



**ONDRAF/NIRAS**

Belgian Agency for Radioactive Waste  
and Enriched Fissile Materials

---

# **The disposal on Belgian territory of short-lived low-level and medium-level radioactive waste**

Final report by ONDRAF/NIRAS for the period 1985–2006  
inviting the Federal Government to decide on the continuation of the  
disposal programme



# **The disposal on Belgian territory of short-lived low-level and medium-level radioactive waste**

Final report by ONDRAF/NIRAS for the period 1985–2006  
inviting the Federal Government to decide on the continuation of the  
disposal programme

ONDRAF/NIRAS would like to express its sincere thanks for all the work carried out to the large number of volunteers from STOLA-Dessel, MONA and PaLOFF, who committed themselves to the development of integrated final disposal projects and to all the staff members of the three partnerships.

ONDRAF/NIRAS also thanks the local authorities of the municipalities of Dessel, Mol, Fleurus and Farciennes for allowing it to carry out studies on their territory.

## Foreword and summary

During the past twelve months, ONDRAF/NIRAS has submitted to its supervising Minister files relating to the five integrated disposal projects for category A waste<sup>1</sup> developed by the partnerships STOLA-Dessel in the municipality of Dessel, MONA in the municipality of Mol and PaLOFF in the municipalities of Fleurus and Farciennes. These files are the result of the proposal made in 1998 by ONDRAF/NIRAS to all the Belgian municipalities interested in working with it, within partnership structures, on the development of an integrated disposal project for category A waste. This collaboration did not imply any commitment on the part of the municipalities to subsequently implement the solution that would be developed. The solution should comprise a disposal facility integrated in a wider societal project including a set of associated conditions offering added value to the municipality and/or region in question.

Whereas the integrated disposal project developed by PaLOFF was terminated in February 2006 following decisions by the municipalities of Fleurus and Farciennes to withdraw<sup>2</sup>, the municipalities of Dessel and Mol declared themselves willing to consider the implementation on their territory of the surface or deep disposal facility developed by their respective partnerships subject to compliance with the conditions associated with the setting up of these facilities. The associated conditions specifically reflect the concerns and values of the community from which they originate and are justified by the fact that the municipality that agrees to the setting up of a disposal facility on its territory will provide a considerable service for all the people of Belgium.

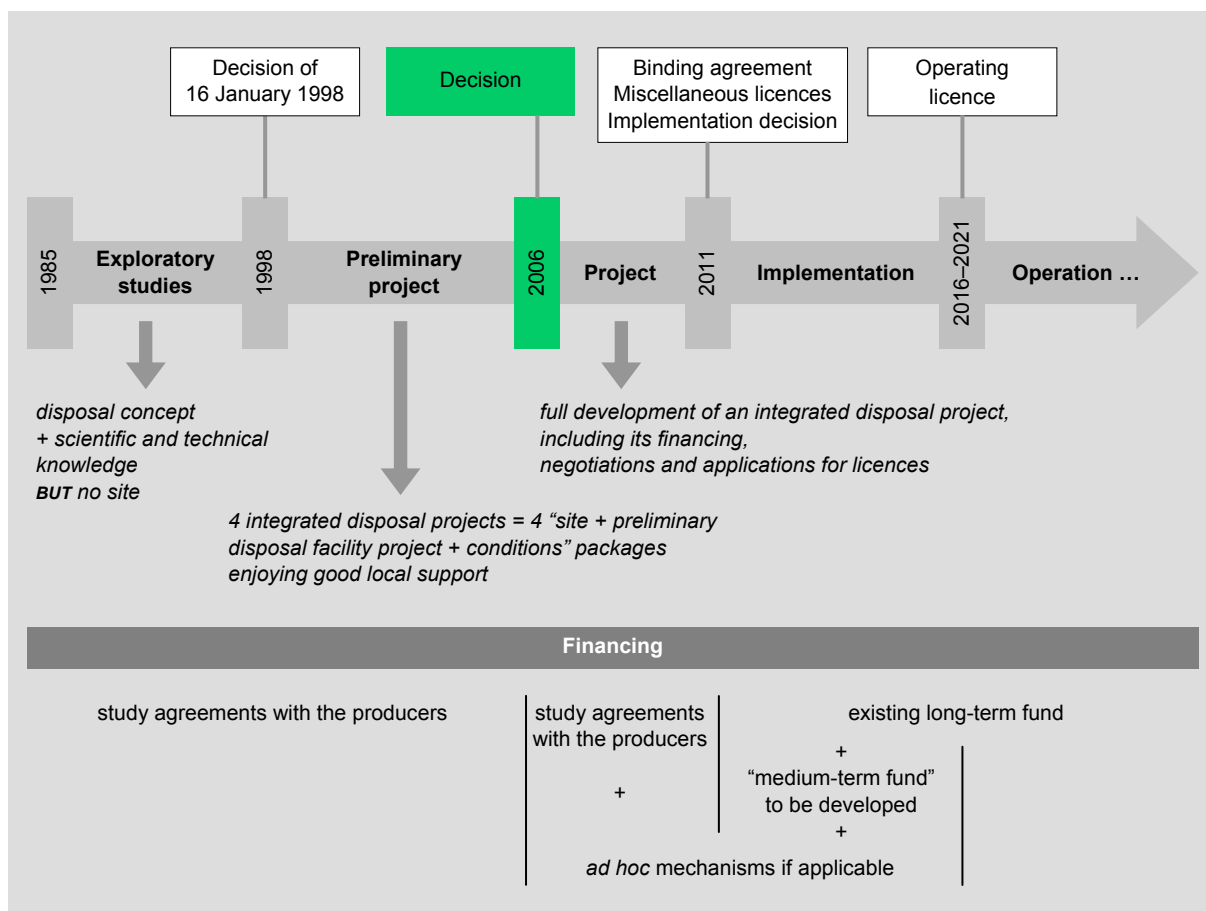
In doing so, ONDRAF/NIRAS therefore completed the missions it had been given by the Council of Ministers on 16 January 1998 since, in particular, it has developed (translation) *“methods, including management and consultation structures, making it possible to integrate a project of this kind at a local level”* and it has supplied the information needed to be able to make *“a technical and economic choice between deep or surface disposal, under comparable conditions of safety, while as far as possible protecting the environment.”*

This report is the culmination of all the work carried out from 1985 to mid-2006 in order to develop a solution for the long-term management of category A waste and requests the Federal Government to reach a decision on its continuation. It describes the path taken since 1985, focusing on the period following the decision of 1998 and introduction of the participative methodology, outlines the integrated disposal projects developed by STOLA-Dessel and MONA, summarises the items that are likely to be taken into account when choosing the integrated disposal project to be continued and provides a general description of the programme that will commence as soon as the Government has taken the requested decision (see also the diagram on the next page).

---

<sup>1</sup> Category A waste is short-lived low-level and medium-level waste. It is frequently referred to as “short-lived low-level waste”.

<sup>2</sup> The final reports of PaLOFF and the report by ONDRAF/NIRAS were submitted purely for information purposes by ONDRAF/NIRAS to its supervising Minister in April 2006.



**General diagram of the programme for the long-term management of category A waste. The project phase will commence when the Government takes the requested decision.**

According to ONDRAF/NIRAS, the four integrated disposal projects submitted to the Government are sufficiently mature to be the subject of detailed studies in the project phase: it considers that they meet the conditions set out by the Council of Ministers in its decision of 16 January 1998 and, according to the exploratory discussions conducted with various waste producers, it should be possible to secure full financing for them.

- **Participative process** The integrated projects have been developed by the partnerships in compliance with the modes of the participative process. Approval without amendment of the final reports of STOLA-Dessel and MONA by their respective general assemblies and by the local councils of Dessel and Mol also shows that the four integrated projects enjoy good local support. In both Dessel and Mol, neither the partnership nor the local council has expressed a preference for either of the two technical solutions developed. Finally, the participative process is being continued both in Dessel and in Mol, in the respective forms of the STORA and MONA partnerships, and has been extended to include the management of radioactive waste in general.
- **Technical conditions** At the current level of knowledge, and in view of the legal framework in force, ONDRAF/NIRAS considers that the four preliminary disposal facility projects that have been proposed can offer sufficient protection to man and the environment in both the short and the long term and that they are technically feasible.

Furthermore, the four preliminary projects are definitive in nature and meet the conditions of progressiveness, flexibility, retrievability and controllability. The latter three characteristics are, however, less marked for deep disposal than they are for surface disposal, but they are also less important for deep disposal. Finally, the Federal Agency for Nuclear Control (FANC) and the Flemish regional bodies responsible for environmental protection have not made any comments likely to cast fundamental doubt on the four preliminary disposal facility projects that have been developed.

- **Financial aspects** The extension in 1998 of the concept of disposal project, which had up to then been limited to infrastructures of a strictly technical nature, to the concept of *integrated* disposal project, implying the integration of the disposal project in a wider project offering added value at a local level, naturally has an impact on the total costs of the project and therefore on its financing, which must therefore be widened as a result.

The technical costs of the integrated projects are covered by the existing long-term fund (FLT) mechanism. Because the rates for the collection of waste have been calculated on the assumption of surface disposal, they would need to be significantly increased to be able to cover the costs of an integrated deep disposal project.

Coverage of the costs of the associated conditions lying outside the scope of the activities covered by FLT makes it necessary to develop one or more additional financing mechanisms. According to exploratory discussions conducted with various waste producers, the constitution over about ten years of a new fund that could be called “medium-term fund” seems to be a reasonable solution. If applicable, this fund could be supplemented by *ad hoc* mechanisms.

Therefore insofar as

- ONDRAF/NIRAS has completed the missions it was given by the Council of Ministers in its decision of 16 January 1998,
- in this report, ONDRAF/NIRAS provides the Government with the final items in its possession that are likely to be of assistance in decision-making,
- the four integrated disposal projects proposed to the Government by the municipalities of Dessel and Mol currently enjoy good local support,

**ONDRAF/NIRAS requests the Government to decide to proceed with the development of one of the integrated disposal projects submitted by STOLA-Dessel or MONA. Such a decision requires**

- **a choice of disposal option (surface or deep disposal);**
- **designation of a location for the disposal facility in a municipality;**
- **a mission to specifically develop the conditions associated with the project.**

Such a decision is necessary for the following reasons:

- to avoid passing on to future generations burdens resulting from activities from which they have not benefited;
- to avoid confronting the municipalities in which waste is currently stored with a *de facto* situation of extended storage;
- to permit efficient industrial management of waste in the short and medium terms;
- to keep local support at its current level;

- to ensure continuity of the disposal programme, *which otherwise will come to a halt*;
- to keep the costs of studies in the project phase within reasonable limits.

The municipality of Dessel and STORA, the municipality of Mol and MONA and ONDRAF/NIRAS also wish this decision to be taken as quickly as possible.

