Licensing Process and Stakeholder Engagement Program Associated with the French Deep Geological Repository Project Cigeo – 23110

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ABSTRACT

Deep geological repository is recognized as the solution for high and intermediate level waste in many countries, however very few experiences on the regulatory and legal framework of such projects can be shared. The industrial center for geological disposal – Cigeo-, is a deep geological disposal facility for high and intermediate radioactive level waste to be built in France. The development of a dedicated regulatory and legal framework took several decades so the licensing process could be eventually clearly drawn. Being a major society issue, considering the fact that Cigeo will be a nuclear facility and also the unique national high and intermediate level waste management solution, the entire development (legally and regulatory speaking) could not have been done without considering interaction with civil society. In the next years, the licensing process will also have to consider this interaction.

This paper deals with the development of the legal framework for a deep geological repository in France, focusing on the interaction with civil society, including the consideration of public opinion, which led to the submission of the construction permit application scheduled for the end of 2022.

INTRODUCTION

The industrial center for geological disposal (CIGEO) is the deep geological disposal facility for HLW and ILW-LL radioactive waste to be built in France. The concerned radioactive waste have been and for some of them, are still produced by France's current NPP fleet and research and fuel cycle nuclear facilities, until they are dismantled, including waste from spent fuel reprocessing. The estimated volume of waste to be disposed of is about 85 000 m^3.

This project is the outcome of more than 25 years of research and development, 3 laws passed in 1991, 2006 and 2016, three editions of the waste national management plan and two public debates held in 2005 and 2013. Although Cigéo will be subject to the general regulation applicable to nuclear facilities, a specific regulation has been developed to license this unique facility. Given that stakeholder engagement, as well as openness and transparency, are key issues in the development of waste management programs, specific actions regarding Cigéo project have been implemented.

This paper addresses both the French experience on the development of the legal and regulatory framework conducting to set up a specific licensee process for a DGR and the associated stakeholder engagement approach.

FRENCH LEGAL FRAMEWORK FOR HIGH LEVEL AND INTERMEDIATE LEVEL WASTE MANAGEMENT

Three successive laws and a national plan

The French parliament started to address the issue of high level radioactive waste management in 1991, by adopting the "***Bataille Law***" **on December 30, 1991**.[1] This law set the main priorities for research programs related to high level waste management. Three research topics were identified: (1) partitioning and transmutation of minor actinides and (2) long-term storage and (3) deep geological disposal. It created the French national agency for radioactive waste management - called Andra –, outlined the roadmap for the next fifteen years of R&D activities for deep geological disposal and framed the authorization process

for an underground research laboratory (URL). In 2000, Andra started to build and operate an URL located in Bure (Meuse/Haute-Marne region) in a clay layer.

The results of the fifteen years' research programs [2] had been submitted to the French parliament by the government in 2005.

After these results have been reviewed, **the Programme Act concerning the sustainable management of radioactive materials and waste passed in 2006** [3] has established the national radioactive material and waste management plan. Concerning HILW, this law has stated that "*after storage, ultimate radioactive waste which cannot be disposed of on the surface or at shallow depth for nuclear safety or radiation protection reasons shall be disposed of in a deep geological repository*", thus endorsing geological repository as the reference solution for HL-IL waste management in France and has provided for a public debate before the application for creation of DGR.
In the same year, another law concerning transparency and security of civil nuclear activities (the "TSN" law) gave a legal framework for public information and created the High Committee for Transparency and Information on Nuclear Safety (HCTISN), a body for information, consultation and debate on the hazards associated with nuclear activities and the impact of these activities on human health, the environment and nuclear safety.

On July 25, 2016, legislation was passed to specify the "*terms and conditions for the creation of a reversible deep geological disposal facility for high and intermediate level radioactive waste*". This law includes the conditions of creation of a reversible deep geological repository, defines the principle of reversibility and introduces the need to implement an "*industrial pilot phase*" before the complete commissioning of the deep geological repository.

These laws set down definition and principles for radioactive waste management contributing to give a clear legal framework.

