andra to build a special trench specifically for these packages.





Plan for a new facility in Aube: geological surveys now complete

Since 2013 Andra has been carrying out surveys of the land in the Vendeuvre-Soulaines area, as part of the search for a site for the disposal of low-level long-lived waste (LLW-LL) and very low-level waste (VLLW). There are currently no specific disposal facilities for LLW-LL, so most of this waste is stored temporarily at facilities on the radioactive waste producers' sites. Meanwhile, VLLW is disposed of at Andra's Cires waste collection, storage and disposal facility, but this facility does not have the capacity to take all the waste that will be generated by the future dismantling of nuclear facilities.

To complement the data already in its possession on the geometry and uniformity of the clay layer and its radionuclide confinement properties, in 2017 Andra began a geological survey campaign, the final phase of which was completed in October 2018. This consisted of drilling three boreholes (two of 30 m and one of 90 m in depth) and taking seismic and well logging measurements¹. The results will be used in forthcoming reports on LLW-LL waste that Andra is required to submit to the government and the ASN.

¹ Measurement of the characteristics of a geological formation using different sensors.

COMMISSIONING OF THE WASTE PACKAGE INSPECTION FACILITY AT THE AUBE DISPOSAL FACILITY

The waste package inspection facility at the Aube disposal facility (CSA) went into operation in summer 2018. It enables Andra to carry out more detailed tests on certain radioactive waste packages.



X-ray scanner inspection of a radioactive waste package

When they arrive at CSA, all radioactive waste packages undergo systematic checks. If packages are identified as non-compliant, Andra can stop accepting them from the producer's site, or even suspend the authorisation enabling the site to send its radioactive waste to CSA. Additional, more detailed tests are also performed on a regular basis. Until now some of them had been contracted out to external facilities not owned by Andra.

Since summer 2018 when the package inspection facility (ICC) was commissioned, in accordance with the licence issued by the ASN in March 2018, Andra has been able to perform these tests itself. The benefit of this is that it has a better knowledge of package quality and can complete the inspections more quickly.

Two types of test

The ICC is equipped for non-destructive testing, i.e. tests that do not require the waste to be removed from its conditioning. Approximately 250 packages are inspected each year. In the receiving area, packages are weighed, their dimensions are measured and they are visually inspected, and the package dose rate is also measured. Outgassing measurements are then performed in an area specially designed for this. Finally, the package contents may be examined using an X-ray scanner to check quality and that there is no prohibited waste present. Destructive testing of 15 to 20 packages per year is also carried out in the ICC. It consists of extracting the wastes layer by layer, and analysing them one by one to check that there is no prohibited waste present. A core-sampling unit is used to take samples of different constituents of the package, which are sent to a laboratory for radiochemical analysis.

Support for the local economy

As well as improving quality and response times, the ICC also fulfils a commitment made by Andra to contribute to economic development in Aube. More than 15% by value of the construction work was given to local companies or companies that are established locally.

FOCUS ON

A new construction phase

To ensure the Aube disposal facility can keep operating, new disposal vaults have been built regularly since it went into service in 1992. The tenth construction phase was launched in 2018. It will create four rows of five gravel backfilled vaults for the disposal of concrete radioactive waste packages and two rows of five concrete vaults for the disposal of metal radioactive waste packages. These vaults will be built on top of nearly 284 metres of underground galleries used for monitoring purposes and for collecting any seepage water. As with the package inspection facility, support for local businesses was taken into account when awarding contracts for the work. By 2023, 30 new disposal vaults will have been built at the Aube disposal facility.



Installation of parts forming an underground gallery during the construction of disposal vaults

PUBLICATION OF AN ADDITIONAL HEALTH STUDY ON LUNG CANCER RISK IN HUMANS AROUND THE CSA

In June 2018, the national public health agency Santé Publique France published the results of an additional health study it had carried out on lung cancer surveillance in humans in a 15 km area around the Aube disposal facility (CSA).

The health study published in 2018 by Santé Publique France follows on from a survey conducted in 2010, which aimed to find out whether people living close to the CSA had a heightened cancer risk compared to the rest of the population in Aube and Haute-Marne. The first study used statistical data and found similar results for the target populations, both sexes combined, both for hospitalisations and deaths, except in the case of lung cancer, which was slightly higher for men but not for women. No causal link between the results and the CSA's activities was demonstrated. A study shared as widely as possible

As a result of these findings, a second study focusing on lung cancer was carried out over a longer period, using the same perimeter and the same methodology. This additional study was presented in June 2018 to the study steering committee, composed of all the stakeholders: local community associations, local elected officials, members of the Soulaines local information commission, the regional health agency, and Andra. It was also presented at the annual public meeting with the Soulaines local information commission in October 2018, so that it could be discussed with the general public.



More detailed results

The results published in 2018 show that the deviation observed in 2010 for the number of hospitalisations among men for lung cancer no longer appears in the new study, and the number of deaths remains at a very low level. The Soulaines local information commission, the regional health agency, and Santé Publique France are currently considering appropriate health monitoring and communication actions that they could implement in this area.

NEW INVENTORY OF FAUNA AND FLORA AROUND THE AUBE DISPOSAL FACILITY

A census of fauna and flora around the Aube disposal facility was conducted in 2018 as part of work to update the site impact study.



When the Aube disposal facility was designed, an environmental impact study was carried out for the site. The inventory of species, which is a regulatory requirement, is regularly updated, most recently in 2018.

