



2008
ACTIVITY REPORT



Fostering dialogue and outreach





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Andra: the French National Radioactive Waste Management Agency

Andra is a public industrial and commercial establishment instituted by the 30 December 1991 Waste Act. Its missions were enhanced by the 28 June 2006 Planning Act Concerning the Sustainable Management of Radioactive Materials and Waste. The Agency is independent from waste producers and placed under the joint supervision of the Ministries for Energy, the Environment and Research.

Its mission

Andra is in charge of ensuring the sustainable management of all radioactive waste generated in France. Similarly to many other countries, France has opted for disposal. The Agency provides the French Administration with its expertise and know-how by designing, implementing and guaranteeing safe solutions to protect human beings and the environment against the effects of such waste over the short and long terms.

Andra on 31 December 2008

- > **4 16 paid employees** including
21 doctorands and 3 post-doctorands
- > **3 disposal facilities**
- > **1 underground laboratory**
- > **2 disposal-facility projects**



_EXECUTIVE COMMITTEE

1_Marie-Claude Dupuis,
Chief Executive Officer

2_Patrick Landais,
Director, Scientific Division

3_Jacqueline Eymard,
Director, Communication and
International Affairs Division

4_Paul Talneau,
Director, Human Resources
Division

5_Thibaud Labalette,
Director, Project Division

6_Bruno Cahen,
Director, Safety, Quality and
Environment Division

7_Jean-Paul Baillet,
Secretary-General

8_Pierre-Lionel Forbes,
Director, Meuse/Haute-Marne
Underground Research Laboratory

9_Francis Chastagner,
Director, Industrial Division

_INTERVIEW

2008: an educational effort

François-Michel Gonnot, Chairman of the Governing Board, and Marie-Claude Dupuis, Chief Executive Officer, analyse the main events of 2008.

How do you look at 2008 events in retrospect?

François-Michel Gonnot :

Over the last year, I would say without the shadow of a doubt that Andra's outstanding achievement lies in its unprecedented determination to extend its outreach. The dialogue that we have maintained with stakeholders, territorial communities and the public at large went far beyond our obligation to account for our activities. The first objective was to explain in more detail our industrial, environmental and health challenges. Since such topics concern us all, it is imperative that the solutions we propose be understood and approved by all. For Andra, that goal also involves that the Agency can listen.

Marie-Claude Dupuis :

The project of low-level long-lived waste shallow disposal stands as a good illustration of our outreach approach. During the initial siting phase, we participated in several municipal councils and public meetings throughout France. It is important to point out that we also met with and listened to the opponents of our proposals. Our eagerness to open the debate helped the scientists, the engineers and the technicians that we are to fulfil a genuine educational vocation in 2008 by explaining in simple and layman terms what we do and why we do it..

What did you note about industrial and research activities?

François-Michel Gonnot :

In response to our call for expressions of interest in June 2008, close to 40 municipalities replied that they were willing to consider hosting the future disposal facility for low-level long-lived (LL-LL) waste. Most of those municipalities are located in Northeastern France and close to Andra's existing sites. We consider such response

“ *In 2008, Andra demonstrated an unprecedented determination to extend its outreach.* ”

> **François-Michel Gonnot,**
Chairman of the Governing Board

as a concrete testimony of confidence from the territorial communities that are familiar with us. Another highlight was the holding at the Meuse/Haute-Marne site of a session of the *Euradwaste* Conference attended by some 300 European experts and decision-makers in order to discuss the research results achieved so far concerning radioactive-waste management and disposal. We consider the event as a significant recognition of Andra's research programme in its Underground Research Laboratory.

Marie-Claude Dupuis :

I should add that the design and implementation of the Laboratory by Andra engineers and associated teams ranked second at the 2008 French National Engineering Grand Prize. However, we must keep in mind the problems we had to face in 2008, notably the consequences of the incident that occurred in August at the *Socatri* facility and with whom we are working to recondition low-level waste. We have drawn worthy lessons for the future, since we shall reinforce our control means and allow our storage facilities to evolve over the short term.

In 2009, Andra will sign its new Quadrennial Contract with the French Administration. What are your forecasts for the years ahead?

François-Michel Gonnot :

The new contract, which will set Andra's objectives for the next four years, will mark a new step forward in the life of the Agency. Andra's missions are broadened and reinforced, thus becoming the public industrialist in charge of developing, implementing and operating innovative disposal solutions for all categories of radioactive waste generated in France. Those ambitions are also reflected in Andra's new corporate visual identity in order to display more prominently its commitments with regard to the protection of human beings and of the environment, and also to its social outreach.

Marie-Claude Dupuis :

Significant deadlines for our overall activities and projects in 2009 will be integrated in the revamped framework. The project to implement a disposal facility for low-level long-lived waste will appear clearer, once suitable sites are selected to conduct the relevant geological surveys.

In June 2009, Andra will publish the *National Inventory for Radioactive Materials and Waste*. The Manche disposal facility (CSM) will celebrate its 40th anniversary and the Technological Exhibition Facility, located on the Meuse/Haute-Marne site, will be inaugurated late that same month. The purpose of the latter is to allow local inhabitants and actors to grasp better the deep repository project on which will focus the exchange and dialogue approach with all our publics and stakeholders throughout 2009. I should also mention that Andra will organise in June the interdisciplinary symposium on the fundamental concept of reversibility in disposal facilities for high-level and intermediate-level long-lived waste. There is no doubt that the first year of our new Quadrennial Contract will be well occupied!



> **Marie-Claude Dupuis,**
Chief Executive Officer

> **François-Michel Gonnot,**
Chairman of the Governing Board

_THE MEN AND WOMEN AT ANDRA

Andra keeps growing

Recruitment, training, exchanges and dialogue... Throughout 2008, the Agency pursued its efforts to enhance its know-how.

Similarly to 2007, Andra intensified its recruiting programme in 2008

During the year, a total of 56 permanent employees, including managerial staff (49), joined Andra. They were hired in order to reinforce various skills in project-related jobs (design and project-management engineers) and in associated technical specialities (mechanical engineering, nuclear engineering). The other profiles involved Earth sciences (geology, geomechanics, etc.) and safety. In addition, a significant number of new employees are dealing with industrial and communication activities.

Skill development is a priority

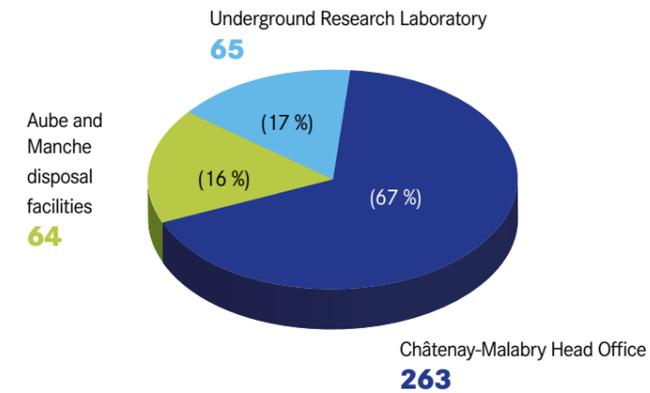
Andra is pursuing its professional-training efforts for the benefit of its staff in order to maintain and to develop the Agency's scientific and technical expertise within its own scope. In 2008, training expenses amounted to 5.45% of the total payroll and were much higher than in 2007. During the year, 366 employees (i.e., 88% of the total staff) followed at least one training session, thus representing an average of a little more than four days for every employee

Productive and ongoing social exchanges

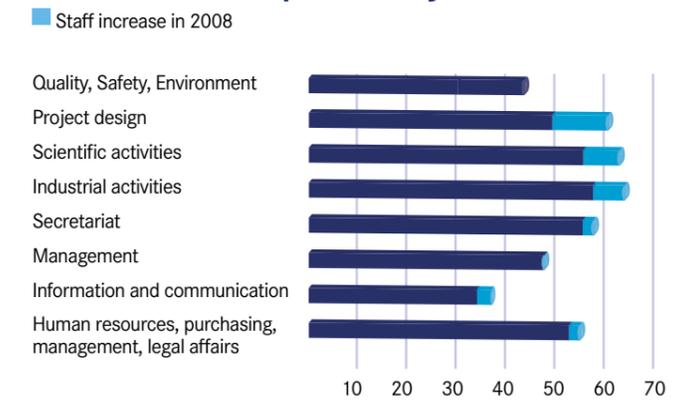
Dialogue is an integral part of Andra's culture and is reflected in its regular negotiations with staff representatives. Year 2008 proved very active in the social field with the signature of six agreements, including:

- > a wage agreement for 2008;
- > the renewal of the profit-sharing agreement for 2008-10;
- > an agreement for the buy-back scheme of days-off earned through the reduction in working hours;
- > an agreement on the forward-looking management of jobs and skills (GPEC);
- > an agreement concerning the Solidarity Day;
- > an agreement for increasing the term of office of elected staff representatives to three years (works council and staff delegates).

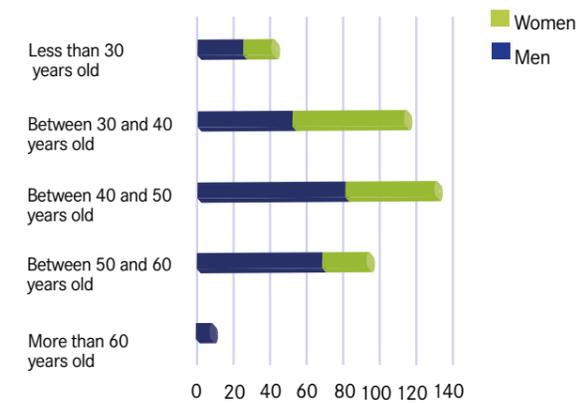
Staff distribution per site



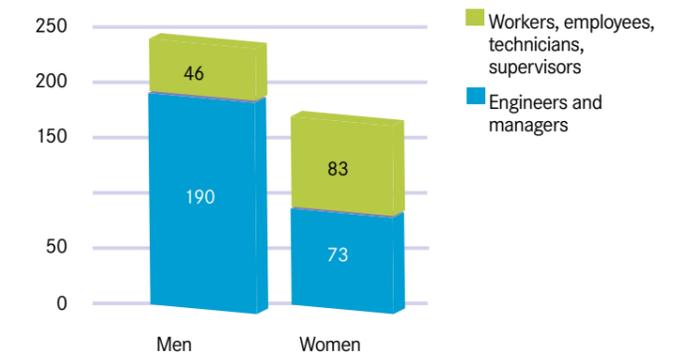
Staff distribution per activity



Staff distribution per age group and sex



Staff distribution per statute and sex



1_A technician collecting water samples in the underground drift network of the low- and intermediate-level short-lived waste disposal facility (CSFMA).

