
Involvement of AVN as TSO in the safety analysis of radioactive waste disposal

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Abstract:

In 1998, ONDRAF/NIRAS, the agency responsible for radioactive waste management in Belgium, was requested by the Government to involve the nuclear safety authorities in its activities of safety evaluation of site-specific waste disposal options (deep or surface disposal) for the short-lived low-level waste. A working group was created in which ONDRAF/NIRAS, FANC (the Federal Agency for Nuclear Control) and AVN discuss different aspects of the ONDRAF/NIRAS program concerning the long-term management of short-lived low-level radioactive waste disposal. It includes also the review of technical safety assessments performed by ONDRAF/NIRAS or by contractors for ONDRAF/NIRAS.

The involvement of AVN (the Belgian TSO) in the pre-project phase appears to be positive for all partners. Indeed, all felt the need for an independent actor, with a strong technical basis. Through this presentation, the experience and the topics discussed since 1998 will be developed. Mainly, the presentation will focus on the approach followed to develop competency in the radioactive waste field, on the discussions about the development of a regulatory framework adapted to final disposal of low-level radioactive waste, and on the technical regulatory positions developed so far.

Also the experience related to the interaction with local stakeholders will be described.

1 THE BELGIAN CONTEXT ON RADIOACTIVE WASTE DISPOSAL

In Belgium, the task of radioactive waste management has been entrusted to a separate government agency created in 1980: the Belgian Agency for Management of Radioactive Waste and Enriched Fissile Materials, known by the French/Dutch acronym ONDRAF/NIRAS. More information can be found on the ONDRAF/NIRAS website [1].

A short historical perspective and the present context on the long-term management of short-lived low-level radioactive waste disposal is shortly described hereafter [1, 2].

Until the international moratorium of 1983, Belgium relied on sea disposal for its low-level waste. Since then, ONDRAF/NIRAS, the Belgian waste management agency, has conducted studies to look for land-based solutions. These studies, some on going, have passed through various phases. The sometimes harsh reactions in public opinion and the recommendations of independent experts, however, progressively led ONDRAF/NIRAS to question its work methodology.

In 1998, the Belgian federal government opted for a final, or potentially final, solution for the long-term management of short-lived, low-level radioactive waste, a solution that also had to be progressive, flexible, and reversible. At the same time, the government entrusted new missions to ONDRAF/NIRAS - in particular that of developing methods to enable the integration of final repository project proposals at the local level - and restricted the number of potential sites for final disposal to the four nuclear sites already existing in Belgium and, possibly, to non-nuclear but interested local districts.

ONDRAF/NIRAS is now carrying out the necessary studies to help policymakers reach a decision. Technical feasibility, budget and safety are all being thoroughly investigated. Attention is also devoted to local environmental and socio-economical factors, including public acceptance.

As a result of the governmental decision mentioned above, ONDRAF/NIRAS has confined itself for its in situ research to the existing nuclear sites (Doel, Fleurus-Farciennes, Mol-Dessel and Tihange) and to areas where the local authorities are showing an interest. Up to now, this resulted in setting up Local Partnerships with the communities of Mol, Dessel and Fleurus-Farciennes (see § 4). This should clear the way for the successful integration of the disposal project at local level.

2 BELGIAN REGULATORY CONTEXT – ROLE OF AVN

The legislative and regulatory framework has been put progressively in place since 1955. The law of 15 April 1994, replacing the law of 29 March 1958, very generally outlines the protection of the population and the environment against the dangers of ionising radiation. The detailed stipulations are given in the Royal Decree (R.D.) of 20 July 2001, replacing the R.D. of 28 February 1963, “providing the General Regulations regarding protection of the population, workers, and environment against the dangers of ionising radiation”. The legislative framework thus comprises:

- a set of laws and regulations, concerning the licensing of nuclear establishments, the measures to protect the health of personnel and the public, nuclear civil liability, safeguards, nuclear materials transport, waste management, emergency plans, etc.
- a nuclear installation licensing system forbidding to operate an installation without a licence (cf. R.D. of 20.07.2001 and, among other, its Articles 5, 6, 15, 16, 79 as well as all the Articles detailing the technical stipulations),
- a regulatory inspection and evaluation system of the nuclear installations, for verifying compliance with the regulations and conditions set in the licence (cf. R.D. of 20.07.2001, among other its Articles 6, 12, 13, 15, 16, 23),
- measures intended to enforce compliance with the relevant regulations and the conditions set in the licence, including the suspension, amendment or withdrawal of licence (cf. R.D. of 20.07.2001, among other its Articles 5, 12, 13, 16).

The law of 15 April 1994 has created the Federal Agency for Nuclear Control (FANC) and defines the missions entrusted to this agency, regrouping most of the activities previously held by the relevant Ministries. The various Articles of that law were gradually brought into force as needed, and the FANC became completely operational on 1 September 2001. According to the law of 15 April 1994, the FANC appoints the authorized inspection organisations in charge of the regulatory inspections of nuclear installations.