Comparative study

The task of drawing up the new inventory was given to the CPIE for the Soulaines area, which visited the site between February and November 2018. Using special equipment (nest boxes for dormice, recorders for bats, etc.), the ecologists worked meticulously to verify whether the species observed before the centre was commissioned were still present and to analyse any changes since the first studies. The CPIE was also asked to suggest new inventories for certain species that had never been surveyed in the past or were present over a wider area, for example those living around the Brienne-le-Château rail terminal, which had never been surveyed by Andra.

Preliminary results

The CPIE's study showed that all the plant and animal species present when previous inventories were drawn up are still present within a five-kilometre radius of the facility. However, unusual periods of drought in 2018 meant that certain species of flowers were less prevalent.

Protective measures

The comparative analyses will enable the CPIE to advise Andra on the protective measures it should take to keep the facility's environmental impact to a minimum. Certain activities related to site operation could therefore be adapted to the needs of particular species.

2018 KEY FIGURES FOR ANDRA'S INDUSTRIAL FACILITIES IN AUBE

AUBE DISPOSAL FACILITY (CSA)



CIRES WASTE COLLECTION, STORAGE AND DISPOSAL FACILITY



.....

650,000 m³ Authorised radioactive waste package capacity 57.9% of the authorised volume reached by the end of 2018

23,826 m³ of radioactive waste disposed of in 2018

866 m³ of radioactive waste packages stored in the Waste Storage Building 241 m³ of radioactive waste packages received in 2018 at the Waste Collection Building

MONITORING OF THE ENVIRONMENT AND DISCHARGES

Andra's Aube industrial facilities and their environment are monitored to track the impact of conditioning and disposal activities and to prevent any risk of contamination, pollution or harm to the environment.

Aube disposal facility (CSA)



Approximately **2,550 samples** taken in the environment for 14,690 radiological and physicochemical analyses



0.00000013 milliSieverts: the radiological impact evaluated over the year 2018, a dose well below the regulatory limit and the impact of natural radioactivity

Cires waste collection, storage and disposal facility



Over 1,500 radiological analyses



No radiological impact on the environment caused by Cires

THE MANCHE DISPOSAL FACILITY MONITORS THE LEAKTIGHTNESS OF ITS CAP

Samples were taken in August 2018 from the cap at the Manche disposal facility (CSM) to verify the condition of the bituminous membrane that prevents leaks from the disposal facility.



To guarantee the integrity of the waste packages disposed of at the Manche disposal facility, Andra installed a 5.6 mm waterproof membrane composed of a geotextile impregnated with hot bitumen. This cap, which is elastic and can adapt to any ground movements, prevents rainwater from penetrating into the disposal facility and drains it into collection systems so that it can be collected and analysed before being released into the environment. The membrane also protects the disposal facility from intrusion by humans, animals or plants (e.g. roots).

Regular monitoring

In accordance with the regulatory monitoring plan for the Manche disposal facility, the cap condition is checked every five to ten years by taking samples to see whether the membrane has deteriorated and, if so, ascertain how quickly it is degrading and when it will need to be replaced. The latest samples were taken in summer 2018.

A specific procedure

The monitoring required a preliminary excavation phase in three different areas of the cap to clear the layers of topsoil, backfill and sand on top of the membrane and uncover approximately 10 m² in each area. At each of these sites, a 6 m² sample was taken and divided into smaller samples that were sent to specialist laboratories for analysis. The membrane's physical characteristics (thickness, porosity, etc.) were measured and compared with the data for the new membrane, and with samples taken during previous monitoring campaigns. Stress tests were also performed with water of variable temperature and composition, while tests with X-rays were used for more detailed analysis of the membrane structure and its leaktightness. The areas where the samples were taken were recovered with new pieces of membrane, which were welded to the rest of the cap.

Initial positive results

Although the results of the initial tests were obtained in a few weeks, those for the additional tests take much longer. The results presented in December 2018 to the Manche disposal facility's local information commission at its second annual meeting were therefore partial. On that date, the first reports showed that the membrane is still in good condition and continues to behave as it should.

FOCUS ON

Environmental monitoring In 2018, the Manche disposal

facility continued to have a very low impact on its environment.





0.00000038

milliSieverts: the impact of releases into the sea per year

0.00016

milliSieverts: the impact of releases into the Sainte-Hélène river per year

2.9

milliSieverts per year: the average impact of natural radioactivity in France



2,088

samples taken around the Manche disposal facility and 10,000 radiological analyses

LOCAL AREA

SPONSORSHIPS AT THE AUBE AND MANCHE FACILITIES

Through sponsorships, Andra provides active support for initiatives that contribute to the dynamism and development of the areas where its facilities are located. In 2018, 72 projects were supported by the Aube facilities and 6 by the Manche disposal facility.

These sponsorships are the practical embodiment of Andra's corporate social responsibility (CSR) policy and its desire to be fully involved in the life of the areas where its facilities are located or its employees live and work. Sponsorships are given in a clear and transparent manner and are governed by the sponsorship charter, which dictates the grant award principles to be followed and the themes to be supported by Andra:

- sharing scientific and technological culture;
- learning about and protecting biodiversity and the natural environment;
- passing on the memory of the sites and safeguarding heritage;

See Andra's sponsorship charter and the list

of projects supported in 2018

- initiatives promoting solidarity and social cohesion;
- support for the local community.