2_Andra geologist.

3_Staff of Andra's engineering department.

2008

The year in review



A disposal-facility project for low-level long-lived waste, the end of the 2005/08 Quadrennial Contract, the signature of agreements, prize and “open-days” events... Those are only some of the highlights of an especially productive year in 2008.

_LOW-LEVEL LONG-LIVED WASTE

Calling upon communities to host a shallow disposal facility

In 2008, Andra appealed for volunteer candidates to host the future shallow disposal-facility for low-level long-lived (LL-LL) waste: an unprecedented approach that was met with some success.

A request from the government

The *2006 Planning Act* requires Andra to find disposal solutions for graphite and radium-bearing waste. The nature and characteristics of such LL-LL waste imply that they be disposed of at a shallow depth varying between 15 and 200 m in a low-permeability clay layer located in a geologically-stable zone.

A broad appeal for volunteer candidates

On the basis of a study conducted by the French Geological Survey (*Bureau de recherches géologiques et minières* – BRGM), Andra identified

184 theoretically-suitable counties for the implementation of a disposal facility. A call for expressions of interest was issued in June 2008 and the mayors of the 3,115 municipalities located within all those counties were sent a fact file on the project. Disseminated over eight regions and 20 districts, the municipalities were invited to express their interest in the project by the end of October 2008. In 2009, two or three sites will be selected with a view to verifying the feasibility of implementing the disposal facility and to furthering the exchange and dialogue approach.

A success

More than 40 municipalities expressed interest in the project. Except for an application from the Picardy region, all others originated from the Champagne-Ardenne and Lorraine regions. Andra's appeal for volunteer applications also provided the Agency with an opportunity to mobi-

lise its efforts in replying to numerous requests for information, meetings, site visits from the communities at large. Andra also spent considerable time and energy in explaining its mission and activities, in presenting the project in the regions concerned and in describing the challenges of radioactive-waste management.

What is next?

In 2009-10, Andra will carry out geological and environmental investigations (borehole-drilling campaigns, geophysical measurements, mapping) on the selected sites in order to verify the possibility to implement the disposal facility. In parallel, the exchange and dialogue approach will be pursued with a view to explaining the project to local populations. Communities will review how the disposal facility may contribute to their territorial development. Before selecting the final site, a public debate involving all concerned municipalities will be held in 2011, after which they will be invited to discuss the project once again and to decide whether they confirm their volunteer application. Then the government will select the site on which further studies will continue in preparation for the file application to be submitted to a public inquiry. Subject to the granting of the licence, construction would start in 2015 and commissioned is expected by 2019.

“ I used to regret that the relationship being created with a municipality for hosting large projects is only financial.



> Jacques Pélissard,
President of the Association
of French Mayors

Andra has not overlooked that de facto situation and I am satisfied to note that it keeps innovating in its relationship with the municipalities in order to founding it on support means for the creation of a territorial

project involving all its partners, such as Électricité de France (EDF), large industrialists, etc. Andra also extends its bona fide approach to all stakeholders and participants, an openness for which we should all be pleased.

1_Mayors' and Local Communities' Congress.

A disposal facility for which kind of radioactive waste?

Low-level long-lived waste mostly includes graphite and radium-bearing waste. Graphite residues result from the operation and dismantling of the first generation of nuclear reactors, all of which have now been shut down. Most radium-bearing residues, on the other hand, originate from the treatment of different minerals, notably in the automotive or fine-metallurgy industry. Other types of waste might also be involved, such as certain low-level bitumised waste, radioactive lightning-conductor heads and fire detectors.

**Call for volunteer communities**

- > Andra participated to **24 meetings of municipal councils**
- > **13 visits** to Andra sites organised by interested municipal councils
- > **More than 200 telephone calls** received
- > **13 public meetings held all over France**

Communication**Mayors' congress**
Local integration to the fore

At the French Mayors' Congress, held in November 2008, a round table was organised on the topic "How to build a territorial project associated with the implementation of a radioactive-waste disposal facility?" Participants included about 50 elected officials invited by Andra from the Meuse, Haute-Marne, Aube and Manche districts. Before the event, they had the opportunity at Andra's Head Office to meet with Mr François-Michel Gonnot, Chairman of the Governing Board, Mrs Marie-Claude Dupuis, Chief Executive Officer and the other executive directors.

Press review

- > **More than 800** articles in the local press
- > **About 50 articles** in national medias (*Le Monde, Le Figaro, La Tribune, Le Parisien, TF1, France 2, France 3, Europe 1, Radio Monte Carlo, France Inter, etc.*)





January

1 - **Season's greetings** to the elected officials of the host territories of Andra sites.

February

2 - **Results from the samples collected by ACRO**, the Association for the Control of Radioactivity in Western France, from the low- and intermediate-level short-lived waste disposal facility located in the Aube district (see p. 28).

March

3 - Launching of the construction of the **Technological Exhibition Facility** at Saudron, on the Meuse/Haute-Marne site.

April

4 - **Signature of the Charter of Public Establishments and Corporations for Sustainable Development** by Marie-Claude Dupuis, Andra's Chief Executive Officer and 32 representatives from public organisations.

5 - In Limay (Yvelines district), visit by a delegation from the National Review Board (*Commission nationale d'évaluation - CNE*) in order to discover the **prototypes and robots** developed by Andra to implement a deep repository.

May

6 - **"The Very Rich Hours of Champagne"** Exhibition (*Les Très Riches Heures de Champagne*) at Soulaines (see p. 31).

June

7 - Launching of the **appeal for volunteer communities** to host a low-level long-lived waste disposal facility (see p. 10).

8 - Arrival of the **100,000th cubic metre of waste** at the very-low-level waste disposal facility (see p. 30).

9 - **"Open-door" Day** at the Meuse/Haute-Marne Underground Research Laboratory (see p. 41).



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July

10 - "Rocks and Marvels" photograph exhibition (*Roches et merveilles*) on gemmology at the Aube disposal facilities (see p. 31).

August

11 - The *Socatri* incident interrupts waste-collection operations from small producers (see p. 20).

12 - "Sunken Heritage" exhibition (*Patrimoine englouti*) at the Manche disposal facility (see p. 27).

September

13 - "Open-door" Day at the Aube disposal facilities (see p. 29).

14 - The "Earthquakes and Volcanoes" Exhibition (*Séismes et volcans*) at the

Meuse/Haute-Marne URL (Underground Research Laboratory) attracted close to 6,500 visitors (see p. 41).

October

15 - Arrival at the Technological Exhibition Facility (located at Saudron) of the prototypes and robots developed by Andra for implementing the deep repository.

16 - Awarding of the National Engineering Grand Prize to four Andra engineers and scientists for the design and implementation of the Meuse/Haute-Marne URL (see page 40).

17 - 7^e conférence Euradwaste: special session organised at the Meuse/Haute Marne URL (see p. 45).

November

18 - 2,500 visitors, including Minister of State Jean-Louis Borloo, at Andra's stand at the science exhibition "Ville européenne des sciences" held in the *Grand Palais*, Paris (see p. 41).

19 - Launching of the information campaign for mayors, fire brigades, etc. concerning the collection of radioactive items (see p. 24).

20 - Andra's stand at the Mayors' Congress.

December

21 - Submission to the Ministry for Ecology, Energy, Sustainable Development and Territorial Planning of the assessment report on the volunteer applications to host the LLL-LL disposal facility.

_THE 2005-08 QUADRENNIAL CONTRACT

A page is turning

Since its creation, Andra has changed drastically. Not only has it been recognised as an independent public establishment in 1991, but it also demonstrated its scientific and technical expertise, and saw its missions expanded. Today, it keeps evolving through the 2009-12 Quadrennial Contract it will sign with the French Administration. A synthesis about the previous contracts and the next orientations.

2001-4: clarifying the government's expectations of Andra

The first quadrennial contract between the French Administration and Andra was signed for the 2001-4 period and occurred 10 years after the creation of the Agency as an independent public establishment. It marked a major event reflecting the shared determination of both parties to set forth a multiannual action framework and to clarify Andra's objectives. At the end of that first contract, Andra consolidated its industrial status through various actions, such as implementing the very-low-level waste disposal facility (CSTFA) in order to provide a suitable disposal solution for various residues outside the nuclear-power sector or by being granted the dual ISO 9001 and ISO 14001 certifications. The Agency reinforced also its technical and scientific status notably by investigating the feasibility of deep disposal, gaining internatio-

nal recognition for its research programmes, and enhancing its partnerships with the scientific community. It also completed the first edition of the *French National Inventory of Radioactive Waste and Recoverable Materials*, which constitutes a broad and detailed listing of such items in France and includes prospective elements.