AVN is an authorized body for inspection and safety review of the Belgian nuclear power plants, research reactors, MOX fuel manufacturer, waste management, radioisotope producing installations and use of ionising radiation in medical and industrial areas.

More information on the Belgian legislative and regulatory system can be found in the Belgian report to the Nuclear Safety Convention and in the Belgian report to the Joint Convention, available on the AVN [3] and FANC [4] websites.

3 AVN ACTIVITIES CONCERNING SAFETY OF RADIOACTIVE WASTE DISPOSAL IN BELGIUM

In 1998, ONDRAF/NIRAS was requested by the Government to involve the nuclear safety authorities in its activities of safety evaluation of site-specific waste disposal options (deep or surface disposal) for the short-lived low-level waste. A working group was created in which ONDRAF/NIRAS, FANC and AVN discuss different aspects of the ONDRAF/NIRAS program concerning the long term management of short-lived low-level radioactive waste disposal. It includes also the review of technical safety assessments performed by ONDRAF/NIRAS or by contractors for ONDRAF/NIRAS.

It was agreed to work around four main themes, being: development of the regulatory framework, implementation of the regulatory framework, the table of content of a safety analysis report, and the review of safety assessments.

As a first step the "Safety Charter" elaborated by ONDRAF/NIRAS was discussed. It contains two parts, Part 1 dealing with "Safety Objectives and Safety Requirements", and Part 2 dealing with "Safety Strategy and Safety Demonstration". This document was discussed amongst FANC, AVN and ONDRAF/NIRAS. A common position on a first version was achieved. In a later stage, ONDRAF/NIRAS revised Part 2 due to new insights and this new revision will be further discussed in the near future. The option was taken that further development of Part 1 should be taken over by the Safety Authorities, given its close liaison with regulatory aspects.

In the context of discussions on particular subjects, ONDRAF/NIRAS addressed some specific questions to the Safety Authorities with relation to acceptance criteria and safety principles. This allowed AVN to start discussions with FANC on regulatory positions. Periodic meetings between FANC and AVN were started. As a result of these discussions, AVN formulated some positions which were then forwarded to the FANC for official transmission to ONDRAF/NIRAS.

In preparation of the development of a regulatory position on how to deal with the issue of human intrusion in the safety assessment of a waste disposal facility, AVN hosted a workshop with representatives of regulatory organisations of other countries to discuss regulatory aspects related to human intrusion, the impact of the post-closure period on human intrusion considerations and the scenarios to be considered for human intrusion. Based on the insights gained from this workshop, it is foreseen to continue discussions with FANC to define a regulatory position, which could then be further discussed with ONDRAF/NIRAS.

In relation to the regulatory framework discussions were also started on the licensing procedure for a waste disposal facility. The starting point was the licensing procedure as presently stipulated in the R.D. of 20 July 2001. A critical analysis of the steps to be foreseen in the licensing of a waste disposal facility was conducted. Based on this AVN worked out a proposal for a licensing procedure, which was then further discussed with FANC and ONDRAF/NIRAS. At this moment an agreement on the technical level exists amongst FANC, AVN and ONDRAF/NIRAS. The introduction of such a licensing procedure remains to be embedded in a legally binding framework.

Another main achievement was the elaboration of a table of content for a safety analysis report (SAR) for a near surface disposal facility of short-lived low-level radioactive waste. Starting from existing references (mainly NUREG-1199 [5]), AVN developed a proposal for the table of content by amending and completing the table of content as proposed in NUREG-1199. This was then extensively discussed amongst FANC, AVN and ONDRAF/NIRAS. This has also led to a technical agreement on a table of content that

could be endorsed more officially in a later stage (e.g. if the development of a waste disposal facility enters the project phase).

Finally, AVN committed an important effort in the review of safety assessment analyses performed by ONDRAF/NIRAS and its contractors.

Some of the reviewed documents deal with methodological aspects of the safety assessment of a waste disposal facility, as for example the definition of parameters and the elaboration of parameter values needed in the long term safety assessment, the definition of scenarios for the safety assessment (based on the FEP (Features, Events and Processes) approach), the hydrogeological model and the near-field simulations.

Also the generic concept of a disposal facility as developed by ONDRAF/NIRAS was examined by AVN and discussed, as well for a near surface facility as for a deep geological facility. Also some characteristics of specific designs for the potential sites under investigation were discussed.

Finally technical analyses on specific issues such as the impact on safety of the gas production in a deep geological disposal facility and the safety assessment methodology and acceptance criteria for aircraft crash were analysed and discussed.