ANDRA'S AUBE INDUSTRIAL FACILITIES

Works by Gérard Larguier go on display

Andra loaned ten canvases by Meuse painter and visual artist Gérard Larguier on the theme of the First World War to the Musée Napoléon in Brienne-le-Château.

These large-format works, produced using collage, were on display as part of the museum's first temporary exhibition, entitled 'Guerre et mémoire : un regard neuf sur un siècle de mémoire' [War and Memory: a fresh look at a century of remembering], which opened in October 2018.



Creation of a wild animal rescue centre

Working alongside associations that strive to protect nature and biodiversity, Andra has provided support for the setting up of a wild animal rescue centre (Cresrel) by the CPIE in Soulaines. Prior to 2018 it was an emergency shelter, but Cresrel can now receive animals in distress in Aube, Marne and Haute-Marne and care for them at its extensive treatment facilities, before releasing them.





ArkéAube exhibition

Andra is a partner in the ArkéAube exhibition organised in Troyes by the Aube departmental council in December 2018. This event, presented in partnership with the French National Institute for Preventive Archaeological Research (Inrap), put the spotlight on a local archaeological heritage of more than 200 objects dating from the prehistoric and protohistoric periods. Coming from around forty sites in Aube, these discoveries were found during rescue archaeology digs or older searches (19th/20th centuries).



'Graine d'artistes du monde entier' exhibition

Because of its own role in the preservation and transmission of memory, in 2018 Andra renewed its sponsorship of the Centre pour l'Unesco Louis-François in Troyes, which introduces children to art and heritage through exhibitions, creative competitions and educational workshops. In particular it supported the international visual arts competition 'Graines d'artistes du monde entier' [Budding artists around the world] organised by the Centre and awarded a special prize to a young Estonian artist.

www.andra.fr



Business creation and succession competition

As it does every year, Andra supported the Aube business creation and succession competition, which rewards young entrepreneurs for their dynamism, the originality of their business or their action in favour of sustainable development. In 2018, 11 project leaders and company managers were awarded prizes to support and finance their initiatives. The Andra prize was awarded to SupAirVision, a business based in Troyes that specialises in inspecting wind turbine blades by drone.

But also...

The Jazzabar Festival in Bar-sur-Aube; a music concert organised by Le Mai des Handicapés for people with disabilities; an exhibition on insects held at the Maison de la Science in Sainte-Savine: just a few examples of the sponsorship requests accepted by Andra's industrial facilities in Aube.

72 local projects supported by the Aube facilities

Valued at





MANCHE DISPOSAL FACILITY

Support for victims of domestic violence

As part of its sponsorship related to solidarity and social cohesion, Andra is working alongside Cherbourg charity 'La belle échappée', which supports and assists domestic violence victims. In particular, this sponsorship enables the charity to organise prevention and awareness events for the general public, such as public talks and showings of short films to inform and help victims rebuild their lives.



Local heritage visit

For the 13th consecutive year, Andra has joined forces with the Cotentin tourist office to offer combined tours, during the summer, of the Manche disposal facility and local cultural sites: a visit to the Manoir Du Tourp, an animated tour of the history of La Hague and a visit to the Ludiver Planetarium.





Herbarium creation and conservation

As part of its commitment to the preservation of heritage and its transmission to future generations, in 2018 Andra renewed its sponsorship agreement with the National Society of Natural Sciences and Mathematics in Cherbourg, which it has been supporting for nearly ten years. This new agreement will support the continuation of two major projects: the creation of a herbarium at the Manche disposal facility, which began in 2015 and is designed to preserve the memory of the plants present on the site cap, and the digitalisation of historic herbariums in Cherbourg.

> local projects supported by the Manche disposal facility

Valued at





#03

SCIENTIFIC AND TECHNICAL KNOWLEDGE

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NATIONAL INVENTORY

NATIONAL INVENTORY 2018: A PANORAMA OF THE RADIOACTIVE MATERIALS AND WASTE IN FRANCE

In 2018, Andra published a new edition of the National Inventory of Radioactive Materials and Waste. In addition to an updated report on the materials and waste held, it also discusses the outlook for the future to inform those responsible for national policy on radioactive materials and waste management.

Produced every three years as part of Andra's public service mission, the National Inventory is a reference document explaining about radioactive materials and waste, where they come from and how they are managed.

In its latest edition in 2018, the National Inventory shows a slight increase in the volume of radioactive waste produced in France: 1,540,000 m³ as at 31 December 2016, compared to 1,460,000 m³ three years before. This increase is in line with projections in the previous Inventory and reflects current production by the different sectors that use radioactivity (mainly nuclear power generation, but also the medical sector, industry, research and defence). The Inventory also explains that disposal solutions exist for 90% of radioactive waste at Andra's surface disposal facilities and that 76% of that waste has already been disposed of.

Preparing for the future

The outlook provided by the Inventory also confirms that there will be an increase in the volume of very low-level waste (VLLW) in future, linked to the dismantling of nuclear facilities. This observation raises the question of how this waste, which will be taken by Andra's Cires waste collection, storage and disposal facility in Aube, will be managed in future. Because future volumes exceed the facility's current capacity, Andra has been working with the radioactive waste producers for several years to find solutions: recycling of certain materials, reduction of waste at source, better use of disposal space, improved conditioning, optimisation of dismantling scenarios, etc.

