

**CoRWM visit to ANDRA, Départements of Meuse and Haute-Marne, France
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Participants

CoRWM: Laurence Williams (The Chair), John Rennilson, Stephen Newson, Lynda Warren, Helen Peters, Mojisola Olutade (Secretariat), Hollie Ashworth (Secretariat).

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Introduction

1. Some CoRWM members travelled to Bure, France to visit the Centre Industriel de Stockage Géologique (CIEGO) Underground Rock Laboratory (URL) built by ANDRA who is the national radioactive waste management agency in France. This was a follow up visit to that in April 2012 (CoRWM doc. 3050). The laboratory, situated in a clay geological environment, was constructed to conduct experiments and gather information about the local geological environment, in order to assess the feasibility of long term geological disposal of radioactive waste in this environment.
2. Bure is a very small community with a population of less than 100 situated in the Département of Meuse. The area is one of isolated farmsteads in an open rolling landscape. ANDRA have two facilities one in each of the two Départements. In addition there is the EDF archive store, a hotel (part funded out of the community funds) and one other building. An extensive archaeological dig was underway close to the ANDRA facilities as preparation for the submission to construct a GDF.

ANDRA General Presentation

3. Florence gave an informative presentation covering the history of the development, some technical details and the future plans for delivery of a Geological Disposal Facility (GDF). There are 3 separate installations that currently exist at the site;
 - a. an Environmental Specimen Bank
 - b. a Technological Centre and;
 - c. the Underground Rock Laboratory (URL).

Background

4. France has over 1000 producers of radioactive waste with roughly 60% of all radioactive waste resulting from nuclear power plants.
5. Only 0.2% of the total volume of radioactive waste in France is considered high level waste (HLW), but this constitutes 98% of the radioactivity. France, like the UK also plans to dispose of some of its HLW in a GDF. The planned GDF is not designed for the disposal of spent fuel.
6. In 1991 the Bataille Act was passed (the Waste Act) which detailed a research and development programme spanning 15 years to assess the feasibility of deep geological disposal. By law, it is not possible to convert this facility into a GDF. In

1993 four sites underwent geological investigation for siting an underground rock laboratory, three of which were in a clay environment and one in granite. The clay site located on the border of the Meuse and Haute-Marne districts was chosen, and the laboratory opened in 2004 to conduct scientific studies.

7. ANDRA produced a Dossier in 2005 reporting some of these experiments, and describing the geological environment as homogeneous, continuous rock, with low permeability, no faults, low seismicity and no reserves of natural resources. From this information a 'transposition zone' was defined which had a surface area of roughly 250 km², and within which it was deemed possible to construct a repository.
8. The 2006 Planning Act detailed plans to design and implement a repository. Studies at the URL were also extended to include technological experiments such as the use of different containers, sealants, and robots underground. Currently there are 1.6 kilometres of galleries underground at the URL.
9. The galleries of the GDF are planned at a depth of roughly 500m (the same depth as the laboratory) and the depth has been chosen so the repository will be in the centre of the clay layer, allowing a thick layer (approximately 148m) to surround the repository and act as a geological barrier.
10. The long-lived intermediate level waste (LL-ILW) disposal cells will be cylindrical with a diameter of 7.5m and 500m in length. There are plans to build 46 cells like this for the LL-ILW. This type of waste will be compacted in stainless steel canisters, which will be slotted into concrete blocks with four pre-existing moulded voids for them. These concrete blocks will in turn be stacked within the galleries.
11. High level waste (HLW) will be vitrified, put in stainless steel canisters and then encased in concrete. These packages, with spacers between them, will be slid into horizontal cylindrical cells (80cm diameter, 100m long) that are lined with stainless steel. This will be done with remote handling technology that can both push and pull the waste packages into position. This also means the waste packages are retrievable until individual cells are closed. There will be a total of 1500 cells for HLW disposal.
12. The waste that is planned for this site is all of the waste generated by reprocessing spent fuel from France's existing 58 reactors plus the two currently under construction at Flamanville, after fifty years of operation. The acceptance of other wastes at this site would require a further site licence application.
13. There will be two surface installations: a reception area, which will deal with the receipt of radioactive waste packages arriving by train (which is currently the site of the technological centre); and a construction area, which will not deal with anything radioactive. The two separate surface installations will allow both construction and operation to occur simultaneously, be built within land designated as 'forest' to avoid the use of farmland, and each will be in a separate district (Meuse, and Haute-Marne).
14. The surface above the underground repository footprint is within the 'ZIRA zone'. This zone is actually 10 km² bigger than the expected underground footprint at

30km². This zone does not have any villages within it, and is close to a main access road.