The development of the selected integrated disposal project must take the project from its current status to the status of a project that is ready for implementation, which may be reflected by the following two objectives for the project phase, which is expected to last five years:

- the signing by all the parties concerned of a binding agreement setting out the modes of implementation of the selected integrated project and the rights and duties of the parties;
- obtaining all the necessary licences and permits from the competent authorities.

The signing of a binding agreement between the parties and obtaining the necessary licences and permits require a number of conditions to be met, however. It would be necessary, in particular,

- *for ONDRAF/NIRAS to be able to take the initiatives necessary to maintain and widen the participative process and to strengthen local support;*
- *for ONDRAF/NIRAS to be able to negotiate with all the parties concerned the binding agreement that must enable the selected integrated project to be implemented;*
- *for ONDRAF/NIRAS to be able to work out proposals for the changes to the legal and regulatory framework that will be necessary to ensure the legal security of the parties;*
- *for FANC to provide ONDRAF/NIRAS in good time with all the information necessary for preparation of the licence application file;*
- *for FANC, in view of the pioneering nature of the project, to formally follow up the work of ONDRAF/NIRAS and provide provisional interim advices on the previously agreed upon topics, in particular a systematic analysis of items relating to the selected integrated project that require special attention.*

## Table of contents

<b>1.</b>	<b>Introduction</b>	<b>1</b>
<b>Part 1</b>	<b>The period 1985–mid-2006 and its achievements</b>	<b>7</b>
<b>2.</b>	<b>Period 1985–1997: exploratory studies phase</b>	<b>8</b>
<b>3.</b>	<b>The decision by the Council of Ministers of 16 January 1998</b>	<b>10</b>
<b>4.</b>	<b>Period 1998–mid-2006: preliminary project phase</b>	<b>11</b>
4.1.	A new societal approach, another technical approach	11
4.1.1.	Local partnerships or the introduction of social sciences to the management of radioactive waste	11
4.1.2.	The systemic approach replaces the criteria-based approach to choosing the surface disposal site	14
4.2.	The integrated disposal projects that were developed	14
4.2.1.	The two integrated disposal projects of STOLA-Dessel	16
4.2.2.	The two integrated disposal projects of MONA	19
4.2.3.	The integrated disposal project of PALOFF	22
4.3.	Assessment of the integrated disposal projects that have been developed and results of consultation with FANC	22
4.3.1.	Confirmation of compliance of the integrated disposal projects with the conditions of the Council of Ministers	23
4.3.1.1.	Compliance with the established participative process modes and continuation of the process	23
4.3.1.2.	Compliance with the technical conditions imposed by the Council of Ministers	24
4.3.1.3.	Estimation of the costs of the integrated disposal projects	24
4.3.2.	Results of consultation with the safety authorities and the competent bodies in the area of environmental protection	25
<b>Part 2</b>	<b>Outline of the programme based on the requested decision and financing guidelines</b>	<b>27</b>
<b>5.</b>	<b>Outline of the future programme</b>	<b>28</b>
5.1.	Project phase	28
5.2.	Implementation phase	31
5.3.	Operational, closure and institutional control phases	31
<b>6.</b>	<b>Financing of the future programme</b>	<b>32</b>
6.1.	Basic financing principles	32

6.2.	Financing of the future programme	32
6.2.1.	Financing of the project phase	33
6.2.2.	Financing from the implementation phase	33
<b>7.</b>	<b>Final considerations</b>	<b>35</b>
	<b>Annexes</b>	<b>39</b>
<b>A1.</b>	<b>The integrated disposal project of PaLOFF</b>	<b>41</b>
<b>A2.</b>	<b>Outline of the work programme for the project phase</b>	<b>44</b>
A2.1	Objectives	44
A2.2	Activities	46
A2.2.1	Preparatory activities	46
A2.2.2	Detailed studies for transition to the implementation phase	46
A2.2.3	Other activities	48
<b>A3.</b>	<b>Proposal for structuring consultation with FANC during the project phase</b>	<b>49</b>
A3.1	The regulatory “guidance” items for safety assessments	50
A3.2	Interim advices prior to submission of the safety report	51
A3.3	Clarification of the legal framework relating to the MER	52
<b>A4.</b>	<b>Abbreviations</b>	<b>53</b>
<b>A5.</b>	<b>References</b>	<b>55</b>

## 1. Introduction

On 16 January 1998, about a dozen years after ONDRAF/NIRAS had started its work on the search for a solution for the long-term management of category A waste<sup>3</sup>, the Council of Ministers decided to opt for a solution that would be definitive or could become definitive for the long-term management of such waste. This decision was in keeping with the recommendations of ONDRAF/NIRAS, which were themselves in keeping with the international consensus concerning intergenerational ethics. At the same time, the Council of Ministers entrusted new missions to ONDRAF/NIRAS, while limiting the scope of its investigations.

In practice, ONDRAF/NIRAS was in future to focus its work on developing two types of solutions for the long-term management of category A waste: surface disposal and deep disposal. In doing so, it was to ensure that these solutions met a number of technical requirements: apart from being safe and feasible, they also needed to be progressive, flexible, reversible and controllable. ONDRAF/NIRAS was also to limit its exploratory activities (translation) *“to existing nuclear zones and to sites where the local authorities show an interest”*, and to *“develop the methods, including management and consultation structures, making it possible to integrate a project of this kind at a local level.”* In the end, it was to provide the Government with the information it needed to make *“a technical and economic choice between deep or surface disposal, under comparable conditions of safety, while as far as possible protecting the environment.”*<sup>4</sup> [1].

In 1998, ONDRAF/NIRAS therefore restructured its work programme for the long-term management of category A waste in order to take account of the new requirements, which had its full support for that matter. ONDRAF/NIRAS offered municipalities wishing to participate in the development of an integrated disposal project for category A waste the opportunity to do so under partnerships specially created for this purpose. Such collaboration implied no commitment whatsoever towards implementing the resulting proposal. The disposal facility<sup>5</sup>—the repository itself and the associated buildings—was to be integrated in a wider societal project, comprising a set of associated conditions that would add value to the municipality and/or region in question, so that the integrated disposal project as a whole would enjoy widespread support among the local population. ONDRAF/NIRAS of course left it to the municipalities on whose territories the existing nuclear zones were located to decide whether or not to participate in the collaboration it was offering.

---

<sup>3</sup> Category A waste is short-lived low-level and medium-level waste. It is frequently referred to as “short-lived low-level waste”.

<sup>4</sup> The disposal of category A waste is based on proven international industrial practice. Disposal sites are currently being operated in France, Spain, Sweden, Finland, Japan and the United States, in particular.

<sup>5</sup> In the rest of the text, the term “disposal facility” usually refers to the actual repository and the associated buildings, from a security post to a post-conditioning building, for example, and the associated infrastructures (roads, parking spaces, drainage, etc.).

With its new work programme, ONDRAF/NIRAS abandoned the site selection methodology that it had been following up to then with regard to the surface disposal option and replaced it with a *systemic* approach: for each of the sites to be proposed, it would examine the possibility of designing a disposal facility that would be suitable for the ground characteristics and such that the system “disposal site + disposal facility” would a priori meet the conditions arising from the decision of the Council of Ministers. If the conclusion was favourable, it would then propose to the partnership in question the development of one or more preliminary projects.

In concrete terms, ONDRAF/NIRAS’ collaboration proposal resulted in the creation of three partnerships between ONDRAF/NIRAS and municipalities whose territory contained a nuclear zone. They all took the form of a non-profit organisation.

- STOLA-Dessel (*Studie- en Overleggroep Laagactief Afval* [Study and Consultation Group on Low-Level Waste]) was created on 30 September 1999 by the *municipality of Dessel* and ONDRAF/NIRAS.
- MONA (*Mols Overleg Nucleair Afval Categorie A* [Mols Consultation on Category A Nuclear Waste]) was created on 9 February 2000 by the *municipality of Mol* and ONDRAF/NIRAS.
- PaLOFF (*Partenariat Local* [Local Partnership] Fleurus–Farciennes) was created on 27 February 2003 by the *municipalities of Fleurus and Farciennes* and ONDRAF/NIRAS.

In this process, the municipalities in question indicated their agreement to the performance of studies on their territory, without making any further commitment.

The partnerships examined the possibility of developing an acceptable proposal for an integrated disposal project. If this was possible, the partnership would submit the proposal to the local council of its municipality. If this was impossible, it could advise the local council not to give any further consideration to the proposal that had been developed. In both cases, the local council would finally decide on whether to accept or reject the proposal.

Eight years after the decision of 16 January 1998, ONDRAF/NIRAS completed the missions that had been entrusted to it by the Council of Ministers. The methodology of the local partnerships actually achieved its objective, since the three partnerships that had been created developed a total of five integrated disposal projects. Four of the proposed projects (the STOLA-Dessel and MONA projects) were accepted by the municipalities in question, whereas the fifth (the PaLOFF project) was terminated in February 2006 following decisions taken by the local councils of Fleurus and Farciennes.

During the past twelve months, ONDRAF/NIRAS has, as announced [2], successively submitted to its supervising Minister the files for the five integrated disposal projects developed by the partnerships<sup>6</sup>. Each of the files comprised three parts:

- the *partnership report* describing its integrated disposal project(s), i.e. one or two “disposal site + preliminary disposal facility project” systems and a set of conditions

---

<sup>6</sup> May 2005 for the file relating to the integrated disposal projects of STOLA-Dessel, July 2005 for the file relating to the integrated disposal projects of MONA and April 2006 for the file relating to the integrated disposal project of PaLOFF. In the rest of the text, the partnerships and the municipalities from which they originate are always referred to in the order in which their respective files were submitted to the Government.

indissociably linked to it (them). STOLA-Dessel and MONA each developed an integrated surface disposal project and an integrated deep disposal project. PaLOFF developed an integrated disposal project referred to as “half-buried”, half-buried disposal being a variation on surface disposal [3, 4, 5, 6].

- the *decision of the local council(s) in question*. The local councils of Dessel and Mol declared themselves willing to consider the implementation of either of the two preliminary disposal facility projects on the territory of their municipalities as long as the conditions associated with the preliminary project were complied with. The local council of Fleurus, on the other hand, decided to terminate the studies relating to the integrated disposal project, after which the local council of Farciennes refrained from expressing an opinion on the file.
- the *ONDRAF/NIRAS report*. ONDRAF/NIRAS formally confirmed that, on the basis of the current level of knowledge and in view of the legal framework in force, the integrated disposal projects developed by STOLA-Dessel and MONA meet the conditions arising from the decision of the Council of Ministers of 16 January 1998, in particular concerning safety and feasibility requirements, and certified the existence of a participative process [7, 8]. ONDRAF/NIRAS also drafted a final report concerning the integrated disposal project developed by PaLOFF, in which it acknowledges termination of the project following the decisions of the municipalities of Fleurus and Farciennes, while at the same time confirming that this project has been developed in compliance with the modes of the participative process and complies with the conditions arising from the decision of the Council of Ministers [9].