90% of waste is suitable for disposal at Andra's surface facilities



Extra content

In addition to these key data, the Inventory is accompanied by factfiles intended to inform the general public. In 2018, two new factfiles were written, on radioactive waste produced by the medical sector and on sites polluted by radioactivity. Moreover, the factfile on sealed sources¹ has been completely revised to highlight the sectors in which they are used and what happens to them after use.

¹ Radioactive source conditioned so as not to release radioactivity into the environment.

FOCUS ON

The 2018 edition of the National Inventory is in the form of a website (inventaire.andra.fr) and two paper documents (Essentials and the Synthesis Report), which are also accessible online and can be downloaded.



LILW-SL waste packages in the CSA's waste storage building, awaiting disposal

FOCUS

A tool for finding out about and managing radioactive waste

Produced and published by Andra every three years, the National Inventory of Radioactive Materials and Waste offers a full inventory of materials and waste, stating where it comes from and where it is held. It also gives an estimate of the quantities of materials and waste that will be produced by current nuclear facilities and the projected quantities based on several scenarios for French energy policy: one scenario in which nuclear power generation is discontinued and three scenarios in which it continues but with different assumptions. The 2018 edition of the National Inventory is based on the stocks of radioactive materials and waste declared by producers at the end of 2016. This is followed by 18 months of work by Andra in conjunction with the radioactive waste producers and the ministry responsible for energy and the environment. All the information gathered by Andra from the declarations is checked and validated. The data are then compiled for publication in the National Inventory.

KEY FIGURES FROM THE 2018 INVENTORY

HOW MUCH RADIOACTIVE WASTE IS THERE IN FRANCE?

1,540,000 m³ VOLUME OF RADIOACTIVE WASTE IN FRANCE AT THE END OF 2016 (ALREADY DISPOSED OF OR DESTINED TO BE DISPOSED OF BY ANDRA) **59.6%**



FACT



The increase in the volume of stocks in line with projections corresponds to the current production by the different sectors that use radioactivity

FIVE WASTE CATEGORIES



Very low-level waste VLLW

Waste from the operation, maintenance and dismantling of nuclear power plants (concrete, rubble, scrap metal, soil, etc.).



Low- and intermediate-level short-lived waste ILW-SL

Waste from the operation, maintenance and dismantling of nuclear power plants (gloves, clothing, tools, filters, sludge, etc.).



Low-level long-lived waste LLW-LL Graphite waste from the first nuclear power plants, radium-bearing waste, for example from the extraction

of rare earths, etc.



Intermediate-level long-lived waste ILW-LL

Waste from the metal structures surrounding spent fuel, technological waste associated with the maintenance of nuclear facilities, etc.



High-level waste HLW

Waste mainly from spent fuel reprocessing.

WHERE DOES IT COME FROM?



FOCUS ON

An evolving website

When the previous edition was published in 2015, a special website was created by Andra (inventaire.andra. fr) so that anyone could access the National Inventory data. In 2018 the site was enhanced with new features to provide even more information, and make it easier to understand and remember. Search modules have been added, making it easier for Internet users to access the information they want to find, particularly based on the family and location of the radioactive waste. There are educational articles explaining what the Inventory is, how it is produced and how the impacts of the different energy policy scenarios are evaluated. Finally, all the documents that make up the 2018 edition and previous editions are available online. For the sake of transparency, all the Inventory data are also available in the form of open data files.

ANDRA'S MEUSE/HAUTE-MARNE UNDERGROUND RESEARCH LABORATORY

NEW EXPERIMENTS AT ANDRA'S UNDERGROUND RESEARCH LABORATORY

Andra continued its borehole drilling campaigns in 2018, so that it could carry out further experiments in its Meuse/Haute-Marne Underground Research Laboratory. A new site for excavating additional drifts will open in 2019.



The experiments conducted by Andra at its Meuse/Haute-Marne Underground Research Laboratory are essential to the design of the Cigeo disposal facility project, and come as close as possible to the reality of an industrial disposal facility. Test and experiment campaigns have been conducted since the 2000s to study the properties of the clay layer and its interactions with the construction materials, the behaviour of the vaults in relation to the surrounding rock, and the disposal cell concepts. To date, nearly 60 experiments have been or are being carried out in the Laboratory's 2,000 metres of tunnels.

Experiments installed in 2018

The new experiments set up in 2018 aim to study in situ the alteration of the glass used to embed high-level waste (HLW) in its packages, to continue studying the geomechanical properties of the rock, and also to study the rock's behaviour when the temperature rises due to the heat released by HLW packages. A new excavation contract was signed in 2018 with the company Eiffage. The work will take six years to complete and will result in the creation of 640 m of additional drifts so that new experiments can take place. A prototype large-format cell for intermediate-level long-lived waste (ILW-LL) will be created as part of this work, along with prototypes for additional cells to those already created for HLW. Innovative monitoring strategies will also be tested, especially using tiny sensors that can be inserted into certain vault components, despite the confined space. Finally backfilling and sealing tests will be carried out to simulate the closure of Cigeo at the end of its operation.

Towards a new drift excavation phase

2,000 m of tunnels at Andra's Underground Research Laboratory





From one site to the next

In June 2018, the underground drift excavation project, known as construction phase 3, was completed, leading to the creation of 1,140 m of drifts since the project began in 2009. The project was used to test different excavation methods, several drift diameters, and different support/liner combinations. Preparatory work began in 2018 for a new project, known as construction phase 4, in readiness for excavation to begin in May 2019.