15. The excavated material will be kept, with 40% being used in the closure of the repository. The remainder will be kept at the site and will be landscaped, with plans to grow plants on it, such as lavender, which can grow in a clay environment.
16. ANDRA does not have responsibilities in relation to nuclear power plant sites and is not involved in decommissioning or in running nuclear facilities. In this respect, it is similar to how Radioactive Waste Management Ltd (RWM) will operate when a Site Licence Company (SLC). However, ANDRA's lines of responsibility to Government are clearer and more direct.

The Future at CIEGO

17. There are plans to build 14km of rail that will be used for future waste transport, but as yet this will only be used for waste package transport, not for public travel. Construction will start in 2017, with the new section of line complete by 2020.
18. The repository licence application will be in early 2018, and if there is authorisation to create CIEGO around 2020, an industrial pilot phase will begin in 2025.
19. The site should be receiving radioactive waste packages in 2030, however HLW will not start arriving at the site until 2080 due to heat generation. Site closure is currently forecast for between 2130 and 2140. Laws are currently being debated which address the ownership of land beneath the surface. up to the point of closure, but not post closure
20. The progressive nature of the project means that there will also be progressive closure of galleries. Up until those decisions are made by the people of the time, the waste will be retrievable.

Community Aspects

21. There are currently between three and four hundred staff at the URL of which 90% live within a forty kilometre radius of the site, with 3000 people expected to be directly involved with the project between 2020 and 2030.
22. ANDRA conducted a public debate in 2013 and produced a report detailing plans for it in "The Ciego project: Meuse/Haute-Marne reversible geological disposal facility for radioactive waste". Unfortunately the debate had to be moved online after there was severe disruption from protesters. After this, 20-30 people from the local communities were chosen to represent the public at panel-type events over three weekends and produce a report on their findings. ANDRA also received emails from the public. The theme that arose from this was that events were progressing too rapidly. The public's concern centred on the long term uncertainty of such a facility as no country has constructed a GDF before.

23. Roughly €30 million per year has been disseminated to each of the Haute-Marne and Meuse districts for the past ten years, and is given to a public interest group for each respective district (GIP Haute-Marne, and GIP Meuse) which finances industrial innovation.
24. The plan to expand the repository progressively is favourable with the public as at each stage work can be halted or even reversed

Tour of the Technological Centre

25. Following the presentation, CoRWM was shown the technological centre which contained exhibition boards with posters and information materials produced between 2005 and 2015, as well as a number of prototypes for waste packages and robotic machinery.
26. There were demonstration videos of the machinery manipulating the HLW packages into place underground, with simple push and pull actions.
27. Each of the seven different steel fibre-reinforced cementitious waste packages that ANDRA have for the LL-ILW was displayed. They had undergone rigorous testing, including drop tests from 6m in height. These tests proved the stainless steel canisters remained intact, with only minimal fracturing of the outer cement package.

Tour of the Underground Rock Laboratory

28. During the visit to the URL, CoRWM members were able to see ongoing experiments into the natural behaviours of excavated cells designed for HLW packages. There were two shown to the Committee, one with and one without the stainless steel liner. The stainless steel liner was pushed into place as the cell was being excavated. The cylindrical concrete cases in which the HLW steel canisters would be placed for positioning within the cell were also available to see. These had been designed with a rim that allows the robotic machinery to latch onto, and push or pull the package into position as necessary.
29. CoRWM members were also shown a new chamber under construction that would be used as an assembly chamber for machinery. This was the biggest chamber being built underground there, with a total diameter of around 9 metres. The URL was very clean, dry, well lit and well ventilated.
30. Finally CoRWM members were shown the visitor's centre which has engaging exhibitions for school groups, and other visitors, about the surrounding landscape, and the discovery of numerous fossils at the site.

Further Information

31. The following websites also contain useful information:

- www.andra.fr/international/
- <http://cigeo.com/en/>
- <http://world-nuclear.org/information-library/country-profiles/countries-a-f/france.aspx>

32. All ANDRA publications related to the CIEGO project can be found at;

- http://www.andra.fr/index.php?id=edition_1_5_2&recherche_thematique=3