The recent decision by the municipalities of Fleurus and Farciennes to terminate the studies casts new light on the integrated disposal project to be developed. Whereas until recently, it was possible to envisage to set up the disposal facility at places that were in geographically distant locations on the territory, the possibilities are now limited to two neighbouring municipalities: the municipalities of Dessel and Mol. These two municipalities have each developed an integrated surface disposal project and an integrated deep disposal project, at places selected by the partnerships as the sites of their respective preliminary disposal projects.

**On completion of the mission entrusted to it by the decision of 16 January 1998, ONDRAF/NIRAS requests the Government to decide to proceed with the development of one of the integrated disposal projects submitted by STOLA-Dessel or MONA. Such a decision requires**

- **a choice of disposal option (surface or deep disposal);**
- **designation of a location for the disposal facility in a municipality;**
- **a mission to specifically develop the conditions associated with the project.**

Clearly, the effects of a disposal facility will go beyond the boundaries of the municipality in question. Furthermore, local support will have to be as widespread as possible. Specification of the associated conditions must therefore be discussed with the representative local stakeholders and, first and foremost, with the municipality that will accommodate the disposal facility and with the corresponding partnership. Any municipality that has submitted a proposal for an integrated disposal project will necessarily remain a discussion partner, wherever the disposal facility is set up. In general,

the participative process is and remains open to other partners on condition that they have a local interest and they have expressed it.

Implementation of the integrated disposal project that is selected will, however, depend on various factors: the results of the detailed studies that have yet to be carried out, the possibility of reaching an agreement between all the relevant parties concerning the modes of implementation of the integrated disposal project and, in particular, the way of specifically meeting the associated conditions and, finally, obtaining all the nuclear and non-nuclear licences that are necessary.

The decision that the Government is being requested to take is necessary for various reasons.

- With regard to the management of category A waste:
  - ▶ The decision is necessary *to avoid passing on to future generations burdens resulting from activities from which they have not benefited*. This principle of intergenerational ethics has been adopted by the International Atomic Energy Agency in its basic principle no. 5, according to which *“radioactive waste shall be managed in such a way that [it] will not impose undue burdens on future generations”* [10].
  - ▶ The decision is necessary *to ensure that the municipalities where the waste is currently stored are not confronted any longer with an extended storage situation that they have not chosen and do not want*.
  - ▶ The decision is necessary *to permit efficient industrial management of category A waste in the short and medium terms*. It is actually necessary to know the final destination of radioactive waste in order to be able to ensure optimum industrial management.
- With regard to the disposal programme:
  - ▶ The decision is necessary *to preserve local support acquired during the previous working phase*.
  - ▶ The decision is necessary *to ensure programme continuity; both partnerships and municipalities also wish this decision to be taken quickly* [11].
  - ▶ The decision is necessary *to keep the costs of detailed studies within reasonable limits*. Carrying out detailed studies for the four integrated disposal projects would actually result in significant extra costs and in a considerable increase in the workload.

This report is the culmination of all the work carried out from 1985 to mid-2006 in order to develop a solution for the long-term management of category A waste and requests the Government to reach a decision on the continuation of the disposal programme. It is divided into two parts.

- The *first part* summarises what has been achieved in the disposal programme and, in particular, what has been achieved as a result of application of the methodology of local partnerships.

- The *second part* outlines the disposal programme, which shall commence as soon as the Government has made the requested decision and, in particular, it outlines the work programme for the next phase, i.e. the project phase. It also outlines the way in which financing of the rest of the disposal programme is to be organised.

The report has five annexes:

- a description of the integrated disposal project developed by PALOFF,
- an outline of the work programme for the project phase,
- a proposal for structuring consultation with the safety authorities during the project phase,
- a list of abbreviations,
- a list of references.



## Part 1: The period 1985–mid-2006 and its achievements

ONDRAF/NIRAS' work on the long-term management of category A waste has had two main phases to date (Figure 1):

- the *exploratory studies phase* (Chapter 2), lasting about twelve years, permitted substantial scientific and technical developments regarding surface disposal, but was unable to lead to a choice of disposal site;
- the *preliminary project studies phase* or *preliminary project phase* (Chapter 4), lasting eight years, permitted the development, under three local partnerships, of five integrated disposal projects that all meet the technical conditions arising from the decision of the Council of Ministers of 16 January 1998, four of which were accepted by the municipalities in question, the fifth having been terminated following decisions by the local councils of Fleurus and Farciennes (Chapter 3).

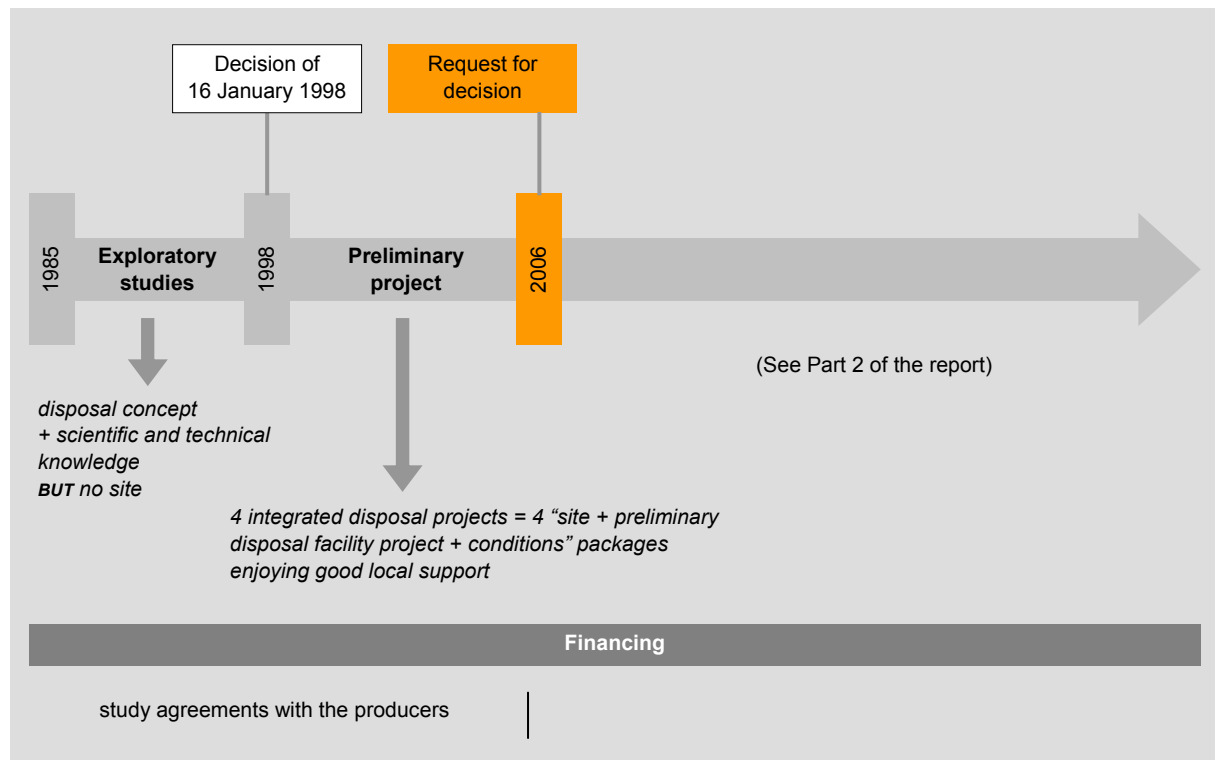


Figure 1 – The programme relating to the long-term management of category A waste: general outline from 1985 to submission of this report. The decision requested in this report must permit transition of the programme to the project phase, i.e. transition to detailed studies of the selected integrated disposal project.

## 2. Period 1985–1997: exploratory studies phase

ONDRAF/NIRAS' research and development activities concerning the long-term management of category A waste started in the mid-eighties, i.e. shortly after the organisation was created. Initially intended to relate exclusively to scientific and technical aspects, these activities, which made significant progress possible in both these areas, also made ONDRAF/NIRAS aware of the need to take account of societal aspects for solving the issue of long-term management of category A waste. In 1997, ONDRAF/NIRAS had indeed reached the stage of having developed a disposal concept that was a priori safe and feasible, but it did not have any prospect of being able to set up a repository anywhere in Belgium, because of the general opposition it ran up against.

The research and development studies prior to the decision of 1998, which can be described as exploratory studies, were financed by the waste producers and the Belgian State <sup>7</sup> (in its capacity as the party financially responsible for the nuclear liabilities <sup>8</sup>) via study agreements. Their total costs are estimated at about 14 MEUR<sub>2006</sub> for the period 1985–1997.

The main achievements and milestones for the period 1985–1997 can be summarised as follows.

**Period 1985–1990** After an initial study [15] published in 1990 comparing three options that could be considered for the long-term management of category A waste—surface disposal, the use of former coalmines or quarries and deep disposal in an argillaceous formation—, ONDRAF/NIRAS decided, in agreement with its supervising Minister, to *focus its work on the study of surface disposal*.

**Period 1990–1993** The studies carried out during the period 1990–1993 focused on assessing the technical feasibility of setting up a surface disposal facility for category A waste in Belgium. They were intended to examine, on the one hand, whether there were adequate construction techniques and, on the other hand, whether it was possible to identify areas that were favourable or potentially favourable for setting up such a facility. They made possible (i) the *first developments of the surface disposal concept*, (ii) the *determination of first radiological criteria to make it possible to distinguish waste that could be suitable for surface disposal and other waste* and (iii) the *identification, on a bibliographical basis, of 98 areas potentially favourable* for setting up a surface disposal facility. The list identifying 98 areas, published in 1994 [16], was, however, unanimously rejected by the municipalities in question and by the general public. The approach taken, which was, after all, natural insofar as it aimed to give a technical answer to a problem that

---

<sup>7</sup> **The Belgian State finances clearance of nuclear liabilities of the BP1 and BP2 sites at Mol–Dessel via the federal contribution introduced by the framework legislation of 24 December 2002 (Articles 432 and 433) [12], amending Articles 12 and 21 of the law of 29 April 1999 concerning organisation of the electricity market [13], itself amended by the law of 20 July 2005 [14].**

<sup>8</sup> Radioactive waste, retired equipment or disused “historical” nuclear facilities, the provisions for whose management were inadequate or even non-existent, and for which the Belgian State has taken financial responsibility.

was viewed as being technical only, had come up against local perceptions: economic and societal factors would in future also have to be taken into account.