Two PoCES traineeships

Training professionals to work in underground environments is the aim of the traineeships offered by the underground environment skills centre (PoCES) run by Mines Nancy and the École Nationale Supérieure de Géologie in Nancy, in partnership with the Objectif Meuse public interest group and Andra.

Two sessions were organised in 2018: one on ventilation systems and the other on fire safety systems. The difference with this training is that it alternates theory with practice, thanks to Andra's provision of access to its facilities in Meuse/Haute-Marne, particularly the drifts in the Underground Research Laboratory.

ENVIRONMENT

THE OPE CONTINUES ITS OBSERVATIONS OF THE ENVIRONMENT IN MEUSE/ HAUTE-MARNE

The Perennial Observatory for the Environment (OPE), which was set up by Andra in 2007 to monitor the environment around the future Cigeo geological disposal facility, conducted several studies of local fauna and flora in 2018.

Covering a vast perimeter of 900 km, the OPE's studies aim to observe the natural environments and the species present around Andra's future facilities throughout Cigeo's operational phase, and to keep a record of them by taking samples stored at the Environmental Specimen Bank set up by Andra for this purpose. In 2018, a collection of beetles was recorded and stored. It was created as a result of several entomological surveys conducted between 2009 and 2016 by the company Entomo-Logic in the OPE's observation area, and particularly in Cigeo's future Shaft and Ramp zones, and

on the site of the future private rail siding (ITE). These samples will be used to carry out a comparative study with the data acquired during the surveys.

A partnership creating a buzz

In 2018, two local beekeepers obtained Andra's consent to install hives on an area of 293 hectares around the edge of Cigeo's future Ramp zone. Several honey harvests have taken place since then. They have provided the OPE with some new types of specimen, a detailed analysis of which



Cryogenic storage containers at the Environmental Specimen Bank

(temperature, humidity, different sugars and pollens, etc.) will enrich the existing databases and can be used to monitor changes over time in honey quality and in the flora visited by the bees. Finally, some other specimens were sampled by the OPE in 2018: surface water and borehole water, but also milk, blackberries, and various vegetables and fish products, acting as indicators of the environmental quality of local natural environments.

EUROPEAN PROJECTS

LAUNCH OF THE EUROPEAN EURAD PROGRAMME ON RADIOACTIVE WASTE MANAGEMENT

The EURAD programme (European Joint Programme on Radioactive Waste Management), led by Andra, was submitted to the European Commission in 2018. It aims to combine the efforts of around a hundred stakeholders involved in radioactive waste management (agencies, assessors, research bodies).

For more than 40 years, the European Commission has financed research projects on radioactive waste management and disposal through Euratom. Given the scale of the challenges and the very long timescale of radioactive waste disposal projects, it wanted to direct its support not to individual initiatives but to more ambitious collaborative programmes.

A collective initiative

It was on this basis that Andra submitted the EURAD joint research programme proposal in 2018, bringing together approximately a hundred European stakeholders in radioactive waste management around a strategic vision and a common research agenda. The proposal, which was accepted by the European Commission in early 2019, consists of a collective initiative conducted in particular as part of the JOPRAD project (Joint Programming on Radioactive Waste Disposal, 2015-2017), already being run by Andra. The JOPRAD project had confirmed the feasibility of a joint research programme on the long-term management of radioactive waste and had led to the drafting of a research agenda, which formed the basis for the EURAD programme.



For five years, stakeholders from the 23 European partner countries in EURAD will be working on a shared roadmap looking at disposal, but also at the link with the upstream phases of radioactive waste management (waste characterisation, treatment and conditioning, storage).



PARTNERSHIPS

ANDRA STRENGTHENS ITS SCIENTIFIC AND TECHNICAL PARTNERSHIPS

Andra's research and development policy relies in particular on the expertise of the research bodies, higher education establishments and companies with which it conducts research on joint projects. Five partnerships were signed or renewed in 2018, reinforcing this research, development and innovation ecosystem.



April

Signature of an agreement with RTE

Andra and RTE, responsible for electricity transmission from power plants to the distribution networks, signed a five-year partnership agreement to meet their joint needs for monitoring of the ageing of concrete structures. Both face the same structure maintenance and durability challenges and they intend to combine their knowledge of monitoring. Under this agreement, Andra and RTE will work on instrumenting the concrete foundations of ultra-high voltage pylons with wireless sensors and on assessing the metrological performance of optical interrogators designed by both partners.

May

Renewal of the partnership with IFP Énergies Nouvelles

Andra and IFP Énergies Nouvelles, who have been partners for 20 years, renewed their collaboration agreement to pool their respective expertise on geological disposal. The applications may differ (the Cigeo project in Andra's case, the CO_2 disposal facility in IFP Énergies Nouvelles' case), but many of the research topics are shared by both organisations. Under the new framework agreement, four topics will be the subject of joint research: geological modelling; monitoring, instrumentation and analysis; numerical simulation; and corrosion of steel.







New partnership with Inria

Andra and Inria renewed their research agreement in 2018. The two organisations have been partners for 10 years, working together to develop methods and digital tools to simulate the evolution of geological disposal facilities and their environments over very long timescales. This collaboration has produced high-level results that have been incorporated into the design for Cigeo.

Under this new partnership, they want to go further and explore areas such as big data, artificial intelligence and 3D visualisation in order to meet Andra's new disposal facility monitoring needs.