2005-8: a key step in the radioactive waste management process

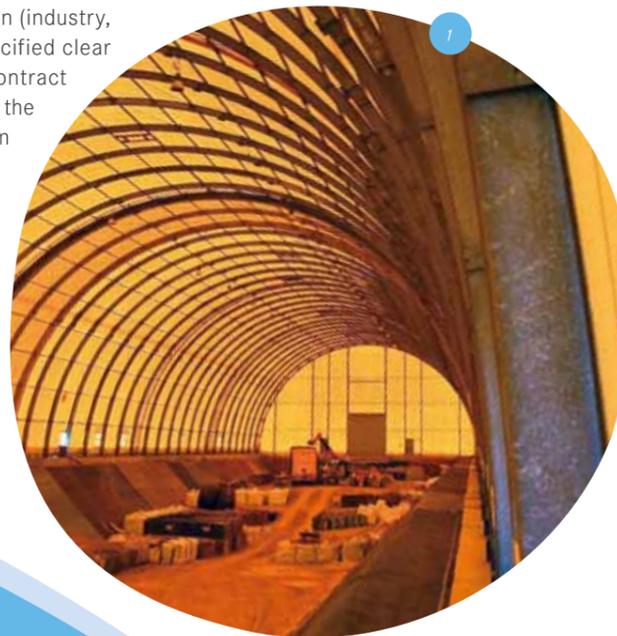
In 2005, the second quadrennial contract reaffirmed Andra's triple mission (industry, research, information) and specified clear objectives in each case. The contract was drafted bearing in mind that the *2006 Planning Act* would confirm those missions. The conclusions of the contract point out the reinforcement of the Agency's public-interest tasks (collection of radioactive items, cleanup worksites), the optimised operation of the low- and intermediate-level short-

lived waste disposal facility (CSFMA) and the significant development of the CSTFA. Another important step consisted in the publication of the development plan for the design of the future deep repository for high-level and intermediate-level long-lived waste after the submission of the *Dossier 2005*, which concluded to the feasibility of such disposal on the Meuse/Haute-Marne site. In parallel, scientific and technical investigations continued to determine the architectures of the repository, to ensure disposal reversibility, to assess its safety and its environmental impact... and also to seek a suitable site for low-level long-lived waste. Lastly, pursuant to its commitment, Andra stressed its information mission by editing the second *French National Inventory of Radioactive Waste and Recoverable Materials* in 2006 and by preparing the 2009 updated edition. In that field, it also published several documents intended for its various readerships, and developed information schemes around its facilities (visits, local newspapers, exhibitions, etc).

“The Quadrennial Contract is a precious tool in support of the national radioactive-waste management policy and illustrates the significance given to that issue by the government.

2009-12: the enforcement of the law and of French National Management Plan for Radioactive Materials and Waste

On the basis of the past achievements and pursuant to the *2006 Planning Act* and the French National Management Plan for Radioactive Materials and Waste (*Plan national de gestion des matières et des déchets radioactifs* - PNGMDR), Andra's Executive Committee laid out at the end of 2008 an overall view of the Agency's prospects until 2017 and submitted it for comments, first to supervisors and then to the entire staff through an internal inquiry. During its third Quadrennial Contract, the Agency will continue its mutation in accordance with the orientations of the *2006 Planning Act* by ensuring the availability of the proper means for Andra to improve its outreach, its expertise and its accountability.



1_Disposal cell at the very-low-level waste disposal facility (CSTFA).
2_Working Group on the project for a new corporate visual identity.



Communication

Rejuvenation Andra's new identity

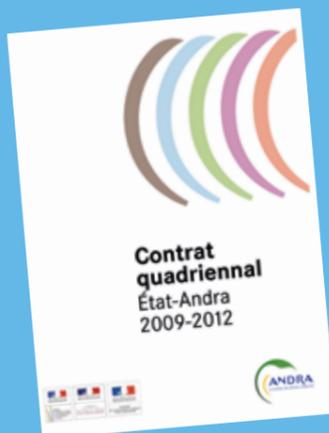
In order to display a closer image to its new ambitions, Andra has decided to enhance its corporate visual identity. A new logo has been designed to reaffirm its essential role to protect human beings and the environment, its public-establishment status, as well as its scientific and technological know-how. It also promotes the Agency's new assets to take the bend announced in the new Quadrennial Contract, namely openness to others and innovation. Lastly, the slogan "Mastering radioactive waste" reflects clearly the Agency's commitment to its mission.



The 2009-12 Quadrennial Contract

In the next quadrennial contract, the French Administration is likely to reaffirm Andra's mission to serve as the public industrial operator to design, implement, operate and promote innovative management solutions for protecting human beings and the environment against the long-term impact of radioactive waste, both today and tomorrow. Such an activity involves four different aspects:

- > an exemplary **industrial operator**;
- > an innovative **designer/assembler** with a high research level;
- > a **public expert** warranting the comprehensiveness of radioactive-waste management solutions;
- > a **diffusion and promoting organisation** in France and abroad.





EXPERTISE N° 1

Operation & monitoring



Andra ensures the take-over of radioactive items and the cleanup of sites contaminated with radioactivity in France, monitors the Manche disposal facility and operates two other disposal facilities in the Aube district.



1_Crusher at the Socatri treatment plant.
2_Filling a polyethylene drum with crushed materials at the Socatri treatment plant.

_WASTE COLLECTION FROM SMALL PRODUCERS

A most fruitful investigation with many lessons to be learnt

In August 2008, a release of carbon-14 gas was reported at Bollène's *Socatri* plant, Vaucluse district, an AREVA branch where the low-level waste collected from "small producers" is reconditioned on behalf of Andra. The incident helped Andra improve its control and storage means.

Non-electronuclear waste in 2008

- > **700 producers** (medical, pharmaceutical, research laboratories, hospitals, etc.)
- > **200 m³ of waste** collected every year
- > about **4,000 waste packages** every year

Interruption in waste collection

Outside the nuclear-power sector, radioactive waste originates from about 700 various "small-scale nuclear activities" waste producers, such as medical, pharmaceutical or research laboratories, hospitals, universities, etc., and from cleanup of old sites contaminated with radioactivity, undertaken by Andra within the framework of its public-service mission. The radioactive release detected at the *Socatri* plant on 6 August 2008 originated from a waste batch delivered by Andra for sorting and conditioning purposes before being directed towards a disposal or incineration facility. Because of this incident, all waste-reception and treatment operations on Andra's behalf were completely stopped. The Agency had to suspend all waste collections at

its customers' premises until 13 October 2008. As soon as it was informed of the incident, Andra initiated an investigation with its small waste producers, whose waste packages were handled by *Socatri* at the time of the incident. The purpose of the investigation was to identify the origin of the waste that caused the release and to implement promptly all appropriate corrective measures. The priority, via that investigation, was to resume waste collection as soon as possible, since the storage capabilities of small producers is limited.

Procedure compliance

Such surveys are useful to confirm the sound application of waste-drumming and control procedures by "small-scale nuclear activities" waste producers. However, for three of them, a corrective action plan was required to remedy deficiencies, while the collection of their waste was suspended until the plan was implemented. A second control was even made at one producer before the actual waste-collection operations could resume.

New control measures

The investigation performed by Andra helped in identifying with certainty that the release-indu-

cing waste originated from the *Isotopchim* site (see p. 22), although the contamination could not be detected by the controls made until then. Hence, investigations have led Andra to modify its procedures in order to incorporate a new systematic control on all waste packages before their transfer to the *Socatri* plant. The incident also provided an opportunity to highlight the crucial role of the so-called "characterisation phase" during which preliminary studies are conducted prior to the cleanup of polluted sites under the responsibility of Andra. Those studies constitute very often 80% of the worksite time, and although they might be expensive, they are essential to the sound management of worksite operations.

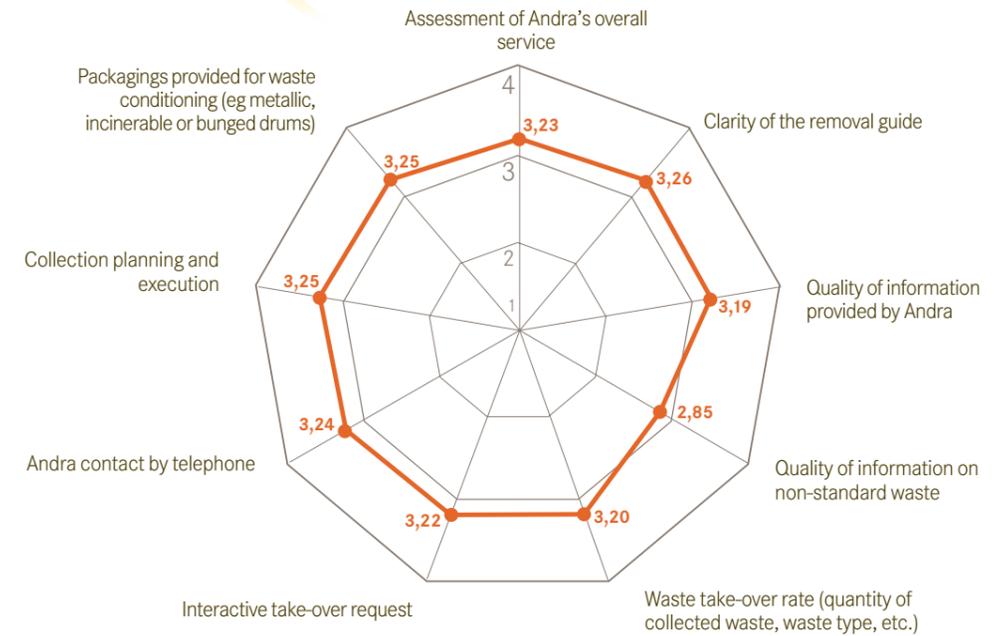
Towards Andra's own storage facilities

The investigation also has another extension, since Andra is now conducting a reflection on storage methods by contemplating the possibility to develop its own facilities. A project in that field will be submitted to its Governing Board in 2009.



Satisfaction survey

According to a poll conducted by Andra's Industrial Division between 12 March and 31 December 2007, 95% of the Agency's customers outside the nuclear-power sector are satisfied with Andra's services. Questionnaires were sent to 535 customers whose waste is collected by Andra, out of which 106 (about 20%) replied.