**Period 1994–1996** In line with the recommendations made by a committee of Belgian experts on the basis of the report of 1994, ONDRAF/NIRAS then started developing an *appropriate methodology for identifying, on the basis of objective criteria, potential sites from among the 98 areas* identified as being potentially favourable, so that it would be possible to set up a relatively simple generic disposal facility on one of them. This selection should be made on the basis of geological, hydrogeological and radiological criteria, but also on the basis of socio-economic and environmental considerations. This work was not continued, however, in view of the turn taken in the meantime by events in the socio-political sphere.

**Period 1995–1997** Wishing to calm the turmoil caused by publication of the 1994 report and to get out of the societal impasse that had come about as a result of it, in June 1995 the Government had indeed requested ONDRAF/NIRAS to carry out a *study of the possible alternatives to the surface disposal* of category A waste. The study that was carried out related to three types of solutions: a solution that was not definitive (long-term storage) and two solutions that were definitive or could become so (surface disposal and deep disposal). They were examined from different viewpoints: definitive character, radiological safety, technical feasibility, controllability, flexibility and costs, in particular. ONDRAF/NIRAS' final report [17], submitted to the Federal authorities in mid-1997, advised against any provisional solution and recommended that the Government base its choice between a solution that was not definitive and a solution that was definitive on ethical considerations, and the Government did so six months later (Chapter 3).

**Period 1996–1998** At the end of 1996, ONDRAF/NIRAS was also requested by its supervising Minister to carry out a further bibliographical study, this time relating to the 25 military sites being taken out of use in Belgium. It was to evaluate the extent to which it could use one or more of these sites in the framework of its activities. This study led it, in summer 1997, to identify *16 potentially favourable military sites*.

Following the preliminary study of the military sites, the municipality of Beauraing was a candidate for a feasibility study on the former military base at Baronville, which was one of the 16 military sites provisionally taken into consideration by ONDRAF/NIRAS. Although the exploratory campaign that was carried out had indicated that the Baronville site could be considered for a preliminary disposal project for category A waste, the popular consultation organised on 28 June 1998 by the local authorities of Beauraing revealed that about 95% of the inhabitants were opposed to the prospect of such a project in their municipality, which therefore withdrew its candidacy. This experience confirmed the need for the participative approach that ONDRAF/NIRAS had just started to develop following the decision by the Council of Ministers (Chapter 3), but that it had not had time to apply to the Baronville site.

### **3. The decision by the Council of Ministers of 16 January 1998**

On 16 January 1998, the Council of Ministers decided to select a solution that was definitive or likely to become definitive for the long-term management of category A waste and to entrust new missions to ONDRAF/NIRAS, while limiting the scope of its investigations. This decision was worded as follows (translation) [1].

*“For the management of short-lived low-level and medium-level waste (category A waste), on the basis of the information and studies available and with the aim of ensuring cautious economic management with regard to future generations, while at the same time ensuring the best possible level of safety and wide consultation with the relevant authorities and communities, the Council:*

- *chooses, in implementation of the Government Agreement, a solution that is definitive or likely to become definitive, and one that is progressive, flexible and reversible;*
- *confirms the need to make a technical and economic choice, as soon as possible, between deep and surface disposal on the basis of comparable conditions of safety and as far as possible protecting the environment;*
- *orders the Minister of the Economy to instruct the Belgian Agency for Radioactive Waste and Enriched Fissile Materials (ONDRAF/NIRAS):*
  - ▶ *to limit itself in its exploratory activities, including the necessary surveys on the ground intended to result in a technical choice, to existing nuclear zones and to sites where the local authorities show an interest;*
  - ▶ *to develop and finalise, as soon as possible, the surface disposal concepts, in particular in terms of reversibility and controllability;*
  - ▶ *to develop and finalise, as soon as possible, the studies of the feasibility and costs of geological disposal of low-level waste;*
  - ▶ *to develop methods, including management and consultation structures, making it possible to integrate a project of this kind at a local level.*

*While accomplishing these missions, ONDRAF/NIRAS shall work in close collaboration with the safety authorities, in particular the Federal Agency for Nuclear Control, concerning all aspects related to the safety of facilities and environmental protection.”*

The letter from the supervising Minister of ONDRAF/NIRAS informing it of this decision also stated that (translation) *“The top-priority question, as stated in the second [box] of the notification, is now to choose between surface and deep disposal, on comparable conditions of safety, on an economic and technical basis. [...]”*

## 4. Period 1998–mid-2006: preliminary project phase

The period that commenced after the decision by the Council of Ministers of 16 January 1998, which culminated in submission of this report to the supervising Minister of ONDRAF/NIRAS, was a preliminary project phase. It is distinguished from the previous phase in that it was based on the implementation of an innovative participative methodology (Section 4.1), which achieved its objective of developing integrated disposal projects within the framework of structures of partnership between interested municipalities and ONDRAF/NIRAS (Section 4.2). Furthermore, two of these municipalities—Dessel and Mol—eventually followed the favourable advice of their respective partnerships and declared themselves willing to agree to implementation on their territory of one of the integrated disposal projects that had been developed, on condition that it would be possible to reach an agreement on the way of meeting all the conditions associated with the disposal facility. The reports by the partnerships and the decisions of the local councils were passed on by ONDRAF/NIRAS to its supervising Minister with its own reports (Section 4.3).

The preliminary project phase was fully financed via study agreements concluded between ONDRAF/NIRAS and the waste producers and between ONDRAF/NIRAS and the Belgian State in its capacity as the party financially responsible for the liabilities. The current agreements expire at the end of 2006 (see also Section 6.2.1).

The total costs of the preliminary project phase are estimated at 20.3 MEUR<sub>2006</sub>, including 2.8 MEUR<sub>2006</sub> for the partnerships' operation. The participative approach was given the *de facto* confirmation of the Permanent Technical Committee of ONDRAF/NIRAS, which issued a favourable advice concerning the annual work programmes, and by the Board of Directors and supervising Minister of ONDRAF/NIRAS, which approved the same programmes.

### 4.1. A new societal approach, another technical approach

Following the decision of the Council of Ministers of 16 January 1998, ONDRAF/NIRAS restructured its work programme relating to the long-term management of category A waste in order to include the *communities consultation procedure* desired by the Government (Section 4.1.1), and the fact that it was in future *to limit its studies to existing nuclear zones and to sites where the local authorities show an interest* (Section 4.1.2).

#### 4.1.1. Local partnerships or the introduction of social sciences in the management of radioactive waste

The community consultation procedure desired by the Government was made concrete through implementation of the local partnerships methodology [18]. Developed on behalf of ONDRAF/NIRAS by *Universitaire Instelling Antwerpen* [University of Antwerp]<sup>9</sup> [19] and

---

<sup>9</sup> Department of Social and Political Sciences. *Universitaire Instelling Antwerpen* was merged, by a decree of 2003, with *Rijksuniversitair Centrum te Antwerpen (RUCA)* and *Universitaire Faculteiten Sint-Ignatius te Antwerpen (UFSIA)* to form *Universiteit Antwerpen (UA)*.

*Fondation universitaire luxembourgeoise* [Luxemburg University Foundation]<sup>10</sup> (FUL), this innovative methodology, which is arousing a definite interest at an international level [20], was intended to create the conditions for an open but structured dialogue and collaboration between ONDRAF/NIRAS and the local communities willing to commit themselves to the search for a definitive solution for the long-term management of category A waste. It was based on the assumption that local communities are more likely to agree to the setting up of a project that can be expected to cause a nuisance for them, or even that involves some risk or is perceived as such, if they have had the opportunity to collaborate in its development and if they have been involved in the associated decision-making process.

In concrete terms, ONDRAF/NIRAS offered the municipalities that wished to do so the opportunity to create a local partnership to participate in the *development of an integrated disposal project*, i.e. in the development of a preliminary disposal facility project integrated in a wider societal project, *such that the integrated disposal project would enjoy wide consensus among the local community in question*. The preliminary disposal facility project would be developed on the basis of a proposal prepared by ONDRAF/NIRAS on the basis of the characteristics of the ground. The disposal facility was actually to be integrated in a wider project with sufficient added value for the municipality and/or region in question. A municipality willing to agree to the setting up of a disposal facility on its territory would indeed be providing a considerable service to all the people of Belgium, while at the same time having to suffer certain drawbacks, such as the low value of the land tied up in construction of the repository or the existence, or even simply the perception, of an additional risk. The municipalities willing to collaborate with ONDRAF/NIRAS within a local partnership would be completely at liberty to terminate the collaboration at any time.

In practice, ONDRAF/NIRAS has, in particular, directly assessed the level of interest of the municipalities on whose territory the four existing nuclear zones are situated. Whereas the municipalities of Beveren (for the Doel nuclear zone) and Huy (for the Tihange nuclear zone) did not wish to enter into the proposed collaboration, the municipalities of Mol, Dessel, Fleurus and Farciennes were quick to show an interest. ONDRAF/NIRAS also organised an information day on the methodology of local partnerships, to which all the Belgian municipalities were invited, on 16 December 1998.

The interest shown by the municipalities of Mol, Dessel, Fleurus and Farciennes culminated in the creation of three partnerships between ONDRAF/NIRAS and these municipalities, which took the form of a non-profit organisation.

- The first partnership, STOLA-Dessel, was created on 30 September 1999 by the *municipality of Dessel* and ONDRAF/NIRAS. Wishing to give priority to links with its own people and because its profile is quite different from that of the neighbouring municipality of Mol, the municipality of Dessel did not wish to associate itself with the municipality of Mol in a joint partnership.
- The second partnership, MONA, was created on 9 February 2000 by the *municipality of Mol* and ONDRAF/NIRAS. The municipality of Mol has always favoured and still does favour a joint partnership with the municipality of Dessel.

---

<sup>10</sup> Socio-economic, Environmental and Developmental Research Group. *Fondation universitaire luxembourgeoise* has since joined *Université de Liège* [University of Liège] (ULg).

- The third partnership, PaLOFF, was created later, on 27 February 2003. In view of the characteristics of the site of the *Institut national des radioéléments* (IRE), frequently referred to as the “nuclear zone of Fleurus–Farciennes”<sup>11</sup>, and in particular the presence of mining damage in the subsoil, the *municipalities of Fleurus and Farciennes* did not actually wish to become involved in a formal partnership structure with ONDRAF/NIRAS until it had proven the technical feasibility of setting up a disposal facility on this site. A local follow-up body was nevertheless set up in 1999 as soon as this preliminary work started<sup>12</sup>, and was a kind of precursor of the future partnership.

The three partnerships were organised so that they could function as representative, transparent, open and independent local discussion and working platforms.