The national radioactive materials and waste management plan

The National Plan for Radioactive Materials and Waste Management (PNGMDR) created by the law of 2006, is a key tool in ensuring the long-term implementation of the principles set out in the Environment Code concerning the sustainable management of radioactive materials and waste. Since 2019, the frequency of updates has been increased from three to five years.
The PNGMDR draws up an inventory of management policy, assesses needs and determines objectives for the future and therefore most of research and studies linked to HILW [4] are carried out by waste producers. Thus in this frame, the waste producers and Andra have been required to provide details regarding, for instance: the analysis of the storage needs for waste packages adopting significant time margins and taking account of the scheduling of transports to the planned DGR, the definition of preliminary version of the acceptance criteria for the DGR, the analysis of acceptability of wastes already packaged and the definition of preliminary version of the acceptance criteria.

DEVELOPMENT OF THE CIGEO PROJECT

The CIGEO project has the particularity of being both a nuclear facility and is the unique national HILW outlet. Hence, it will be topic of discussion in the frame of the PNGMDR and be regulated, as a nuclear facility, by the ASN.

Principle of the DGR

The principle is to dispose of the waste in disposal vaults at a depth of 500 meters below ground, within a rock chosen for its containment properties, then to close the repository once all the waste has been disposed of. Over time, the waste packages will gradually deteriorate and release radionuclides.

That is when the geological formation comes into play, retaining the majority of these elements in the rock and slowing the movement of the most mobile radionuclides. At the same time, the activity of waste will decrease due to radioactive decay and will become less hazardous. Most of radioactive elements will reach the surface after thousands of years and in a very small quantities. They are expected to present no danger for humans and the environment.
The requirements that must be complied with, from the site investigation and design phases of the disposal facility, in order to ensure its safety after closure were previously laid down in a safety rules published in 1991. They have since been completed and updated by the Safety Guide relative to radioactive waste disposal in deep geological formations published by the ASN in 2008 ("Guide n°1").

A step-by-step approach
As previously mentioned, the development of the French DGR doesn't follow a common process due the specificity of this facility.

Over the past decades, Andra has carried out many studies in its URL and submitted several technical reports related to the site and design of a DGR. These reports have been reviewed by the ASN with the support of its technical support organization, the French Institute for Radiation Protection and Nuclear Safety (IRSN). The main topics on which the ASN has issued official opinions1 have been:

- in 2006, on the results of fifteen years long research programs implemented between 1991 and 2006: the ASN stated that deep geological disposal was a management solution that appeared to be unavoidable, and that the outcome of Andra's investigations showed that major results related to the feasibility and safety of a disposal had been acquired on the Bure site. This opinion contributed to inform French parliament during the elaboration of the Program Act concerning the sustainable management of radioactive materials and waste passed in 2006;
- in 2010, on Andra's proposals for an area of interest for in-depth investigation and for surface siting scenarios2 (the French government had previously approved, in 2009, the 30 km² underground zone proposed by Andra for studying the siting of the facility) ;
- in 2011 and 2013, on technical reports submitted by Andra and related to: the waste inventory to be disposed of in Cigéo and the scheduling of waste packages disposition, the concept of reversibility3, long-term safety (after closure) and the coordination between research programs and facility development, the seismic hazard evaluation and the potential direct storage of spent fuel;
- in 2015, on the evaluation of the cost of the Cigéo project.

A key step in the project development occurred in 2016, when Andra submitted Cigéo's "safety options report" to the ASN. This report included the key safety choices and covered all phases of the DGR lifecycle (from design to passive survey phase).
In its Opinion issued in 2018, the ASN stated that the Cigéo project had reached a sufficient level of technical maturity. However, several highlighted issues would require further development such as the management of bituminous waste, external hazard consideration, post-accident management and monitoring programs.

It is expected by ASN that all the requests for additional information made during the previous reviews will be integrated in the construction permit application which is expected to be submitted by the end of 2022.