November

Agreement between Andra and Ineris

Andra and Ineris wanted to extend their partnership for five years, continuing their scientific collaboration begun in 2001. As Andra prepares the construction licence application for Cigeo, this new agreement should enable it to refine its knowledge of the phenomena at work in the disposal facility, monitoring of the facilities and the environment, and risk prevention (fire, etc.). Meanwhile, Ineris will use this collaboration to pursue its studies of the long-term behaviour of underground structures and continue to develop multidisciplinary skills in industrial risk prevention.





17 years of collaboration between Andra and Ineris



New partnership with the BRGM

A new research agreement has been signed by Andra and the BRGM, continuing a partnership begun 20 years ago. The agreement lasts for four years and covers four subject areas. One is geology, hydrogeology and geophysics, on which the two organisations have collaborated historically. Instrumentation, information systems and data mining is another, particularly for monitoring disposal facilities and the surrounding natural environments. The third research topic is numerical simulation to monitor the evolution of disposal facilities and the environment over long timescales and large areas. The final topic is geochemistry and the transfers that take place in the geological medium and disposal facilities.





New areas of collaboration

In September 2018, Andra brought together its scientific partners to discuss the new research challenges related to radioactive waste management and construct new forms of collaboration for the future. Five areas for consideration emerged from this meeting: long-term protection of knowledge and skills in fundamental areas; the development of new knowledge in target areas; Andra's knowledge, skills and tools being made available for its partners' needs; training of a multidisciplinary team to assist with disposal facility projects internationally; and finally dialogue with society.





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CONSULTATION

A NEW LOCAL CONSULTATION PHASE FOR THE CIGEO PROJECT

Continuing the actions implemented since the 2013 public debate to give civil society greater involvement in the Cigeo project, in March 2018 Andra launched a new consultation phase among communities living alongside the future disposal facility in Meuse/Haute-Marne.



10 actions and meetings organised in 2018 as part of the consultations

Aware of the general interest of the Cigeo disposal facility project, but also of the challenges and questions that it raises, Andra decided to give the public and stakeholders direct involvement in the project to ensure the best possible decisions would be made. One practical manifestation of this is a local consultation launched in the wake of the 2013 public debate, the themes of which evolve with the different phases of the project.

A dedicated roadmap

Continuing the process of information and participation implemented since 2014, Andra began a new consultation phase in March 2018, aimed at involving residents of Meuse and Haute-Marne in the next stages of the project. The contributions received will inform decisions to be made in preparation for the declaration of public utility and the construction licence application to be submitted by Andra, but also decisions made throughout the life of the project, if it is given the go-ahead. The roadmap for this new consultation phase has four main themes for discussion related to Cigeo's environmental and territorial integration: the water cycle, transport infrastructure development (roads, rail), Cigeo's energy supply, and development and quality of life.

The first two themes were discussed between April and September 2018 during meetings, workshops, tours and talks attended by nearly 450 participants. The other two will be launched in 2019.

Constructive exchanges

The issue of Cigeo's water cycle was discussed in two parts: the future site's water supply; and effluent discharge into the environment from the two surface zones (the Shaft zone and the Ramp zone). In the latter case, the meetings organised as part of the consultation produced detailed discussions with local stakeholders on the different scenarios for the location of effluent discharges. All the opinions expressed will be studied by Andra as the project progresses. The transport infrastructure associated with Cigeo, and particularly the private railway siding (ITE), a 14 km section of track linking Gondrecourt-le-Château to the future Ramp zone, also produced a very fruitful dialogue with local stakeholders. Local communities were able to express their opinions and make comments about different options for reinstating roads and paths cut off by the ITE and the variants for the track route.

FOCUS ON

Two new guarantors

In June 2018 the National Public Debate Commission (CNDP) appointed two new guarantors to assist Andra during the consultation concerning the Cigeo project: Marie-Line Meaux and Jean-Daniel Vazelle. Alongside Jean-Marie Stievenard, appointed at the end of 2017 following Andra's approach to the CNDP, they will ensure the public are kept properly informed and are able to participate. Pierre Guinot-Delery left his position as guarantor in May 2018.



FOCUS

Closure of the consultation on the intersite connection

The consultation with local stakeholders on the link between Cigeo's surface facilities, which was launched in December 2016, concluded in November 2018 with a site visit. This provided an opportunity for some twenty participants (elected officials, landowners, farmers, representatives of different organisations, companies and administrations, etc.) to see at first hand the chosen route and validate the technical options. The link is designed so that construction materials and excavated rock can be transported between the Ramp zone (where the radioactive waste packages for disposal will be received, inspected and prepared) and the Shaft zone (where the underground work will be carried out). A special consultation was carried out for this link to develop a technical solution with wide support, meeting the needs of both the project and the local community. The methodology used by Andra would also work for other subjects such as the environmental impact and other construction projects related to Cigeo.



INFORMATION AND DIALOGUE

ENGAGING IN DIALOGUE THROUGH NEW MEANS OF EXPRESSION

Because radioactive waste management is a subject that affects everyone, Andra has established a dialogue process that gives everyone the resources to understand the challenges and express their point of view. This includes new means of expression using art, social media and, most of all, young people, who are the embodiment of future generations. In 2018, several initiatives led by Andra have helped to breathe life into this process.