- *The partnerships were representative of the communities from which they originated.* After the relevant local authorities had given their approval, a detailed enquiry was carried out in the potentially interested municipalities in order to find out more about their socio-economic profile, identify wishes regarding the creation of a consultation platform, determine the modes of operation of the partnership and identify the main local players likely to join it. The partnerships were actually to include representatives of interested representative local players (political, socio-cultural, environmental and economic players) and ONDRAF/NIRAS. Interested private individuals and representatives of bodies that covered more than one municipality or that did not belong to the municipality in question could also join, without being able to take part in decision-making, however. The partnerships created in this way each had about 70 to 80 members. All the people from local communities were members on a voluntary, unpaid basis, apart from two staff members in each partnership, who were employed on a full-time basis (see below).
- *The partnerships operated on a democratic and autonomous basis.* They had the following four organisational levels:
  - ▶ a general assembly, comprising representatives of the local council(s) and the local societal and economic players, and a representative of ONDRAF/NIRAS;
  - ▶ a board of directors made up of representatives of the political, societal and economic players and a representative of ONDRAF/NIRAS;
  - ▶ a co-ordination unit comprising two full-time staff members;
  - ▶ working groups, each comprising representatives of members of the general assembly and private individuals and an expert from ONDRAF/NIRAS. They were assisted on a permanent basis by ONDRAF/NIRAS and on a quasi-permanent basis by UA (for STOLA-Dessel and MONA) and FUL (for PaLOFF). They called on independent experts whenever they wished to do so.
- *The partnerships had full decision-making autonomy.* They had the option of terminating their work at any time and solely decided on the contents of the advice

---

<sup>11</sup> Although according to the sector plan, the site of the IRE is an “industrial area”, ONDRAF/NIRAS generally refers to it as the “nuclear zone of Fleurus–Farciennes”, since it includes nuclear activities.

<sup>12</sup> As a result of the existence of the local follow-up body and in view of the stage of development of the disposal solution proposed by ONDRAF/NIRAS to PaLOFF at the time of its creation, the work of PaLOFF did not last as long as that of STOLA-Dessel and MONA.

accompanying the report that they submitted to their respective local councils when they had completed their work.

- For both symbolic and practical reasons, *the partnerships were based in the centre of the municipalities from which they originated* (Farciennes in the case of PaLOFF, with an associated office in Fleurus).
- *The partnerships were allocated a budget by ONDRAF/NIRAS and were solely responsible for managing it.*

Apart from developing an integrated disposal project, the partnerships were also to communicate with the local community and inform it of their work and the studies carried out. In order to best meet the needs and concerns of the local communities from which they originated, they held a dialogue with them and made an effort to find out their opinions of the integrated disposal projects they were developing.

#### **4.1.2. The systemic approach replaces the criteria-based approach to choosing the surface disposal site**

Following the Government's request to limit its work "*to existing nuclear zones and to sites where the local authorities show an interest*", ONDRAF/NIRAS abandoned the site selection methodology that it had been following up to then for the purpose of its studies of surface disposal, replacing it with a systemic approach. In future, potential sites for setting up a surface repository would be examined as part of a whole, the "disposal site + disposal facility" system. ONDRAF/NIRAS would examine the possibility of designing a surface disposal facility appropriate to the characteristics of the ground and such that the entire system would a priori be able to meet the conditions arising from the decision of the Council of Ministers. This approach is just as valid as the site selection methodology that involved examining sites on the basis of their suitability to accommodate a previously defined disposal facility. It is just different. As an analogy, it might be said that these two approaches differ in the same way as *off-the-peg* and *made-to-measure*.

Furthermore, the change in methodology resulting from the decision of 16 January 1998 supported a change that had only recently been made within ONDRAF/NIRAS concerning the monitoring of the proper functioning of a surface disposal system. Whereas until the mid nineties, ONDRAF/NIRAS took the view that it was sufficient to monitor the quality of water at a single measuring point situated at some distance from the disposal facility—on condition that all the outflows of underground water likely to have been contaminated by the waste reach the point in question—, this view evolved in 1997. Since then, ONDRAF/NIRAS considers that it is preferable to carry out checks at different distances from the disposal facility: in inspection galleries located beneath the disposal facility, near the disposal facility and within the broader environment.

#### **4.2. The integrated disposal projects that were developed**

The local partnerships methodology resulted in the development of five integrated disposal projects. Each of the projects comprises a preliminary disposal facility project and a set of associated conditions that are indissociably linked with it:

- a preliminary (surface or deep) disposal facility project developed for the site selected by the partnership;
- a set of associated conditions specific to the relevant local community. They cover a wide range of concerns and values, all the way from the priority given to safety, health and the environment to conditions intended to ensure social, economic and cultural added value for the municipality in question. Meeting some of these conditions would also *de facto* result in added value beyond the municipality immediately concerned.

The preliminary disposal facility projects were developed by the partnerships with the assistance of ONDRAF/NIRAS, from proposals prepared by ONDRAF/NIRAS on the basis of the characteristics of the ground and subsoil.

- In view of the results of bibliographical studies and preliminary ground studies carried out for the nuclear zone of Mol–Dessel and in view of the good knowledge it already had of the Boom Clay present in the subsoil of the region, ONDRAF/NIRAS was able to propose to STOLA–Dessel and MONA a preliminary surface disposal project and a preliminary deep disposal project.
- In view of the geomechanical and hydrogeological characteristics of the nuclear zone of Fleurus–Farciennes and the surface area available, ONDRAF/NIRAS proposed to PALOFF a preliminary disposal project described as “half-buried”, which is a variation on surface disposal. The option of deep disposal was not studied: because the subsoil of Fleurus–Farciennes is schistose by nature and it is not well known, it would have actually been necessary to develop a significant study programme specifically devoted to deep disposal in a schistose formation.

The integrated disposal projects were the subject of an intermediate progress report by ONDRAF/NIRAS to its supervising Minister in 2002 [21], final reports by the partnerships and “compliance” reports by ONDRAF/NIRAS.

- The final report of STOLA–Dessel (Section 4.2.1) [3] was unanimously approved without amendment by the general assembly of the partnership and by the local council of Dessel. Neither the general assembly nor the municipality expressed a preference for either of the two proposed technical options.
- The final report of MONA (Section 4.2.2) [4] was approved without amendment by the general assembly of the partnership (27 votes for, 1 vote against, 4 abstentions) and by the local council of Mol (unanimously apart from 2 abstentions). Neither the general assembly nor the municipality expressed a preference for either of the two proposed technical options.
- The general assembly of PALOFF decided, by 24 votes for and 4 votes against, to pass on the final reports of PALOFF [5, 6] to the local councils of Fleurus and Farciennes. The local council of Fleurus decided to terminate the studies by 23 votes against 3. In view of this decision, the local council of Farciennes unanimously refrained from expressing an opinion on the file.

The reports of the partnerships were passed on to ONDRAF/NIRAS, with the decisions of the local councils, so that it could pass them on to its supervising Minister, each accompanied by its own report (Section 4.3) [7, 8, 9].

#### 4.2.1. The two integrated disposal projects of STOLA-Dessel

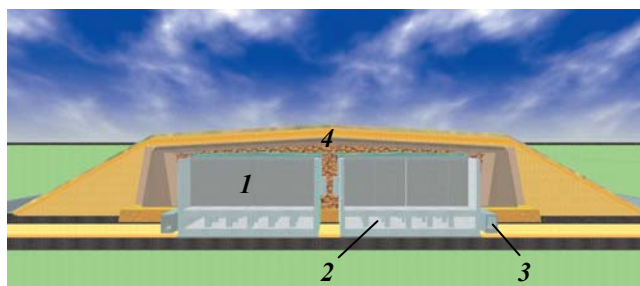
STOLA-Dessel developed two integrated disposal projects. They are distinguished by their preliminary technical projects, one being a preliminary surface disposal project and the other being a preliminary deep disposal project [3].

**The preliminary surface disposal project** developed by STOLA-Dessel comprises two double rows of sealed concrete disposal modules filled with monoliths also of concrete containing the conditioned waste (Figure 2). Each double row of modules is protected against penetration by rainwater by a multi-layer cover several metres thick, which forms a tumulus and whose final characteristics will be determined by future generations on the basis of the knowledge available at that time. There are two tumuli. The monoliths and disposal modules are designed to permit the formation of highly stable stacks that are sufficiently strong to bear the weight of the concrete top slab of the modules and the weight of the multi-layer cover.

The surface disposal facility is provided with a drainage system and inspection galleries that are situated on both sides of the double rows of modules and are intended to make it possible to check the water that will eventually penetrate the modules and might be contaminated. To place the inspection galleries out of reach of the water table, which is very close to the surface in this region, while at the same time permitting drainage by gravity, the disposal modules are raised from the ground by almost three metres: they all have an accessible “basement”, two metres high, which is itself constructed on a 0.6 metre-high embankment. The “basements”, which are accessible from the inspection galleries, are evidence of the importance attached by STOLA-Dessel to visual checks on the facility, and in particular to monitoring the absence of unacceptable cracks and of penetration by water.

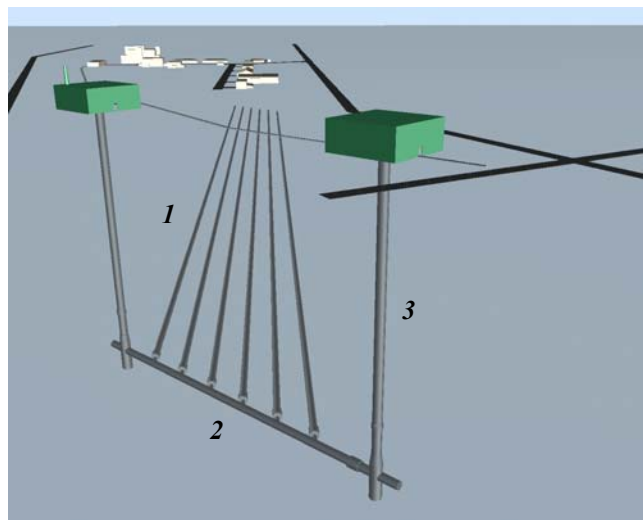
The surface disposal facility would, at the choice of STOLA-Dessel, be set up on a piece of land of several dozen hectares belonging to Umicore and adjoining at its eastern side the site operated by Belgoprocess.

**Figure 2 – The preliminary surface disposal project developed by STOLA-Dessel showing one of the two double rows of modules (1), two “basements” (2), the two inspection galleries (3) and the multi-layer cover (4) [credit STOLA-Dessel].**



In view of the waste inventory of 2003, the surface disposal facility developed by STOLA-Dessel could be limited to 34 disposal modules. As a precautionary measure, STOLA-Dessel does, however, agree to retain the number of modules calculated by ONDRAF/NIRAS on the basis of the previous inventory, i.e. 40 disposal modules arranged in two by two rows of 10 modules. The two corresponding tumuli would in such a case be about 412 metres long, 154 metres wide and 20 metres high.