Average per topic

- 1: Unsatisfactory
- 2: Slightly satisfactory
- 3: Satisfactory
- 4: Very satisfactory
- : Customer-satisfaction level



_POLLUTED SITES AND RADIOACTIVE ITEMS

Securing under high surveillance

In the framework of its general-interest mission, Andra is in charge of rehabilitating sites contaminated with radioactivity when the responsible entity is defaulting. Details of a few interventions performed in 2008.

A long and delicate operation at *Isotopchim*

The premises of the *Isotopchim* plant, located in Ganagobie, Alpes-de-Haute-Provence district, where the synthesis of radioactive molecules used to be performed for nuclear-medicine purposes, were abandoned in September 2000. The operator went into liquidation and left without removing any remaining products, without securing the facility or even leaving any information on its business. The initial operation consisted in drawing an inventory of all substances, including the chemicals present on the site, and to remove the first batch. A study followed with a view to specifying the modalities for removing the most radioac-



tive waste still present on the site. Finally, in 2008, Andra was entrusted by an order of the Alpes-de-Haute-Provence district Prefect to secure the premises. The most radioactive products constituting chemical hazards were shipped to the Marcoule facility of the French Atomic Energy Commission (*Commissariat à l'énergie atomique - CEA*). That operation was accompanied by the pre-cleanup of the premises, notably by shipping drums containing contaminated waste to the *Socatri* plant for control and reconditioning purposes. The main problem with that worksite still under way is the identification of the radiological and chemical content of the



What is a polluted site?

According to the interministerial circular of 17 November 2008, "a site contaminated with radioactivity means any site, abandoned or in service, on which radioactive substances, either natural or man-made, have been or are manipulated or stored under such conditions that the site is hazardous to health and/or the environment".

products due to the absence of their quality control follow-up and the low radiation of carbon-14, which complicates the radioactivity assessment.

Gif-sur-Yvette: work performed "in public"

Andra also completed the cleanup of two dwellings located in the Coudraies neighbourhood of Gif-sur-Yvette, Essonne district. Some of the buildings erected in the 1970s on the site of the former *Société nouvelle du radium* facility and laboratory were contaminated with radioactivity. In 2007, the National Assistance Commission in the Radioactive Field (*Commission nationale des aides dans le domaine radioactif - CNAR*) issued a favourable opinion regarding the execution and funding of the operation. In 2008, between

the cleanup, the renovation and the controls to ensure that all flats were fully decontaminated, the worksite mobilised three people throughout the whole year. The overall intervention amounted to about €500,000.

1_Various contaminated products at *Isotopchim*.
2_Decontamination worksite at Gif-sur-Yvette.

Decontamination? An affair of State

In France, there are about 20 sites with no responsible entity. Rehabilitating a site implies two long successive operations. The first phase consists in securing the site, which means removing the major and readily-accessible waste and securing accesses. During the second phase, the task is to clean up the site and to restore it for re-use purposes. In accordance with the *2006 Planning Act*, all securing operations may be funded by public subsidies.





Operation and monitoring

Orflam Plast, a new detected zone of radiological anomalies

Lastly, Andra intervened at Pargny-sur-Saulx, Marne district, where *Orflam Plast*, a former lighter-manufacturing company, had abandoned radioactive thorium-bearing residues resulting from ore transformation. As soon as operation ceased in 1997, various site-securing and waste-disposal operations were undertaken. With the site continuing to be monitored carefully, it soon became imperative to complete securing of the site. Funds were mobilized for Andra to carry out geotechnical characterization works, which started in November 2008 to identify

the most adapted scenario for that purpose. Moreover, in October, a former employee of the plant designated three areas where various waste had been dumped outside the plant site. Andra launched immediately a “doubt-raising” campaign with a view to identifying those areas, and the first measurements made on one of them showed radioactive anomalies. Andra delineated the sector, which is not readily accessible to the public, and prohibited all access to the area as a precaution. The securing operations will be determined in conjunction with the Public Authorities after further investigations.

Good riddance of radioactive items!

Items such as old alarm clocks, mineral collections, etc., may be radioactive. Since January 2008, Andra provides a free service thanks to the financial-support policy implemented by the National Assistance Commission in the Radioactive Field (*Commission nationale des aides dans le domaine radioactif* - CNAR) by collecting and taking over those items found in private homes or in schools. To let it know, Andra launched an information campaign throughout the country in order to help identify those objects, which must not be thrown away in the dustbin or dumped anywhere. A practical guide was widely distributed to local elected officials, firemen and waste-treatment inter-communal syndicates.



1_Various contaminated products at Isotopchim.



1_Aerial view of the Manche disposal facility.

_MANCHE DISPOSAL FACILITY

Reporting on safety

The Manche disposal facility is already in post-closure monitoring phase. A site safety report was prepared in 2008 and is scheduled to be reviewed by competent authorities. An information file on the mechanical behaviour of the facility cap was also submitted to the Nuclear Safety Authority (*Autorité de sûreté nucléaire* - ASN).

2008: preparation of the final report

At the beginning of January 2009, six years after the Manche disposal facility entered its post-closure monitoring phase, Andra will submit to the French Nuclear Safety Authority (*Autorité de sûreté nucléaire* - ASN) the “final safety report relating to the overall facility and an update of the general operating rules, of the internal contingency plan and of the monitoring plan”. The report, prepared in 2008, consisted in verifying various safety hypotheses and in redirecting them, if need be. Special care was given to the following items:

- the analysis of risks during the post-closure monitoring phase;
- the perennity of the cap;
- the optimisation of monitoring actions concerning the facility and its environment in order to ensure a progressive transition to a passive-monitoring phase;
- the transmission of all relevant information to future generations.

A positive balance

More particularly, the report points out that the cap fulfils entirely its role as a barrier between the waste and the environment. The impact on populations is also satisfactory since it remains below 1 microsievert (μSv), compared to a dose of 1,000 μSv , which would correspond, for instance, to seven Paris-San Francisco return flights or the annual average of medical radiological exams performed in France *per capita*. The review of the report will take about one year. The French Institute for Radioprotection and Nuclear Safety (*Institut de radioprotection et de sûreté nucléaire* - IRSN) will submit its assessment of this report to the ASN’s Standing Expert Group, which in turn will relay its opinion to Andra.





Operation and monitoring



1_ Aerial view of the Manche disposal facility.

2_ Installation of a retaining wall to buttress the cap.

Communication

Event When science radiates

The Science Days (*Fête de la science*) organised by *Relais d'sciences de Basse-Normandie* was met with great success. In fact, 5,800 visitors came to the "Science Village" held in Caen on 22-23 November 2008. In partnership with the nearby Ludiver Planetarium, the Manche disposal facility had a stand entitled "The Applications of Radioactivity" and focused on solar radioactivity. The display was completed by a slide show on radiological applications in archaeology (carbon-14) and an exhibition named "When Atoms Radiate" provided by the Science Space of Rennes.



Exhibition Memories, memories

From 28 July 2008 to 30 June 2009, the Manche disposal facility is showing a special display on "Sunken Heritage" (*Patrimoine englouti*). Located in the Information Centre, the exhibition was free of charge and presented a historical and geographical overview of the major sites of the surrounding Cotentin Peninsula, including newly-discovered sunken treasures. It provides an opportunity to remind visitors that the history of the Manche disposal facility has been recorded and archived on permanent paper in order to preserve its memory and get it available to future generations.



Synthesis report A duty of memory

Andra has the regulatory obligation to maintain the memory of the Manche disposal facility for three centuries in order to inform future generations of its existence and content, to facilitate the understanding of observed phenomena and to allow for decisions regarding the future of the site to be taken in full knowledge of the facts.

The detailed memory of the Manche disposal facility includes more than 10,000 documents (which amount to about 500,000 pages being stored over 60 m of shelf space) and covers all phases of its lifetime. In 2008, the first edition of a shorter version (169 pages) of the memory of the facility was issued. Available for consultation and downloadable on the Agency's website (www.andra.fr), this "memory" synthesis describes the major information about the facility, especially required by decision-makers at the local level (prefects, mayors, notaries, etc.) or at the national level (ministries, etc.). Through its wide distribution, this document maintains the memory of the Manche disposal facility among the public at large (notably via associations), national authorities (ASN, Regional Directorates for Industry, Research and the Environment [*Direction régionale de l'industrie, de la recherche et de l'environnement* - DRIRE], etc.) and international organisations (OECD Nuclear Energy Agency [NEA], International Atomic Energy Agency [IAEA], etc.). That first edition will be updated on a regular basis.



Ongoing vigilance for the facility cap

A fact file describing the completed work on the cap and on the project of its reinforcement selected by Andra was also submitted to French Nuclear Safety Authority (*Autorité de sûreté nucléaire* - ASN) for approval. The mechanical behaviour of the cap does require reflection and corrective actions. Thanks to its permanent monitoring, various subsidence and landslide phenomena were detected. Although such movements had been anticipated during the design stage of the cap,

investigations will be conducted in 2009. They will address the north-eastern subsidence observed in 1999 in order to understand better its origin and to identify appropriate technical solutions for that situation, which has stopped evolving in the meantime. With regard to the landslides that occurred on the steep slopes due to the site exiguity, they require regular backfilling. Those different movements in the cap do not constitute any higher risks of diffusion or release in the environment risks than the standard ones. The regular monitoring activities conducted on the site underscore the fact that release levels have not increased.

The Manche disposal facility (Digulleville)

> commissioned in **1969**

> about **527 000 m³** of disposed low- and intermediate-level waste

- > capping works 1991 to 1997
- > post-closure monitoring phase since January 2003
- > 10 hectares
- > about 6,000 collected samples for about 10,000 analyses





_AUBE DISPOSAL FACILITIES

Environmental impact: a free hand for a counter-expertise

Following the questions raised by local residents close to the low- and intermediate-level short-lived waste disposal facility (CSFMA), the Local Information Committee (CLI), chaired by the Aube district Councillor Michel Roche, wished to benefit from an external critical point of view on the environmental impact of the facility.