A highly original **street art** project was run at the Aube disposal facility (CSA) in June 2018: at Andra's initiative, 25 students from several schools in Troyes and young creatives from a local communications agency were invited to design works of street art on the outside walls of a disposal vault. Led by Aube-based artist Jean-Sébastien Godfrin, alias Argadol, the initiative produced some original works of art on the nuclear theme, but also on memory, the passing of time and nature. It continued at the CSA open days in September with the creation of a monumental mural by Argadol.

Also with the aim of encouraging young people to get to grips with the topic of radioactive waste

management, Andra invited three **youtubers** (Dave Sheik, Simon Puech and Anonimal) to visit its facilities in Aube and Meuse/Haute-Marne. The purpose of their visit was to enable them to find out about what Andra does, but also familiarise themselves with a subject that young generations often know little about and to express their points of view freely. Following these visits, which took place in October 2018, the videos made by them prompted much discussion on social media.

At the end of the year, Andra ran another initiative: the 'Art and Memory' call for projects, which was in its third year. An integral part of Andra's research into the conservation and Mural by Aube-based street artist Jean-Sébastien Godfrin, *alias* Argadol, on a radioactive waste disposal vault at the Aube disposal facility



transmission of a memory of the radioactive waste disposal facilities, the initiative invited artists from all disciplines to contribute to the collective reflection process. The three winning works in 2018 were selected for their artistic quality but also their originality and relevance and the way they tackled the issues of memory-keeping.

Another approach used by Andra is the popularisation of science. In particular, Andra contributes to **Sciencetips**, a free newsletter that aims to democratise access to scientific culture. Each week, two offbeat science stories, written and checked by specialists, are sent by email to subscribers. In 2018, radioactive

EVER MORE VISITORS TO ANDRA'S FACILITIES

Free of charge to visit, Andra's facilities in Aube, Manche and Meuse/Haute-Marne enable the public to gain a better understanding of all aspects of radioactive waste management in France. With more than 16,000 visitors in 2018, visitor numbers at Andra's sites have risen.



Meuse/Haute-Marne Centre

11,340 visitors were welcomed to the Meuse/ Haute-Marne Centre (40% more than in 2017), including more than 800 on Andra's open day and nearly 140 on tours of the drifts, when the public can explore the Underground Research Laboratory and find out about the latest developments with the Cigeo project

• **350** tours of the underground facilities (for nearly 2,900 people)



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decay and the Cigeo project were some of the stories explained in a simple, fun way. In partnership with the same publisher, Andra has also launched a **microlearning** module, deciphering radioactivity in 16 eight-minute episodes (find it at: microlearning-radioactivite.fr).

Enabling young film directors to portray their points of view on radioactive waste management is the aim of a film shorts competition entitled **Regards sur les déchets radioactifs** [Perspectives on radioactive waste], organised each year by Andra. *Et après* by Antoine Rodriguez, the winning film in 2018, was premiered at the opening ceremony of the Pariscience festival, of which Andra is a partner. Like cinema, photography is also a particularly good means of communication with society. Photographer Stéphane Lavoué was invited by Andra in 2018 to tour the drifts at Andra's Underground Research Laboratory in Meuse/ Haute-Marne and Andra's industrial facilities in Aube. He narrated the most representative photos of this experience on YouTube in a series of videos entitled **Chaque photo a son histoire** [Behind every photo is a story].

Finally, also related to transmission of memory to future generations, **memory capsules** were made by pupils at several primary schools in Aube as part of a project run by the Centre pour l'Unesco Louis-François in Troyes,



sponsored by Andra. Filled with photos, newspapers, poems and everyday objects, in 2018 these capsules were placed in Aube's departmental archives, where they will be kept for ten years.

Andra's Aube industrial facilities

3,574 visitors were welcomed to Andra's industrial facilities in Aube in 2018, including nearly 900 at Andra's open days

• Nearly **10%** of foreign delegations (representatives from China, England, Belgium, Switzerland, Italy, Malaysia, Australia, South Korea and Japan)



eight members of the Commission of inquiry into the Safety and Security of Nuclear Facilities toured the Aube disposal facility and the Meuse/Haute-Marne Centre in April 2018

Manche disposal facility



- **1,791** visitors were welcomed to the Manche disposal facility in 2018
- **57**% of visitors are from the education sector (school pupils, students and teachers)

ANDRA'S FACILITIES, MEETING POINTS OF SCIENTIFIC CULTURE

Andra regularly organises events, exhibitions and other functions on its sites, often linked to major national or regional science events. This programme of events forms part of its public information activities, but is also designed to promote openness and spread Andra's scientific and technical culture. 2018 was marked by rich and varied events.



Meuse/Haute-Marne Centre

From April to December 2018, the Meuse/ Haute-Marne Centre held the exhibition 'Amphibiens et reptiles de nos campagnes' [Local amphibians and reptiles] in its public information centre. These species are some of those monitored by the Perennial Observatory of the Environment (OPE) as part of the Cigeo project. The exhibition programme included the discovery of unknown species and their living environments, using a scientific yet entertaining approach. Echoing this event, in September 2018 Patrick de Wever, geologist and professor at the National Museum of Natural History, gave a talk on biodiversity through the geological time scale. It provided an opportunity to explain to the audience certain scientific concepts in this area.

Finally, the Fête de la Science came to the Meuse/Haute-Marne Centre in October with the theme of 'Reptiles fossiles et actuels' [Fossil and current reptiles]. More than 1,100 visitors, including many children, were attracted by exhibitions, events, talks and 3D films.