**The preliminary deep disposal project** developed by STOLA-Dessel comprises six parallel disposal galleries 40 metres apart from one another and connected to the same side of the main gallery linking them, with which they form an angle of 45° to facilitate movement of the wagons intended to transport construction materials, excavated clay and the waste (Figure 3). The main gallery is itself linked to the surface by two access shafts, one being used to transport materials and radioactive waste and the other being used to transport staff, in particular. The disposal galleries, each with an internal diameter of 5.1 metres, will be filled with concrete monoliths containing the conditioned waste. The remaining gaps between the monoliths and between the monoliths and the disposal gallery wall will not be backfilled. The main gallery and the shafts will be backfilled with an appropriate material when the repository is closed.



**Figure 3 – The preliminary deep disposal project developed by STOLA-Dessel showing the six disposal galleries (1), the main gallery (2) and the two access shafts (3) [credit STOLA-Dessel].**

The deep disposal facility would be set up on the same piece of land as that chosen by STOLA-Dessel for setting up the surface disposal facility.

In view of the waste inventory of 2003, the deep disposal facility developed by STOLA-Dessel could be limited to a total of 9.3 km of disposal galleries. As a precautionary measure, STOLA-Dessel does, however, agree to retain the length of galleries calculated by ONDRAF/NIRAS on the basis of the previous inventory, i.e. 11.2 km, or even to consider six galleries, each of 2 km.

**The associated conditions** linked by STOLA-Dessel to its preliminary disposal facility projects may be summarised as follows [3, summary leaflet] (translation).

- *Conditions linked to safety and to monitoring the impact of the disposal facility on health and the environment.*
  - ▶ The *conditions linked to safety* are as follows, in particular:
    - establishment of emergency plans and regular information of the community;
    - creation of a specialist intervention team;
    - maintenance of nuclear know-how in the region.
  - ▶ The *conditions linked to health* are as follows, in particular:

- follow-up of the epidemiological data collected by STOLA-Dessel;
  - possibility of a free annual medical check for the inhabitants of Dessel.
- ▶ The *conditions linked to the environment* are as follows:
- periodic measurements of the quality of the air and the quality of the surface and underground waters close to the disposal facility and at Dessel itself and information of the community about the results of such measurements;
  - regular checks and follow-up of the companies of Dessel and neighbouring municipalities holding a Class I environmental permit and whose activities are likely to have an impact on the quality of the environment;
  - maximum use of the Bocholt-Herentals canal during construction of the disposal facility.
- The *maintenance of local participation*, by the creation of a permanent, representative and independent local participative structure with appropriate organisation and financing. The purpose of such a structure is to follow up the management of radioactive waste in the municipality of Dessel and, in particular, to follow up the evolution of the integrated project file of the municipality of Dessel, and to ensure that the community is informed of the various aspects of nuclear activities in the region.
- The *creation of short-term and long-term social, economic and cultural added value*, on the basis of the following three initiatives:
- ▶ *improvement of communication with the community*, via the creation of a *communication centre* devoted to nuclear matters, which would have to be designed to be flexible so that it could be equally useful for initiatives taken by the people of Dessel. The communication centre would combine in the same place a *reception and contact centre* for all questions relating to nuclear matters, a *digital and interactive network*, which would permit the exchange of information relating to nuclear matters, in particular, and a *scientific park devoted to radioactivity*, which would turn the nuclear aspect of the region into a tourist attraction.
  - ▶ *the creation of a “Fund for a sustainable Dessel”*, which would be intended to support varied projects staggered over time that would help to improve the quality of life, housing and work of the people of Dessel. Such a fund would facilitate adaptation to the needs of the community, since it could be used for projects of very different kinds. The fund would need to be financed by the Federal authorities since, by accepting the repository, Dessel would be providing a solution to a problem that affects all of society.
  - ▶ *town and country planning*, through adaptation of the *Ruimtelijk Structuurplan* [environmental structure plan], in order to provide more space for housing and for small and medium enterprises, and through transformation of the national N118 Geel-Retie route, which is being opened up.
- *Clear commitments*, including, in particular,
- ▶ limitation to 70500 m<sup>3</sup> of the volume of category A waste to be disposed of, any significant increase in this volume being subject to negotiation;
  - ▶ a financing guarantee for the entire integrated disposal project, from the transition to the project phase to the end of institutional control;

- ▶ maximisation of the positive effects on employment through locating all the activities associated with the disposal facility in Dessel; in the event of termination of nuclear activities, economic activity would have to be maintained on the grounds of the nuclear zone through their reallocation, decontamination of the buildings and the soils concerned and the encouragement of substitute economic activities and employment;
- ▶ the creation, in line with the condition relating to the maintenance of local participation (see above), of a follow-up group to be responsible for considering issues relating to the management of category B and C waste<sup>13</sup> in the municipality of Dessel, although the creation of such a group shall not in any way commit the municipality with regard to the long-term management of such waste. (This condition will continue to apply even if the repository for the category A waste is not constructed at Dessel.)

Finally, STOLA-Dessel considers it particularly important for the entire process of deciding whether or not the category A waste is to be disposed of at Dessel to be carried out transparently and that sufficient space be granted to the structure responsible for following up this issue, in order to create a climate of trust. From this viewpoint, STOLA-Dessel considers it necessary for the Government to take the requested decision as quickly as possible.

#### **4.2.2. The two integrated disposal projects of MONA**

MONA has developed two integrated disposal projects. They are distinguished by their preliminary technical projects, one being a preliminary surface disposal project and the other being a preliminary deep disposal project, and by slightly different settings [4].

**The preliminary surface disposal project** developed by MONA comprises two double rows of sealed concrete disposal modules filled with monoliths also of concrete containing the conditioned waste (Figure 4). Each double row of modules is protected against the penetration of rainwater by a multi-layer cover several metres thick, which forms a tumulus, so that there are two tumuli in total. The monoliths and disposal modules are designed to permit the formation of highly stable stacks that are sufficiently strong to bear the weight of the concrete top slab of the modules and the weight of the multi-layer cover.

The surface disposal facility is provided with a drainage system and inspection galleries that are situated between the double rows of modules and are intended to make it possible to check the water that will eventually penetrate the modules and might be contaminated. To place the inspection galleries out of reach of the water table, which is very close to the surface in this region, while at the same time permitting drainage by gravity, the disposal modules are constructed on a three-metre-high embankment.

The surface disposal facility would, at the choice of MONA, be set up on a strip of land extending to the boundary with the municipality of Dessel in the north and to the Bocholt-Herentals canal in the south. This land belongs to Umicore, except for a small portion

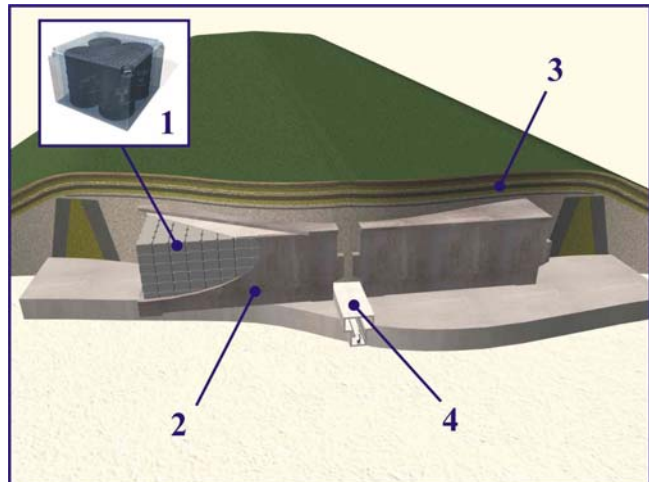
---

<sup>13</sup> Category B waste is long-lived low-level and medium-level waste. Category C waste is high-level waste.

belonging to the Belgian State, which is part of the site operated by Belgoprocess. It therefore adjoins the rest of the site operated by Belgoprocess.

In view of the waste inventory of 2003, the surface disposal facility developed by MONA could be limited to 34 disposal modules. This being said, MONA sets the maximum capacity of the repository at 84600 m<sup>3</sup> of waste, i.e. 20% more than the capacity necessary for the 2003 inventory, which means that it could contain up to 40 disposal modules, arranged in two by two rows of 10 modules. The two corresponding tumuli would in such a case be about 412 metres long, 154 metres wide and 20 metres high.

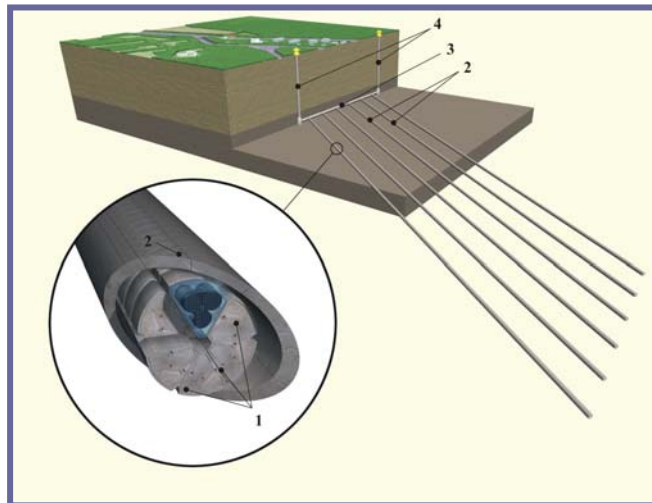
**Figure 4 – The preliminary surface disposal project developed by MONA showing stacking of the monoliths (1) in the modules (2), the multi-layer cover (3) and the inspection gallery (4) [credit IDEMAX].**



**The preliminary deep disposal project** developed by MONA comprises six parallel disposal galleries 40 metres apart from one another and connected to the same side of the main gallery linking them, with which they form an angle of 45° to facilitate movement of the wagons intended to transport construction materials, excavated clay and the waste (Figure 5). The main gallery is itself linked to the surface by two access shafts, one being used to transport materials and radioactive waste and the other being used to transport staff, in particular. The disposal galleries, each with an internal diameter of 5.1 metres, will be filled with concrete monoliths containing the conditioned waste. The remaining gaps between the monoliths and between the monoliths and the disposal gallery wall will not be backfilled. The main gallery and the shafts will be backfilled with an appropriate material when the repository is closed.

The deep disposal facility would, at the choice of MONA, be set up on a piece of land on either side of the Bocholt-Herentals canal, extending up to the boundary with the municipality of Dessel in the north. The part situated to the north of the canal belongs to Umicore, except for a small portion belonging to the Belgian State, which is part of the site operated by Belgoprocess. It therefore adjoins the rest of the site operated by Belgoprocess. The part situated to the south of the canal belongs to the Belgian Nuclear Research Centre (SCK•CEN).