Three objectives

In April 2007, a working group chaired by Philippe Dallemagne, Vice-president of the Local Information Committee (*Commission locale d'information* - CLI) and President of the Soulaines Community of Municipalities, entrusted to the services of the Association for Radioactivity Control of Western France (*Association pour le contrôle de la radioactivité de l'Ouest* - ACRO) with a three-fold study: collecting data to assess the impact of the CSFMA on its surrounding ecosystems, establishing a reference system for potential investigations in the future and providing the CLI with information to address the issues raised by local residents.

Very comprehensive studies

At the ACRO's request, a study was carried out on the sampling locations, which were different, except for minor exceptions, from those being used normally by Andra for its own controls. In fact, the ACRO was granted free access to all Agency installations. Samples were collected from soils, sediments, vineyards, garden products, vegetables, trees, surface waters and groundwaters.

Results confirm Andra's own results

The results of the study, presented at the CLI meeting of February 18th 2008, indicate that the activities of the CSFMA induced no trace of radioactivity in the close environment of the facility. Those results confirm the conclusions of the 15,000 average annual analyses performed by Andra in the environment within and around the disposal facility, as regularly communicated to the media and posted on the Agency's website (www.andra.fr).



> Patrice Torres,

who succeeded Nicolas Ricquart on June 1st as Director of the Aube disposal facilities.

“My objective is to ensure that the Aube disposal facilities serve as a reference due to their outstanding performance.”

Communication



Beyond open doors

“Dear friends: we have built that structure during the 20th century and the beginning of the 21st. We thought about you, as of our future descendants, and we wish you peace, harmony and above all progress and faith in science at the service of Mankind.” That message is but one of many others left to the attention of future generations during the open-door visit organised at the Soulaines-Dhuys facility on 14 September 2008. Close to 800 persons attended the “Scientific Rally” during which they were able to discover the itinerary of a waste package, from its initial preparation to its final disposal, and also the appropriate tools implemented on the site to protect the environment.

Science not fiction

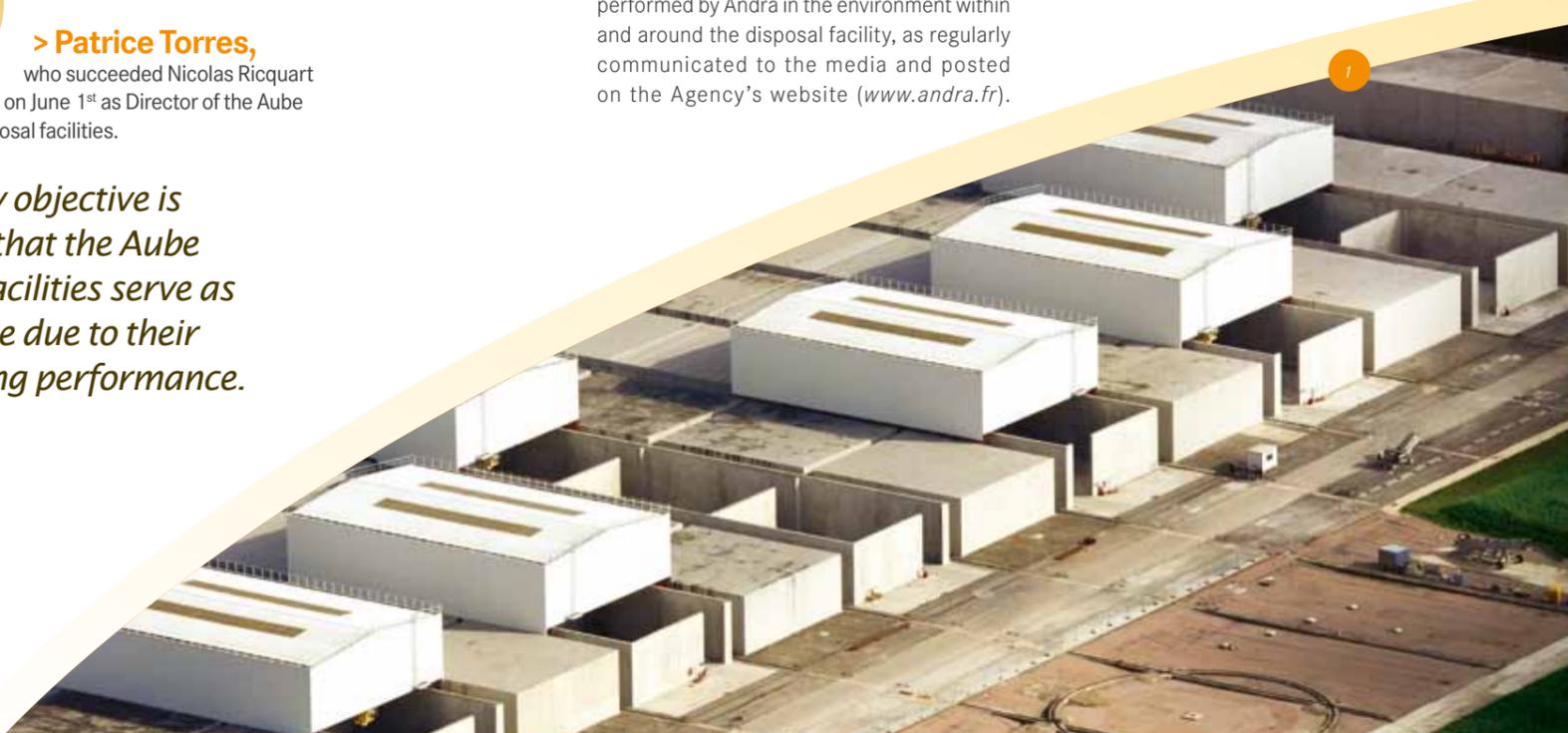
Throughout the year, the Aube disposal facilities were associated with a large number of initiatives designed to promote science and its career opportunities. College students from Bar-sur-Aube attended a conference on geosciences and the profession of geologist. In October, more than 400 pupils from Montier-en-Der participated in a week of recreational and educational workshops on paleontological excavations, water, rocks, etc., organised by Andra and the *Nature de Der Association*. From the Science Days in November until 31 March 2009, the Information Centre will host an exhibition called “Spotlights on the Sky” dedicated to the history of astronomy.



“Opening the gates of the nuclear site, together with the possibility to collect samples at the very foot of waste-disposal structures, reflects the determination of Andra's management to assist the CLI in the gathering of its own information in spite of an attitude that we perceived initially as being somewhat mistrustful.”

> Excerpt from the ACRO Report

1_Waste disposal cells at the Soulaines-Dhuys facility (CSFMA).



The CSFMA

(Low-level and intermediate-level short-lived waste disposal facility) (Soulaines-Dhuys, Aube District)

- > commissioned in 1992
- > 1 million cubic metres of disposal capacity

- > 219,939 m³ of disposed waste packages at the end of 2008
- > operating budget of €33.6 M in 2008
- > 95 hectares, including 30 for disposal purposes
- > 17,727 received packages in 2008 including 6 reactor-vessel heads
- > 12,549 m³ of delivered waste in 2008
- > 11,886 m³ of disposed waste in 2008
- > 95 closed disposal cells, including 3 in 2008 (about 400 other disposal cells are planned until the closure of the disposal facility)
- > about 5,000 collected samples for about 18,000 actual analyses in 2008



_AUBE DISPOSAL FACILITIES

Large deliveries attracting attention

The stream of very-low-level (VLL) waste at the CSTFA facility is more intense than originally planned at the design stage and requires additional reflections on the management of the facility.



1_Unloading big-bags at the CSTFA.

Passing the 100,000-m³ mark in 2008

On Friday, 13 June 2008, the CSTFA disposed of its 100,000th cubic metre of very-low-level waste. The 1-m³ package weighed 1,375 kg and consisted of a “big-bag” of rubble from a deconstruction site belonging to AREVA. This big-bag, bearing a bar code to ensure waste traceability, was delivered in a container on 4 June. Beforehand, Andra checked that it complied with the Agency’s specifications and had the required characteristics to be disposed of at the CSTFA. It was finally transferred to a disposal cell being filled up.

What is the best management method?

The 100,000th cubic metre of waste reflects the CSTFA’s heavy workload. Much higher than the original forecasts, the increase in VLL-waste streams corresponds to the implementation of dismantling programmes for shut-down nuclear facilities (notably the EURODIF plant) which means no less than 150,000 t of additional metal scrap to be dealt with. That perspective led Andra and waste producers, such as EDF, AREVA and the CEA, to undertake a two-fold reflection: the first one about a better compacting of waste and the second one about re-using metal scrap in the nuclear industry. Pending the results of those reflec-

tions, disposal cells keep on being filled and sealed. The first phase in the installation of the final cap was completed in the spring. The second phase should start around 2011-2. In the meantime, a temporary cap consisting of several layers of materials will protect disposal cells already filled with waste in order to ensure the impermeability of the whole system (geomembrane, sand, clay, etc.).



Communication

Exhibitions Expansion of facilities

In January and February 2008, the Bar-sur-Aube Tourist Office hosted an exhibition on the Aube disposal facilities and provided an opportunity for passers-by and onlookers to examine both day and night a mock-up of the Soulaines facility from every angle.

Unusual photographs

Designed in co-operation with photographer artist Bruno Cupillard from Franche-Comté, an exhibition dedicated to gemmology was presented from June to October by the Aube disposal facilities. Entitled “Rocks and Marvels” (*Roches et merveilles*), the fairyland adventure invited the visitor to marvel at the forms, colours and irregularities of precious gems photographed across the world.