More recently, the discussions between FANC, AVN and ONDRAF/NIRAS were extended towards the disposal of Category B (low or medium-level and long-lived) and Category C (high-level short or long-lived) waste (further referenced as Cat. B&C waste). In 2001, ONDRAF/NIRAS published the SAFIR 2 report [6] and this was taken as a starting point to involve the Safety Authorities in discussions on the future development of the Cat. B&C programme. The following aspects are foreseen to be dealt with: information gathering and exchange, identification and delimitation of the future phases and decision points in the disposal programme, identification of priorities in the themes to be discussed, and the methodology of the safety assessment and exploratory analyses.

So far, the discussions between FANC, AVN and ONDRAF/NIRAS were mainly devoted to the definition of future phases and decision points of the programme. Amongst others the role of a Strategic Environmental Assessment was extensively discussed. AVN examined the recommendations of the Peer Review of SAFIR 2 performed by NEA, with as objective to identify priorities for discussion amongst FANC, AVN and ONDRAF/NIRAS. AVN is also carrying out a review of SAFIR 2 in view of a discussion with ONDRAF/NIRAS and the FANC on how to move from SAFIR 2 as a state-of-the-art report to a safety case.

4 EXPERIENCE OF AVN FROM ITS INTERACTION WITH LOCAL PARTNERSHIPS

Early 1998, ONDRAF/NIRAS set up a new programme of work based on an entirely new methodology to bring the decision-making process closer to the public and to lower the threshold for active participation [7]. Researchers from the University of Antwerp (UA) and the University Faculties of Luxemburg (FUL), developed the idea of local partnerships, through intense dialogue with ONDRAF/NIRAS. The partnerships are intended to bring the decision-making process closer to the public and to lower the threshold for active participation.

Three local partnerships have been formed, bringing together all local representative interested parties (including individual citizens of the local community on a voluntary base) and members of ONDRAF/NIRAS. The first of these, known as STOLA-Dessel (Studie- en

Overleggroep Laagactief Afval - study and consultation group on low-level waste), was set up on 30 September 1999 in Dessel. The second, MONA (Mols Overleg Nucleair Afval Categorie A - consultative group on type A radioactive waste), was formed on 9 February 2000 in Mol. The third, PaLoFF (Partenariat Local Fleurus-Farciennes - local partnership Fleurus-Farciennes), was formed on 27 February 2003. More information on these 3 partnerships can be found on their websites [8, 9, 10].

In order to allow the partnership to work independently, each partnership receives an annual budget from ONDRAF/NIRAS. With this money the partnership can, for example, remunerate self-chosen experts, order specific studies or reviews and organise visits to disposal facilities in other countries. Each partnership has engaged two project coordinators, one with a scientific background, the other with a background in communication, to perform the day-to-day work: administration, organising of meetings, draw-up reports, take care of the communication with the population, ...

The concept and the functioning of the Belgian Local Partnerships was recently extensively discussed during the 4th meeting of the OECD/NEA Forum on Stakeholder Confidence [2]. More information can also be found in a recent paper by MONA [11].

In the framework of their activities with ONDRAF/NIRAS, the Local Partnerships MONA and STOLA expressed the wish to have contacts with the Belgian safety authorities. In particular, the Local Partnerships wanted to be better informed about the independent assessment made by the regulatory organisations on the safety assessments of the disposal options.

The FANC has given presentations on the Belgian regulatory framework and nuclear safety regulations.

To both Local Partnerships, AVN explained its role in the Belgian regulatory context. Special attention was drawn on the fact that at this stage of the NIRAS-project on radioactive waste disposal, AVN has not yet a regulatory assessment role. Indeed, the project is still in a pre-project phase and no formal licensing is on going. Even at this stage of the project, the Local Partnerships stressed their appreciation for the explanations received from AVN as an independent expertise body.

AVN explained in the first place its role as an Authorised Inspection Organisation (AIO) within the Belgian regulatory framework. The variety of installations where AVN exercises its role of AIO was presented to illustrate AVN's experience in nuclear safety assessment. Also AVN's role in the Belgian nuclear emergency plan was explained. The way AVN is building and maintaining its expertise by training of its personnel, participating in international activities (working groups, conferences, ...), exchanges of operational feedback of nuclear installations, and by its research and development program, was explained. The legal basis and structure of AVN as an independent, private, non-profit organisation was described. The existence and role of a surveillance commission and a Scientific and Technical Committee at AVN were highlighted. Finally, the fundamental values of AVN

Fulfill its missions in full independence, coherence and impartiality.

Maintain its competence in nuclear safety and radiation protection.

To be at the service of the population and the workers.

Continuously optimize the dynamics of a multidisciplinary team.

Prioritize the good relationship and the mutual respect with each of its partners.

were explained.