In view of the waste inventory of 2003, the deep disposal facility developed by MONA could be limited to a total of 9.3 km of disposal galleries. However, since MONA fixes the maximum disposal capacity at 120% of the capacity necessary for the 2003 inventory, it could contain up to about 11.2 km of disposal galleries.



**Figure 5 – The preliminary deep disposal project developed by MONA showing the monoliths (1) in the six disposal galleries (2), the main gallery (3) and the two access shafts (4) [credit IDEMAX].**

**The associated conditions** linked by MONA to its preliminary disposal facility projects may be summarised as follows [4].

- *Safety must be maximum and be ensured as good as possible.*
- *The preliminary disposal facility project that will possibly move on to the project phase must be developed in compliance with the criteria prepared by MONA, among which control aspects play an important part, and which are added to the technical conditions of the Council of Ministers. In addition, MONA limits the disposal capacity to 84600 m<sup>3</sup>.*
- *The general conditions relating to participation, safety, environment and health must be met:*
  - ▶ information of the people of Mol, in Dutch, of matters relating to radioactive waste and nuclear issues in the region in general, and creation of a new independent and representative participative structure, whose mission would be widened; such a structure could be based on the structure of MONA (This condition will continue to apply even if the repository for category A waste is not constructed at Mol.);
  - ▶ as long as there are nuclear activities in the region, maintenance of nuclear knowledge in the region, in particular with regard to radiological protection and waste processing, and therefore maintenance of specialist personnel;
  - ▶ optimisation of the existing emergency plan and better distribution within the community, and optimisation of the emergency services and medical infrastructure in Mol;
  - ▶ continuing checks for radioactive contamination of the environment (air, water, soil, fauna and flora, etc.), which implies, in particular, trouble-free operation of the existing TELERAD measuring system and other monitoring programmes and their regular adaptation to international developments;
  - ▶ maximum limitation of the loss of environmental heritage and compensation where necessary;
  - ▶ preparation and implementation of an adequate repository control programme;

- ▶ continuation and development of the public health study carried out for MONA by the *Provinciaal Instituut van Hygiene* of Antwerp;
  - ▶ continuation of the study of the radiological reference value at the site and its environment intended to make it possible to subsequently reveal the impact or otherwise of the repository;
  - ▶ development of the transport study carried out for MONA by the *Centrum voor Beleidsmanagement*.
- The disposal facility must be integrated within a wider project, so that it provides added value for the local people. Only then will it be possible to talk of support from society: *the setting up of a disposal facility in the municipality of Mol is indissociably linked to the creation of a fund intended to improve the quality of life of the inhabitants of Mol and the region as a whole.*

*Finally, MONA and the local council of Mol wish the Government to read the final reports of MONA and STOLA-Dessel as a whole.*

#### **4.2.3. The integrated disposal project of PaLOFF**

The integrated disposal project of PaLOFF, which has been terminated by the local councils of Fleurus and Farciennes, comprised a preliminary half-buried disposal project and a set of associated conditions. This disposal facility would have been set up close to the centre of the IRE site. It comprised three cylindrical silos, each with an inspection “basement” communicating with the annular space between the silo and the slightly permeable moulded wall intended to insulate the silo from the water table (Annex A1).

#### **4.3. Assessment of the integrated disposal projects that have been developed and results of consultation with FANC**

The integrated disposal projects were developed, in the different partnerships, according to the need for optimum compliance with the conditions arising from the decision of the Council of Ministers of 16 January 1998: safety, feasibility, definitive character, progressiveness, flexibility, retrievability<sup>14</sup> and controllability on the one hand, and local integration of the disposal project on the other, while at the same time complying with the established participative process. ONDRAF/NIRAS has confirmed that it considers these various conditions to have been met by the various integrated disposal projects, including the project developed by PaLOFF, which was, however, terminated following the decisions of the municipalities of Fleurus and Farciennes (Section 4.3.1). The Federal Agency for Nuclear Control (FANC), which has been able to closely follow the development of all the preliminary disposal facility projects, has not, however, made any comments that are likely

---

<sup>14</sup> The decision by the Council of Ministers refers to a *reversible* solution. Because the concept of reversibility however includes both the concept of flexibility of the decision-making process and the retrievability of waste placed in a repository, ONDRAF/NIRAS tends to replace the term “reversibility” with the term “retrievability”.

to cast fundamental doubt on the radiological safety of any of the remaining preliminary disposal facility projects (Section 4.3.2).

#### **4.3.1. Confirmation of compliance of the integrated disposal projects with the conditions of the Council of Ministers**

In its capacity as the body having final responsibility for the technical studies, ONDRAF/NIRAS has evaluated the various integrated disposal projects that have been developed in terms of compliance with the conditions imposed by the decision of the Council of Ministers of 16 January 1998. Since it participated in the entire process of development of the preliminary disposal facility projects, assessment of compliance with the technical conditions was, in reality, more a formal well-argued confirmation of compliance with these conditions. These assessments, carried out according to the same framework for all the projects, were summarised in three reports (one for each partnership) [7, 8, 9], which were submitted by ONDRAF/NIRAS to its supervising Minister at the same time as the partnerships' reports and the decisions of the local councils. In view of the decisions of the local councils of Fleurus and Farciennes, assessment of the preliminary disposal project developed by PaLOFF was carried out for information only. ONDRAF/NIRAS has not, on the other hand, expressed an opinion on all the conditions associated with the disposal facilities, insofar as they do not all formally fall within its area of competence.

The next three sections summarise the main points of the assessments carried out by ONDRAF/NIRAS. The non-technical aspects, i.e. those relating to the participative process and financial aspects, are supplemented by a certain amount of additional information.

##### **4.3.1.1. Compliance with the established participative process modes and continuation of the process**

The five integrated disposal projects were developed in compliance with the established participative process modes.

Approval without amendment of the final reports of STOLA-Dessel and MONA by their respective general assemblies and by the local councils of Dessel and Mol also shows that the four integrated projects in question currently enjoy good local support. In both Dessel and Mol, neither the partnership nor the local council has expressed a preference for either of the two technical solutions developed.

On the other hand, the local council of Fleurus decided to terminate the studies relating to the integrated disposal project developed by PaLOFF, after which the local council of Farciennes refrained from expressing an opinion on the file. The participative process in Fleurus–Farciennes was therefore terminated.

In line with the wishes of STOLA-Dessel and MONA (Sections 4.2.1 and 4.2.2) and the two municipalities, the participative process continues in the form of partnerships in Dessel and Mol and was widened to include the management of radioactive waste in general:

- the STORA (*Studie- en Overleggroep Radioactief Afval Dessel* [Dessel Study and Consultation Group on Radioactive Waste]) partnership was created on 27 April 2005 (see also [www.stora.org](http://www.stora.org));

- the articles of association of the MONA partnership were amended on 24 November 2005 and the name of the non-profit organisation was amended from *Mols Overleg Nucleair Afval Categorie A* [Mols Consultation on Category A Nuclear Waste] to *Mols Overleg Nucleair Afval* [Mols Consultation on Nuclear Waste] (see also [www.monavzw.be](http://www.monavzw.be)).

The two partnerships and the two municipalities consider that when the integrated disposal project and the municipality where the disposal facility will be set up have been chosen, the other municipality and its partnership must be able to continue to participate in the decision-making process (Section 5.1).

#### **4.3.1.2. Compliance with the technical conditions imposed by the Council of Ministers**

In the current state of knowledge and in view of the legal framework in force, the five preliminary disposal facility projects comply with the technical conditions imposed by the Council of Ministers.

- ONDRAF/NIRAS considers that the preliminary disposal facility projects developed by STOLA-Dessel and MONA are suitable for transition to the project phase (see Part 2) [7, 8]: they are able to offer sufficient protection for man and the environment in the short and long terms and they are feasible. They are also definitive in nature and meet the conditions of progressiveness, flexibility, retrievability and controllability. The latter three characteristics are less marked in the case of deep disposal than in the case of surface disposal, however. They are also less important for deep disposal, especially with regard to retrievability and controllability, in view of the excellent confinement capacity of Boom Clay, which is present under the ground of the municipalities of Dessel and Mol.
- ONDRAF/NIRAS considers that the preliminary semi-buried disposal facility project developed by PALOFF was also suitable for transition to the project phase [9]. Like the preliminary disposal facility projects developed by STOLA-Dessel and MONA, it offers a priori sufficient protection for man and the environment in the short and long terms and it is feasible. It is also definitive in nature and meets the conditions of progressiveness, flexibility, retrievability and controllability.

#### **4.3.1.3. Estimation of the costs of the integrated disposal projects**

The extension in 1998 of the concept of disposal project, which had up to then been limited to infrastructures of a strictly technical nature, to include the concept of *integrated* disposal project, requiring integration of the disposal project in a wider project offering added value at a local level naturally has an impact on the total costs of the project and therefore on its financing, which must therefore be widened as a result.

It will be recalled that according to the method presented in the European ExternE study of the European Commission (1995) [22], the environmental detriment associated with the setting up of a surface disposal facility and, in particular, the detriment associated with the expected radiological impact, is estimated at 11.2 MEUR<sub>2003</sub> [2].

According to the partnerships methodology, the partnerships could themselves determine the conditions providing added value for the local community. The STOLA-Dessel and MONA partnerships did not wish to estimate the costs of these conditions.

An initial estimate by ONDRAF/NIRAS produced an amount in the order of 70 MEUR<sub>2005</sub> in order to meet these conditions. This amount is purely indicative, since the concrete development of the integrated disposal project is one of the main aims of the project phase. The real costs will not be known until the end of this phase. Of course, there is no agreement between the different parties about these costs at present.

The costs of the disposal facility (from the start of the implementation phase to the end of institutional control) are estimated at 350 to 500 MEUR<sub>2005</sub><sup>15,16</sup> for a surface repository and at 680 to 1060 MEUR<sub>2005</sub> for a deep repository.

The technical costs of the integrated disposal projects are covered by the long-term fund (FLT—Section 6.2.2), which is built up by means of a contractual rate mechanism calculated on the basis of the hypothesis of a surface repository. The choice of an integrated deep disposal project would require revision of the current agreements and a considerable increase in the rates. The FLT mechanism will need to be supplemented by one or more other mechanisms in order to be able to ensure financing of the integrated disposal project selected in its entirety (Section 6.2.2). The costs of the project phase will be covered by agreements between ONDRAF/NIRAS and the waste producers and by the Belgian State in its capacity as the party financially responsible for the liabilities (Section 6.2.1).