The “Golden Age” of books

A travelling exhibition entitled “The Very Rich Hours of Champagne” (*Très Riches Heures de Champagne*) provided a good opportunity to discover or to re-discover at Soulaines, in May, the exceptional artistic heritage constituted by some Champagne manuscripts and their gothic illuminations of the 15th century.

A halt for antinuclear walkers

At the end of June, the Aube disposal facilities greeted about 20 nuclear opponents from different nationalities during their walk from London to Geneva. The group visited both facilities and learned more about various disposal solutions in a serene atmosphere. An exchange of polite regards concluded the encounter...



The CSTFA

(Very-low-level waste disposal facility)
(Morvilliers, Aube district)

- > commissioned in **2003**
- > **650 000 m³** of disposal capacity

- > 115,657 m³ of disposed waste at the end of 2008
- > operating budget of €11.5 M in 2008
- > 45 hectares, including 28.5 for disposal purposes
- > 28,168 received packages in 2008
- > 28,466 m³ (or 24,112 tonnes) of delivered waste in 2008
- > 26,321 m³ of disposed waste in 2008
- > about 1,100 collected samples for about 2,800 actual analyses

Aube Disposal Facilities

- > In 2008, both facilities welcomed about **3 000** visitors

EXPERTISE N° 2

Study and design



Beyond its industrial know-how regarding waste management and site monitoring, Andra is seeking to find solutions for waste categories awaiting a long-term management solution.



_PROJECT FOR A LOW-LEVEL LONG-LIVED (LL-LL) WASTE REPOSITORY

Work on the disposal concept is progressing

In parallel with the 2008 call for expressions of interest launched in the search for a suitable site (see p. 10-11), Andra has deepened its knowledge about LL-LL waste with regard to disposal. It also continued to review various technical solutions for such disposal and it prepared the case on which the government will rely to analyse the volunteer applications from interested municipalities.

A better knowledge

Pursuant to the *2006 Planning Act*, the French Administration required Andra to find disposal solutions for all radium-bearing and graphite waste classified as LL-LL waste. In consultation with waste producers, Andra continued in 2008 to collect and acquire information on such residues. In accordance with the decree of 16 April 2008, it reviewed the possibility to take over within the same disposal facility other types of LL-LL waste, such as items containing low-level radium, uranium and thorium, sealed sources, etc. In conjunction with EDF's Engineering Centre for Deconstruction and the Environment (*Centre d'ingénierie de la déconstruction et de l'environnement - CIDEN*), the Agency also participated in the definition and follow-up of package production for graphite waste, notably by proposing a fibrous concrete formulation. Tests are still under way.

Two possible disposal solutions

In parallel, Andra is deepening its studies on disposal concept. Various options are being investigated on the basis of bibliographic data. Research involves modelling activities and technical-feasibility studies. Two solutions have been selected. The reference solution provides for graphite and radium-bearing

residues to be disposed of on the same site according to a technique known as "shallow cavern disposal", which means disposal under an intact cover and involves the opening of underground drifts accessed by tunnels and the backfill of those drifts after disposal. A variation would consist in disposing of radium-bearing waste according to a technique called "cut and cover disposal", which implies an open-cut site with disposal cells being capped with a layer of clay as operations progress.

Geological analysis of volunteer municipalities' areas

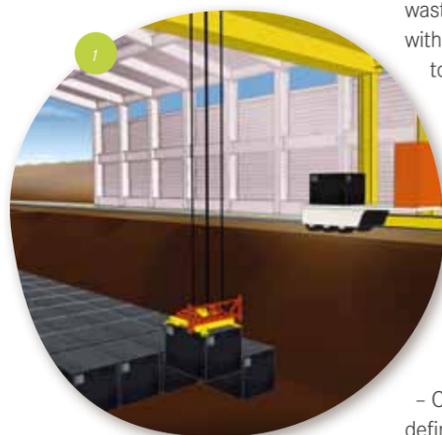
At the end of 2008, Andra used the available information from the literature to analyse the geology of the volunteer municipalities' areas (see p. 10-11) in order to ascertain the feasibility of implementing the disposal facility. Various criteria were taken into account, such as thickness, homogeneity, the dip and the depth of the clay formation, potential faults, seismicity, surface hydrogeology, the long-term geomorphological evolution, the available area within the municipality, potential recoverable resources and the quality of available geological information. The analysis helped in the identification of the most interesting municipalities for the siting of the disposal facility.

Two complementary analyses

For these municipalities, Andra also drew a bibliographical list of the experimental data likely to compromise or even to exclude the implementation and operation of a disposal facility. Since such data vary in nature (ecological media, protection zones of water resources or cultural heritage, natural and technological risks, land uses), Andra had to rule out certain municipalities. A preliminary socio-economic analysis was carried out on the remaining municipalities in order to assess the dynamics of the territory at stake by studying notably its current geographic context, demography, as well as its activities and transport infrastructures. Those analyses were included in the report that was submitted on 24 December to the Minister of State with a view to helping the government in selecting suitable sites for the implementation of the new disposal facility. In 2009-10, more detailed investigations will be undertaken on those sites, while an exchange and dialogue approach will be initiated.

Carbowaste Graphite waste under study

Led by the FZH Nuclear Research Centre (*Forschungszentrum Jülich GmbH*) in Germany, the European Carbowaste Project includes 28 organisations. Its objective is to improve the management of graphite waste resulting from the dismantling of the first generation of gas-cooled graphite-moderated nuclear reactors. Andra's main intervention deals with the evolution of the microstructure of graphite before and after irradiation within the reactor, and on the behaviour of graphite under repository conditions.



1_Cut and cover" disposal concept.
2_Illustration of the LL-LL waste repository project.
3_Shallow cavern disposal concept.



_PROJECT FOR A HIGH-LEVEL AND INTERMEDIATE-LEVEL LONG-LIVED WASTE REPOSITORY

Geological surveys completed in 2008 confirm the 2005 results

In accordance with the *2006 Planning Act*, Andra is responsible for conducting studies and investigations on the deep disposal of high-level and intermediate-level long-lived (HL/IL-LL) waste. The purpose is to select a suitable site and to design a reversible disposal facility early enough for the licence application to be reviewed in 2015. Subject to the granting of such licence, the facility should be commissioned by 2025.

Significance of the geological environment

The long-term-safety performance of a disposal facility for HL/IL-LL waste depends on the characteristics of its host rock. In the *Dossier 2005*, Andra demonstrated the feasibility of deep geological disposal within a 250 km² around the Meuse/Haute-Marne Underground Research Laboratory (URL), where the properties of the

potential host rock for disposing of waste packages are similar to those observed in the URL.

In-depth surveys

In order to clarify and homogenise all data concerning the subsoil of the overall 250 km² zone, Andra completed in 2008 a campaign of geological surveys from the surface. The campaign consisted in various initiatives: the borehole-drilling operations

those results are not characteristic of an exceptional resource that would have been incompatible with the implementation of a deep disposal facility. With due account of the outstanding characteristic of that borehole – since more than 20 years have elapsed without drilling similar deep boreholes in France – the Agency wished to share with the scientific community the data and samples it acquired during the process. Various establishments and organisations interested in that deep borehole, such as universities, the French National Centre for Scientific Research (*Centre national de la recherche scientifique* – CNRS), the French Petroleum Institute (*Institut français du pétrole* – IFP), the French Geological Survey (*Bureau de recherches géologiques et minières* – BRGM) and the French Institute for Radioprotection and Nuclear Safety (*Institut de radioprotection et de sûreté nucléaire* – IRSN), have submitted more than 40 projects, which were reviewed by an independent scientific panel and consolidated within a research programme to be concluded by a symposium at the end of 2010.

Drilling boreholes down to the Trias formation 2,000 m underground

In the framework of the geological surveys conducted from the surface, Andra drilled 14 boreholes in 2008. One of them is 2,000 metre-deep and reaches a geological formation dating back to the Trias. Its purpose was not only to study the role of deep Mesozoic formations in the transfer of elements, but also to assess their geothermal potential and, hence, to respond to the concerns of the URL's Local Information and Oversight Committee (*Comité Local d'Information et de Suivi* – CLIS) about the potential presence of a deep geothermal resource. Since temperature reaches 66°C in the Lower Trias sandstone and shows a low productivity in comparison with the current geothermal fields found within the same temperature ranges in the centre of the Paris Basin,



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1_Borehole-drilling and groundwater-sampling around the URL.
2_Vibroseis truck.

carried out in 2008; the seismic-data acquisition procedure conducted in 2007, the results of which were interpreted in 2008, and geological mapping. The resulting boreholes and geophysical measurements from those operations helped, for instance, in confirming and clarifying the layout and the internal structure of the Calovo-Oxfordian formation (a 160-million-year-old sedimentary rock), such as its thickness, its depth, its sedimentary sequences, its dip, etc. Analyses were also performed in situ and on the samples collected in the boreholes, and contributed also in improving the data on its properties, such as permeability, porosity, retention capability, diffusion coefficient, hydraulic-head gradient, etc. Results confirm their lateral homogeneity within the overall area. In 2009, the results of that campaign will serve in the selection, within the larger 250 km² zone, of a smaller (30 km² approximately) zone with notably the most favourable geological features for the implementation of the underground installations of the repository. The implementation site will be selected also by taking into account industrial and environmental constraints, together with criteria of regional development and local integration as identified during exchanges with local actors.

Sustainable monitoring

In 2008, the Perennial Observatory on the Environment (*Observatoire pérenne de l'environnement* – OPE) is gradually set in place. It prefigures the environmental monitoring to be carried out during the operation of the

Why drilling boreholes?