Further, AVN described how expertise has been built up during the last 5 years in the field of radioactive waste disposal. Before 1998, AVN had few activities in this field. It was explained that the request of the Government towards ONDRAF/NIRAS to involve the nuclear regulatory organisations in the discussions already at that stage, was experienced as an effective way to prepare the safety authorities on their later task as licensing authorities and to inform ONDRAF/NIRAS in an early stage on special points of attention, as identified by the regulatory organisations, to be considered in the safety assessments.

Later, AVN presented to the Local Partnership MONA the main results of the review of the safety analyses developed by ONDRAF/NIRAS. It was for MONA an opportunity to check the outcomes of their own discussions (mainly those of their working group on safety) with the outcomes of the AVN safety reviews.

For AVN, such direct contacts with local stakeholders were a rather new approach (together with some recent participation in local committees on nuclear safety in the municipalities of the nuclear power plants). This voluntary policy for communicating with local stakeholders fits perfectly well in the values – see above - that AVN has defined for its activities.

In this way, communicating with local stakeholders is for AVN a rather recent experience. However, the interest and the motivation encountered at those local stakeholders are an incentive to pursue and develop further this strategy of being as open and transparent as possible.

5 AVN ACTIVITIES CONCERNING SAFETY OF RADIOACTIVE WASTE DISPOSAL IN THE INTERNATIONAL CONTEXT

In 2000, a franco-belgian working group was established to discuss the methodology for safety evaluation of deep geological disposal of radioactive waste. In this working group, the Safety Authorities (DGSNR and FANC), their Technical Support Organisations (IRSN and AVN) and the waste management agencies (ANDRA and ONDRAF/NIRAS) are participating. Besides an exchange of information on the national programmes in both countries, subgroups have been working on the identification and definition of relevant safety functions, on the identification and definition of relevant safety principles, and on radiation protection principles. Ultimately, the result of this work was integrated in one single common document on “Geological Disposal of Radioactive Waste: Elements of a Safety Approach”. It is foreseen to discuss this document in a wider international context.

Since more than one decade AVN is intensively involved in activities of transfer of Western European methodology and practices in the field of nuclear safety to Eastern European countries. In these countries, AVN assistance to the Regulatory Authorities and their TSOs is supported by the European Commission (EC) in the framework of TACIS and PHARE projects.

In this context, about five years ago, the safety issues concerning the final disposal of radioactive waste were an increasingly part of AVN activities. Support to the State Nuclear Regulatory of Ukraine (SNRCU) for the review of safety assessments in the licensing process of near-surface repositories for LLW on the Chernobyl site is a current project where AVN is involved with other Western European TSOs. The collaboration with Ukraine has been strengthened last year with an additional project in the context of spent nuclear fuel and radioactive waste management and concerning the transfer of knowledge about the R&D system supporting the Regulatory Authorities.

Other support activities in the field of spent nuclear fuel (MOX fuel in particular) and radioactive waste management are currently in progress with the Nuclear Regulatory Authorities of the Russian Federation: AVN is reviewing regulatory documents of RF Gosatomnadzor concerning safety requirements for interim storage facilities and for the disposal of radioactive waste.

Finally, a new project to support VATESI and Lithuania TSOs in licensing activities related to the decommissioning of the Ignalia NPP has been recently accepted by the EC. In this project, AVN will participate to safety issues concerning the interim storage facility for RBMK spent nuclear fuel assemblies and for a L/ILW repository.

6 R&D ACTIVITIES SUPPORTING AVN EXPERTISE ON SAFETY ANALYSIS OF RADIOACTIVE WASTE DISPOSAL

The main efforts of AVN in the field of R&D related to waste disposal are being undertaken in the framework of the IAEA Co-ordinated Research Programme ASAM, standing for "Application of Safety Assessment Methodologies for Near Surface Waste Disposal Facilities". This programme started in November 2002, as the successor of the Co-ordinated Research Programme ISAM. Within the ASAM CRP, AVN has mainly been active in the "Disused Sealed Sources and Heterogeneous Waste Working Group" and in the "Regulatory Review Working Group". In the latter a lot of attention is being devoted to the definition of a Safety Case for a waste disposal facility and to a procedure for the review of safety assessments and of the Safety Case.

Contacts are also maintained with academic institutions, in particular with the ULB (Université Libre de Bruxelles). Some students have been guided in elaborating a thesis.

7 CONCLUSIONS

Since 1999, AVN has undertaken important efforts to develop its competencies in radioactive waste disposal safety assessment.

A major part of these efforts are taking place in the national framework via discussions between FANC, AVN and ONDRAF/NIRAS. Although the disposal projects in Belgium are still in a pre-project phase, the present activities allow AVN to discuss regulatory aspects with the FANC and to prepare its future role as TSO for the review of safety assessments.

Also the contacts with the Local Partnerships allowed to illustrate the involvement of AVN in the safety analysis review of future waste disposal facilities.

To strengthen its capacities, AVN is taking part in international projects, working groups and R&D projects.

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