Andra's Aube industrial facilities

As part of the Fête de la Nature 2018, the Aube facilities organised two educational workshops for children. The first was on ants and the second presented the use of clay in the disposal of radioactive waste.

Several talks have also been held by Andra to raise awareness of its facilities among local communities. In February, a nuclear physics engineer came to explain how the ARC-Nucléart research and conservation workshop uses radioactivity to preserve or restore artefacts. In April, the conservator from the mineralogy museum at the École des Mines in Paris gave a talk on the history of the museum's 100,000 mineral specimens. At the end of the year, a film and talk on dinosaurs was given by a palaeontologist as part of a series of talks entitled 'L'invité(e) de l'Andra' [Andra's guest], and a science historian looked back at the different techniques used for measuring time over the centuries.





Manche disposal facility

A presentation of the Manche disposal facility from an offbeat, artistic angle by highlighting its textures and materials was an original project supported by Andra, co-organising with the IPC 50 photography club an exhibition entitled 'Textures'. The aim was to arouse public interest and present a different view of the site. On show from October 2018 to March 2019 in the public information centre at the Manche disposal facility, this photography exhibition revealed to visitors visual details of the site that are normally missed. During Industry Week in March 2018, organised by the Normandy branch of the Union of Metallurgy Industries and Trades (UIMM), Andra offered pupils from Lycée Tocqueville in Cherbourg-Octeville a series of energy-related events: a talk on the life and work of Marie and Irène Curie, educational workshops on radioactivity and energy, and tours of the Manche disposal facility. A talk for the general public on energy transition was also held.

INTERNATIONAL EVENTS: 2018 HIGHLIGHTS

Andra took part in many international exchanges enabling it to share its knowledge, but also to compare and contrast it with the work of its peers. A few major meetings took place in 2018.



In April, Andra organised the Decovalex (DEvelopment of COupled models and their VALidation against Experiments) colloquium in Nancy. This international collaboration meets twice a year, bringing together radioactive waste management organisations and nuclear safety authorities from all over the world to look at understanding and modelling the thermal, hydraulic, mechanical and chemical processes at work in geological disposal facilities. Predicting these effects is essential to assess the facilities' performance and safety. During this fifth edition, around sixty people from all over the world discussed the latest results obtained, particularly in clay environments like the Callovo-Oxfordian formation in which Cigeo will be built.

In May, Andra took part in the Sixth Review Meeting of the Joint Convention adopted by the International Atomic Energy Agency (IAEA). Signed in 1997, the Convention defines the obligations of the 75 contracting parties in terms of governance, regulatory framework, spent fuel and radioactive waste management methods, safety, development prospects, etc. At the Review Meeting, Andra presented the report describing the way France fulfils these obligations. The preparation of this report was coordinated by the ASN with contributions from the other regulatory authorities, the relevant ministries, Andra and the nuclear operators (Orano, EDF, CEA).

Finally, as every year, Andra also spoke at the Waste Management conference in Phoenix (USA), one of the most important annual events on radioactive waste management.

19

international events in which Andra's scientists took part in 2018

FOCUS ON

Positive conclusions of the Artemis international review on radioactive waste management in France

In January 2018, as required by European Directive 2011/70/Euratom of 19 July 2011 (the 'waste directive'), Artemis, the international review by independent experts, supervised by the IAEA, examined the way France organises its radioactive waste management. As the agency in charge of radioactive waste management in France, Andra was involved in the discussions.

The Artemis review highlighted the high standard of Andra's work. The National Inventory is one of the exemplary practices identified: the IAEA's experts felt that it provided a good overview of waste in France and that its preparation and publication were appreciable. More broadly, France's approach to developing and implementing the National Radioactive Materials and Waste Management Plan (PNGMDR) was highlighted by the review. IN BRIEF



An Andra radiation protection officer shares his expertise with the Malaysians

In September 2018 Andra sent a radiation protection expert to Malaysia on a consultancy and assistance mission. Malaysia uses sealed radioactive sources for industrial. medical and research activities. Once they have been used, these sources constitute radioactive waste. With the IAEA's help, Malaysia has therefore begun a medium-depth disposal facility project for managing this waste. During a review of the project carried out at the end of 2017, points for improvement were identified regarding radiation protection procedures. The IAEA therefore asked Andra to provide its expertise to the Malaysians. Having explained its radiation protection methodology, Andra participated in developing a radiation protection programme defining procedures to be implemented at the future disposal facility to protect workers and the environment from ionising radiation.

24 Andra contributions to IAEA activities in 2018

GLOBAL ACTIVITY

ANDRA STRENGTHENS ITS INTERNATIONAL PARTNERSHIPS

Andra maintains many bilateral cooperations with foreign organisations responsible for radioactive waste. It is regularly called upon to share its experience, assist with certain projects or carry out experiments. These international exchanges contribute to responsible management of radioactive waste throughout the world.

In June 2018, an agreement between Andra and its Canadian counterpart NWMO was renewed to facilitate the exchange of knowledge and to pool experience acquired by both partners in radioactive waste management. Also in June, Andra signed a partnership agreement with BGE, its German counterpart set up in 2017. The German agency will thus benefit from French experience with deep geological disposal of the most highly radioactive waste, as it restarts its process of finding a disposal site. Finally, Andra's relationship with Korad, the Korean radioactive waste management agency, was strengthened with the signature in July of an assistance contract as part of the safety demonstration for the second phase of the Korean disposal facility for low- and intermediate-level waste.









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