Boreholes can provide a vertical description of the subsoil by recording data obtained with various sensors and rock samples (cores, cuttings) as well as fluid samples, in order to study the different superimposed layers and their characteristics.

disposal facility, which is expected to last for about 100 years. In that sense, it constitutes a unique tool to acquire environmental data. Beyond the regulatory requirement to monitor water and air quality and bio-indicators, that essential mechanism for understanding and monitoring the environment around the future disposal facility focuses also on the study of ecosystems in the 250 km² zone. The studies concerning the flora, amphibians, insects, large mammals and bats have already been launched, and others on the aquatic fauna and bees will follow in the near future. In the case of human activities, an observatory of farming and forest practices is being implemented for the zone under study.



Study and design



Preparation the site for experimentations

With regard to the experiments in URL drifts with a view, for instance, to studying the diffusion rate of radioelements in the rock, to assess rock response to heat or to observing its geomechanical behaviour during excavation, year 2008 marked a transition period. The first boreholes for the future experiments have now been drilled and the implementation of experiments in the available drifts is completed. A total of 29 boreholes were drilled, analysed and instrumented in 2008. About 100 more boreholes are already scheduled for 2009.

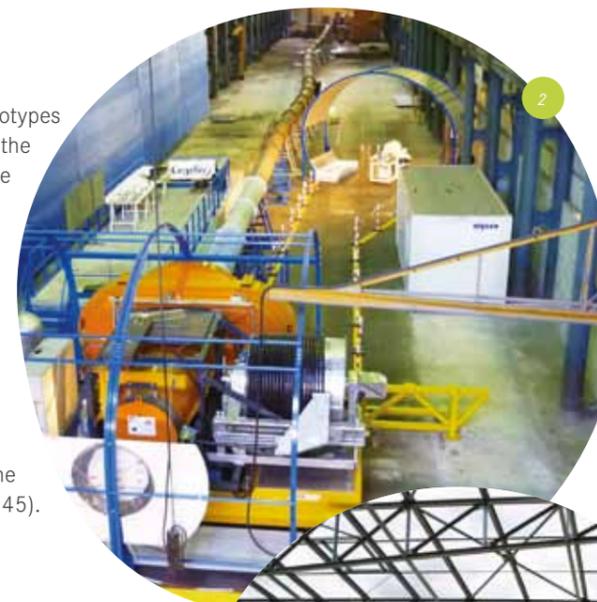
Excavation goes on!

The excavation of the second experimental drift and of the northern access drift started in April and May 2008, respectively. Close to 90 m of both drifts were opened in 2008. A specific machine was designed for boring mini-tunnels with a view to testing the excavation method to be used in 2009 for small-diameter (1m) high-level waste disposal cells (1 m).

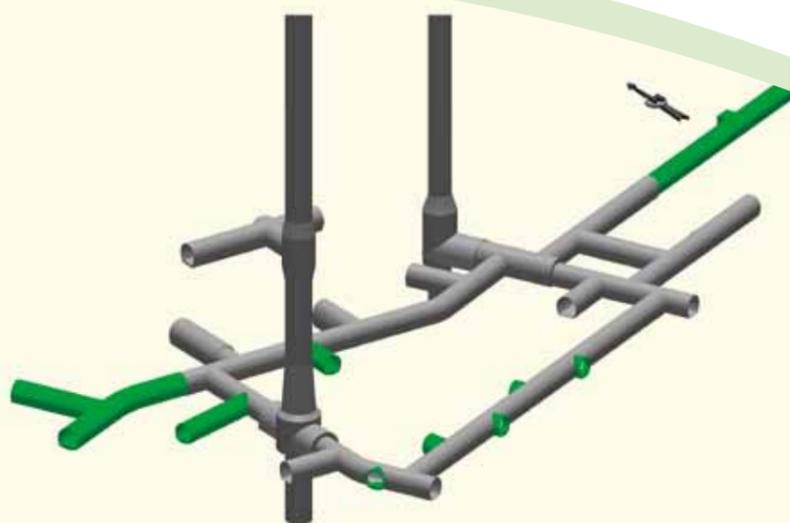
Exchange and dialogue approach

In order to prepare in parallel the public debate scheduled to be held in 2012-3, Andra has initiated an exchange and dialogue approach with a view to involving the local population and actors in the final selection of the implementation site. In 2008, the Agency reinforced its means to ensure the development of its relations with the Local Information and Oversight Committee (*Comité Local d'Information et de Suivi* - CLIS) and local actors (elected officials, consular chambers, associations, etc.) and provide them with technical elements describing the project. Andra can rely on the Assessment and Monitoring Committee for the Information and Consultation Approach (*Comité d'expertise et de suivi de la démarche d'information et de consultation* - COESDIC) which provides advices to clarify its information or to develop outreach actions towards the public. The URL continues also to open its doors very wide and recorded in 2008 an exceptional number of visitors (see p. 41). Those visits are expected to increase when the construction of the Technological Exhibition Facility, which started in March 2008, will be completed around mid-June 2009. The new building will serve as a showcase of the deep-repository project,

and various existing or upcoming prototypes will be on display. On 29 May 2008, the project was presented directly on the worksite itself to Bure and Saudron residents, in conjunction with the municipal authorities of both villages. In October, a few days after having been first introduced to European media, it expanded its outreach by greeting close to 300 people for a delocalised session of the European *Euradwaste* Conference organized in Luxembourg by the European Commission (see p. 44-45).



1_Observation of the environment.
2_Transfer and handling prototype for HL-waste containers.
3_Construction of the Technological Exhibition Facility located at Saudron.



Opening drifts at the URL

- Existing drifts by end 2007
- Excavated drifts during year 2008

Code name: FUNMIG by Scott Altmann

The Callovo-Oxfordian formation is a rock with a strong retention capability, thus retarding and limiting the migration of the radionuclides contained in the waste to the geological environment. The studies that were conducted for the preparation of the *Dossier 2005* noted that the minerals of the rock were able to retain the least mobile nuclides, such as actinides (uranium, plutonium, etc.), and to restrict the migration of the most mobile nuclides, such as iodine and chlorine. In order to deepen its understanding of such mechanisms, Andra participated from 2005 to 2008 in an integrated project of the European Commission, called "Fundamental Processes of Radionuclide Migration" (FUNMIG), grouping 15 European countries and 48 organisations, nine of which are located in France. Andra co-ordinated the part of the project relating to the study of those mechanisms in clay formations and relied on the efforts of French organisations, such as the CEA, the BRGM, Subatech, the Joseph-Fourier University (UJF) in Grenoble, Études-Recherches-Matériaux, etc. as well as 10 European partners from Belgium, Germany, Hungary, Spain and Switzerland.

The FUNMIG project helped in understanding better and in modelling those key mechanisms at various scales (nanometric, centimetric or hectometric) for the safety case of radioactive waste disposal in a geological formation such as the Callovo-Oxfordian.



> **Scott Altmann**,
Head, Transfer &
Migration Department,
at Andra's Scientific
Division



_GRAND ENGINEERING AWARD

Consecration of the Underground Laboratory

Andra teams won the second prize *ex aequo* of the 2008 French National Engineering Grand Prize for the design and implementation of the Meuse/Haute-Marne Underground Research Laboratory. Hence, engineers and scientists have been praised for their capabilities in conducting construction work and scientific studies simultaneously and often under difficult conditions.

Recognition of Andra's expertises

The Underground Research Laboratory is truly a unique scientific tool. It is excavated at a depth of 500 m with a view to carrying out studies on deep disposal feasibility for the most radioactive waste generated by French nuclear-power plants. It includes more than 500 m of underground drifts to study a 160-million-year-old formation likely to host the future repository. Thanks to this

Second Prize in Engineering, it stands right behind the Dubai subway and *ex aequo* with the construction of one of the most difficult highways to be built on the Réunion Island. The French National Engineering Grand Prize was created by the Ministry of Ecology, Energy, Sustainable Development and Territorial Planning and *Syntec Ingénierie*, with the participation of the *Moniteur* media group. This prize highlights every year the outstanding achievements of engineers and of their teams in the design and implementation of a project, either completed or under way: infrastructures, public equipment, buildings, etc. Applications are assessed for their inventiveness or innovation, transversality, the specific input of engineering and, in 2008, the support to sustainable-development approaches.



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About 51,000 visitors in at the Underground Research Laboratory

since its creation, including close to 12,000 in 2008

1_Award of the French National Engineering Grand Prize.
2_Measuring variations in the diameter of an URL drift.

Communication

European Science World at the Grand Palais, Paris Journey to the core of the rock

On 14-16 November 2008, close to 2,500 people of all ages responded to Andra's invitation and visited a reconstituted Underground Research Laboratory drift, which was actually more realistic than nature. With the assistance of Agency scientists, the public was able to discover the types of experiments taking place and to understand the studies being carried out for deep disposal. Foreign scientists also contributed efficiently to the lively atmosphere of the stand by presenting the investigations conducted in their own countries. Mr Jean-Louis Borloo, Minister of State, also paid a visit to the exhibition and all in all, the event was a great success.



Exhibition Earthquakes and volcanoes

In the autumn of 2008, Andra's Laboratory hosted an exhibition called "Earthquakes and Volcanoes" (*Séismes et volcans*) designed by the *Palais de la découverte* (Paris) and co-founded by the Agency. Hence, 7,000 visitors, including a large number of school children, wandered through a recreational and educational course as if they were travelling in the heart of volcanoes and earthquakes in order to understand the inducing mechanisms of such spectacular geological phenomena.



Open-door day An overwhelming reception for the drift mock-up

For the ninth edition of the Laboratory "Open-door Day", on 22 June 2008, the public was offered a display on the disposal concepts being studied by Andra as well as a visit to the surface installations and to a mock-up of a Laboratory drift where French and foreign researchers presented the different experiments being conducted in the Callovo-Oxfordian formation. A presentation of the Perennial Observatory of the Environment (OPE) around the Laboratory was also scheduled. The overall programme was well appreciated by all visitors who expressed their unanimous enjoyment about their day on the site.