[1] 8 opinions and 5 positions paper have been issued since 2006

[2] There are no provisions in the French regulations regarding the siting of nuclear facilities (i.e., the siting of a facility is not subject to a specific authorization)

[3] The ASN stated that the period during which reversibility can be implemented should be limited and that the provisions implemented for reversibility should not compromise compliance with safety objectives, both during operation and after closure.

If the regulatory process unfolds as required by the law, Cigéo's construction permit could be granted after a 3- to 5-year review of the application.

About 10 years after construction starts, the partial commissioning license could be granted by the ASN, including the operation of the facility during the "industrial pilot phase[4]". The French parliament will then have to pass a law on the conditions of reversibility in order to pursue the commissioning of Cigéo up to an industrial rate.

STAKEHOLDER ENGAGEMENT

The uniqueness of Cigeo and the ethical issues it raises make it a project of general interest for many stakeholders. The licensing process has thus to include stakeholder opinion.

The laws passed in 1991 and 2006 have required the creation of a local information committee charged with informing and following the activities in the URL ("CLIS de Bure") and holding of public debates for the preparation of the management plan of the PNGMDR and before Cigéo's construction permit application is submitted. The High Committee for Transparency and Information on Nuclear Safety (HCTISN), created by the Law on transparency and security in 2006, periodically organizes consultations and debates concerning the sustainable management of nuclear materials and radioactive waste.
In this frame, two public debates about the DGR were held:

- in 2005, on radioactive waste management. This debate was held by demand of the Government after the 15 years of research imposed by the"Bataille Law" in 1991 and in order to feed the Program Act of June 2006. Public meetings highlighted the need to make an ethical and social choice between two options for managing high-level waste: long-term storage or geological disposal.
- in 2013 on CIGEO as provided by Program Act of June 2006. Due to the difficulty of holding public meetings, mainly linked to disorder caused by opponents of the project, consultation tools were diversified: the debate was held online and a "citizen's conference" was also held for the first time. In 2016, following this debate, the French parliament passed a law setting a precise framework for the development of the project. In particular, this law introduced the beginning of the commissioning of Cigeo through a « pilot phase », requiring Andra to develop a "master operating plan", which describes the mains milestones of development of the facility and aims to be a tool to communicate with the public during this development.

Another public debate was held in 2019 on the future 5th edition of the PNGMDR. Among the topics discussed, alternatives to a DGR have been re-questioned and the need of a dedicated process of consultation during the Cigéo construction permit application review has been emphasis. Hence, actions dedicated to the development of a dialogue on these topics are included in the 5th edition of PNGMDR. Both Andra and public authorities, including the ASN, are currently defining how public consultations will be implemented during the review of Cigéo's construction permit application. All these initiatives are coordinated by the High Committee for Transparency and Information on Nuclear Safety (HCTISN).

[4] From a technical standpoint, Cigéo's industrial pilot phase will allow to provide *in situ* confirmation, under actual industrial operation and environmental conditions, of the data acquired for Cigéo design and to gradually take over the operation of the unique industrial complex that is Cigéo

CONCLUSIONS

As shown in the French experience, the development of a deep geological repository is long process that extends on several decades. The legal framework has been built step by step based on progress of scientific and technical knowledge as well as public opinion.

The construction permit application is expected to be submitted by the end of 2022. The way keeping all stakeholders informed and taking into account the public's concerns throughout the review of Cigeo without compromising the review process is a challenge for the years to come. This approach is essential in order not to crystallize oppositions and to allow an appropriation and acceptance of the project.

The next step is to define the methods and tools to maintain a dialogue between the government and the regulatory body, Andra and civil society throughout the operating phase, which is expected to last no less than a century.

REFERENCES

1 Report to the French Parliament on high level waste management – Ch.Bataille - 1990
2 Summary of the opinion of the nuclear safety authority on research related to the management of high activity, long lived waste carried out within the framework of the law of 30 December 1991
3 Report to the National Assembly n °3003 – Cl. Birraux - April the 5 2006
4 PNGMDR 2016-2018