Events Science events

On 25 /26 September, Andra was present at *Géologia 2008*, an exhibition dedicated to geosciences, where the National Geology School (*École nationale supérieure de géologie*) of Nancy celebrated its 100th anniversary by displaying its new prospects to the public. For the 2008 edition of *La Fête de la Science* (Science Days), Andra also had a recreational and educational stand at the Science Village of the University of Nancy, where visitors were offered a chance to discover mock-ups of the Laboratory and the geology of the site, and even try to drill a borehole through coloured foam.

Art inauguration The local environment at the fore

Since June 2008, a large fresco decorates the Information Centre at the Laboratory. Commissioned by Andra and made by a Meuse painter, Gérard Larguier, with the assistance of photographer Olivier Frimat, the work is 9 m wide by 3 m high, and displays some of the highlights of the local heritage.



“When work started in January 2000, who would have even dreamed that, eight years later, a panel sponsored by the Minister of Ecology, Energy, Sustainable Development and Territorial Planning would grant an award to Andra's Underground Laboratory?”

> **Pierre-Lionel Forbes,**
Director of the Laboratory

EXPERTISE N° 3
Sharing



Exchanging views on the advances achieved in research and providing knowledge keys to the most qualified international experts and to the public at large constitute Andra's major roles in the dissemination of information on radioactive waste management, both in France and throughout the world.



_INTERNATIONAL RELATIONS

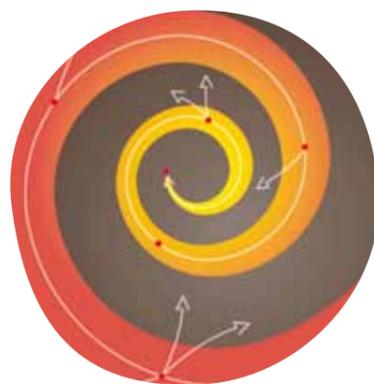
Always furthering

The purpose of Andra's participation in international projects and exchanges is to present and to explain its approaches and concepts, together with its results. It also serves not only to compare them with those of its foreign counterparts and of competent international organisations, but also to enhance its own reflection on national projects. Here is an overview of the main international endeavours in 2008.

Andra proposes a reversibility scale

On 13 March 2008, Andra's Chief Executive Officer, Marie-Claude Dupuis, chaired for the first time the annual plenary meeting of the Radioactive Waste Management Committee of the OECD Nuclear Energy Agency (NEA). At the meeting, Andra presented the reversibility approach it is developing for the deep disposal of radioactive waste and proposed the first version of a reversibility scale. The scale project is a communication tool designed to help

all stakeholders (elected officials, experts, citizens, etc.) discuss on a clear and common basis. It expresses the stepwise approach of the different phases in the disposal process and characterises the evolution of the capability to retrieve the waste. Its principle was well received and an international working group is pursuing the reflection within the NEA with a view to publishing a final version of the scale in 2010. In the meantime, Andra will organise in 2009 a symposium in Nancy in order to explore the relationships generated by the reversibility concept between sciences, techniques and society with regard to radioactive-waste deep disposal.



Reversibility

Designing a reversible disposal facility provides future generations with the possibility to modify or to redirect the procedure for repository closure. A new law is scheduled in 2016 to specify the relevant requirements for reversibility which duration cannot be less than 100 years.

"The international recognition of Bure"

Those are the words used by the representative of the European Commission, which organises the Euradwaste Conference every four years in order to present the results achieved

in the research field on radioactive-waste management in Europe. During its 7th edition, close to 300 participants from all countries attended a special session held on Andra's Meuse/Haute-Marne site. Scientists, engineers and political decision-makers were presented with the achievements of the 5-year project on Engineering Studies and Demonstration of Repository Designs (ESDRED). Coordinated by Andra, this European project has contributed in demonstrating the technical feasibility of the various operations involved in the construction, operation and closure of a deep reversible repository for radioactive waste. Visitors also had the opportunity to discover the different prototypes and robots developed by Andra for conditioning and emplacing packages in the deep repository under study. Lastly, they were able to visit the URL itself. In conclusion, the Conference proved to be a perfect illustration of the new trend launched in 2008 to enhance the promotion of international projects in France.



1_About 300 participants attended the special session of the 7th edition of the Euradwaste Conference at the future Technological Exhibition Facility.
2_Visit by members of the OECD/NEA, foreign counterparts of Andra scientists.





New partners

The Agency's international exchanges intensified in 2008. Andra's Chief Executive Officer, Marie-Claude Dupuis, and the Chairman of Andra's Governing Board, François-Michel Gonnot, paid a visit to the Wolsong disposal facility currently under construction in South Korea. They could meet all Korean authorities just before the implementation of the Korean Radioactive Waste Management Corporation was set up. This highlight of their trip confirmed that South Korea was a well-advanced country with regard to radioactive waste and that further exchanges might prove very fruitful.

Radioactive Waste Management Company (*Empresa nacional de residuos radiactivos* - ENRESA), Andra also signed partnership agreements aiming at reinforcing exchanges and co operation projects with both organisations. Three members from ENRESA's communication division came to familiarise themselves with the communication tools used by the Aube disposal facilities (CSFMA & CSTFA) and the Underground Research Laboratory. They were most interested in the drift mock-up, which they considered as an excellent educational tool accessible to all. In addition, the NDA showed great interest for the overall spectrum of issues followed by Andra, especially those relating to governance, communications, education and project management. It requested also more information on graphite waste and on the preparation of the *National Inventory of Radioactive Materials and Waste*, a most legitimate wish since the European Council has just adopted a resolution recommending that a radioactive-waste inventory and management plan be drawn in every country on the basis of the French model.

With the British Nuclear Decommissioning Authority (NDA) and its Spanish counterpart, the National

A first project for the new Agence France nucléaire internationale

In 2008, the French government created the French International Nuclear Agency (*Agence France nucléaire internationale* - AFNI) within the CEA in order to accompany many countries, especially emerging ones, in the development of nuclear energy for civilian uses, while abiding by the strictest safety standards. Andra is a member of the Steering Committee and has participated in the preparation of the first AFNI project.



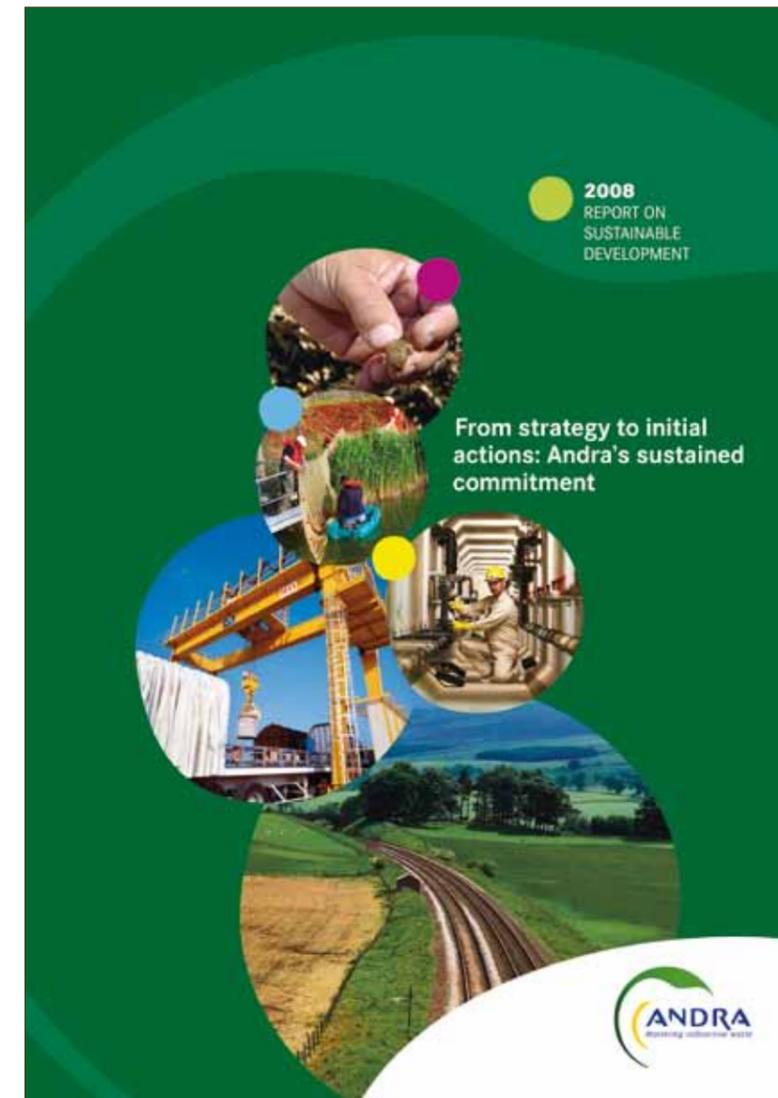
- 1-3_Visit by ENRESA and its Chairman, accompanied by a commission of Spanish parliamentarians dealing with energy issues.
- 2_Visit by a delegation from the Japan Electric Power Information Center Inc (JEPIC).
- 4_Entrance to the Meuse/Haute-Marne site.
- 5_Visit by members of NAGRA, the Swiss Radioactive Waste Management Agency.

Foreign delegations In good hands

Abroad, the French experience often constitutes a reference and the large number of visits made by foreign delegations reflects that interest. Among those visitors, we greeted representatives from:

- > Thailand, to learn more about the organisation of the French nuclear-power system;
- > Switzerland, to exchange views on the recent joint work carried out in Switzerland and France;
- > The United States and Germany, to obtain more information about the French approach for deep waste disposal studies;
- > Belgium, to familiarise themselves with the take-over of waste packages, relations with waste producers, as well as the safety and monitoring of facilities. It should be recalled that Belgium is due to commission a disposal facility for LL/IL waste within the next 10 years or so;
- > Vietnam, to meet the major actors of the French nuclear-power sector, as this country plans on developing its own nuclear-reactor fleet.





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