#### **4.3.2. Results of consultation with the safety authorities and the competent bodies in the area of environmental protection**

As requested by the decision of the Council of Ministers, ONDRAF/NIRAS has worked in close collaboration with FANC with regard to all aspects related to the safety and environmental impact of the preliminary disposal facility projects. At the request of FANC, the following bodies have been included in the consultation:

- *regarding aspects of radiological safety, Association Vinçotte Nucléaire* [Vinçotte Nuclear Association] (AVN);
- *regarding environmental aspects*, the competent Flemish and Walloon regional bodies, i.e.
  - ▶ for the Flemish Region, *Administratie Milieu-, Natuur-, Land- en Waterbeheer* [Department for Environment, Nature, Land and Water Management] (AMINAL, unit MER (*Milieueffectrapportage*)) and *Openbare Afvalstoffenmaatschappij voor het Vlaamse Gewest* [Public Waste Company for the Flemish Region] (OVAM);

---

<sup>15</sup> Base costs subject to margins of uncertainty to reflect the technological and project hazards in line with the methodology developed in the United States by the Electric Power Research Institute (EPRI) in connection with the analysis of the costs of electronuclear facilities.

<sup>16</sup> All the costs estimates relate to the inventory of 2003.

- ▶ for the Walloon Region, *Direction générale des Ressources naturelles et de l'Environnement* [Directorate General of Natural Resources and the Environment] (DGRNE).

All the preliminary disposal facility projects have been developed, with regard to radiological safety aspects, in accordance with the approach described in the safety charter drawn up by ONDRAF/NIRAS, which was the subject of detailed discussions between FANC and AVN. This charter describes the general approach to be adopted to ensure the safety of a disposal facility and to show that the required level of safety has actually been reached.

During the preliminary project phase, ONDRAF/NIRAS carried out or arranged a number of technical and scientific studies, including preliminary assessments of the safety and environmental impact of the preliminary disposal facility projects proposed by STOLA-Dessel, MONA and PALOFF.

- The studies concerning safety have been discussed in detail with FANC and AVN.
- The studies concerning environmental impact have been discussed in detail with FANC and AMINAL and OVAM on the one hand or with FANC and DGRNE on the other.

Comments, questions and reservations expressed by FANC, AVN, AMINAL, OVAM and DGRNE were discussed systematically, which made it possible for each of them, taking into account the information and explanations provided by ONDRAF/NIRAS, to agree:

- either to deal with the matter in question during the preliminary project phase;
- or to defer the matter in question to a possible project phase, to enable it to be dealt with in detailed studies.

OVAM [23] and DGRNE [24] each sent ONDRAF/NIRAS a preliminary advice in which they do not cast doubt on the validity of the preliminary projects that have been developed.

According to ONDRAF/NIRAS, the comments made by the competent bodies have not revealed any insurmountable problem regarding the preliminary disposal facility projects. ONDRAF/NIRAS considers that all the outstanding questions and comments relating to the remaining preliminary projects (STOLA-Dessel and MONA) can be satisfactorily dealt with in future work during the project phase, which is intended in particular to obtain the necessary licences and permits.

To be more specific, during its discussions with ONDRAF/NIRAS, FANC did not make any comments that cast fundamental doubt on the radiological safety of any of the remaining preliminary disposal facility projects (STOLA-Dessel and MONA).

Final confirmation that the disposal facility to be implemented really does offer the required level of safety will be provided at the end of the project phase, via the safety report to be submitted to FANC in the nuclear licensing procedure. An environmental impact assessment (EIA, referred to as MER<sup>17</sup> in the Flemish Region) must also be submitted to FANC during the same procedure.

---

<sup>17</sup> The name MER is used in the rest of this report, since the integrated disposal projects submitted to the Government are submitted by municipalities in the Flemish Region.

## Part 2: Outline of the programme based on the requested decision and financing guidelines

The decision that the Government is requested to make, i.e. *to continue the development of one of the integrated disposal projects submitted by STOLA-Dessel or MONA*, will mark the transition of the programme to the project phase (Figure 6). At the current stage, the outline of the future programme (Chapter 5) mainly focuses on the project phase and, in particular, on the detailed studies of the integrated disposal project to be continued. One important aspect of these studies, which has been the subject of preliminary consideration, will be to widen the financing planned (Chapter 6).

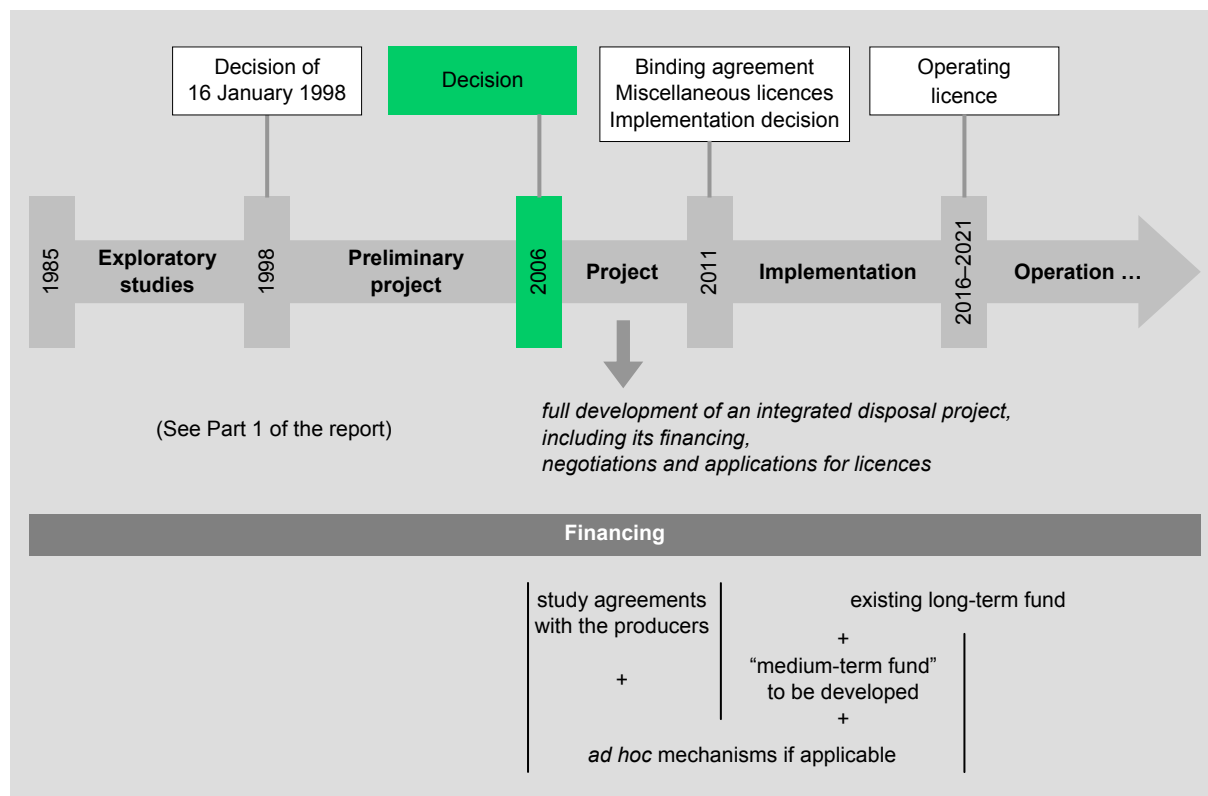


Figure 6 – General overview of the programme for the long-term management of category A waste from the point when the Government takes the requested decision. This decision will mark the transition of the programme to the project phase, which will, in particular, be devoted to detailed studies of the selected integrated disposal project, including detailed studies of its financing.

## 5. Outline of the future programme

The future programme will commence at the time when the Government decides to continue development of the disposal programme. The programme comprises the following phases: the project phase (Section 5.1), the implementation phase (Section 5.2) and the operational, closure and institutional control phases (Section 5.3). It will be carried out in the spirit of dialogue and collaboration that has prevailed since 1998.

### 5.1. Project phase

The project phase must take the integrated disposal project from its current status to the status of a project ready for implementation, i.e. a project that has received the agreement of all the parties concerned and for which all the necessary licences have been obtained. It will therefore relate to all the aspects of the integrated disposal project: disposal facility, associated conditions, financing and legal aspects, preparation of the files relating to applications for nuclear and non-nuclear licences, etc. (see also Annex A2).

As far as ONDRAF/NIRAS is concerned, the partnerships will remain the centre of the participative process at a local level during the project phase. The transition to the project phase will, however, make it necessary to search for a participation method that is appropriate to the new situation, i.e. that the location of a specific disposal facility will have been decided upon and that local support will have to be as broad as possible. The impact of a disposal facility will indeed go beyond the administrative boundaries of the municipality in question. This means that the other municipality that has submitted proposals will retain the right to participate in specifying the conditions associated with the disposal facility. The other stakeholders will also be able to make themselves known, which will make it possible to take account of their interests as long as the basic principles of the participative process are observed. Just as when the partnerships were created, ONDRAF/NIRAS wishes to base its approach on a detailed enquiry among the relevant parties, from which it will be possible to develop an appropriate participative model. As far as ONDRAF/NIRAS is concerned, the municipality where the selected integrated disposal project will be set up and its partnership will remain the first discussion partners; the other municipality and its partnership will be obligatory discussion partners, and may defend their interests in an equivalent way. The selected disposal project will provide a basis for a more detailed definition of the project, making it possible to determine the contents of a final integrated disposal project.

The intended participative process must enable ONDRAF/NIRAS to take all the measures necessary to be able to complete the detailed studies, while as far as possible keeping to the timetable and budget that will have been previously established by mutual agreement.

The integrated disposal project can only be implemented when the following two aims have been met:

- a *binding agreement* comprising at least the following four aspects must be signed by all the parties concerned, when the remaining negotiations have been completed:

- ▶ the *detailed description of the integrated disposal project to be implemented*, both as regards the disposal facility and the associated conditions;
  - ▶ the *(participative) management structure of the integrated disposal project* from the start of its implementation, including the roles and responsibilities of the various parties;
  - ▶ the *financing of the integrated disposal project*, in particular the modes for setting up and providing the financing intended to cover the costs of the associated conditions, taking account of the constraints expressed by the various parties;
  - ▶ the *general timetable for implementation* of the various components of the integrated disposal project.
- obtaining *all the necessary licences and permits* from the competent authorities, mainly comprising
    - ▶ the nuclear creation and operating licences (see below) (unless preference is given to a global application for all the nuclear facilities at the disposal site);
    - ▶ the environmental permits (insofar as they are not included in the nuclear creation and operating licences);
    - ▶ the building permits (for the actual repository and other buildings on and outside the disposal site);
    - ▶ if applicable, the *ad hoc* permit for construction of an underground facility.

The existence of a binding agreement will depend on the existence of the legal instruments (laws, royal decrees, etc.) that will be necessary to ensure an adequate legal basis for the new financing mechanism(s).

ONDRAF/NIRAS estimates the duration of the project phase to be four to five years, i.e. that three or four years will elapse before submission of all the necessary files in connection with the various licence applications and an additional year to obtain the relevant licences. Keeping to this timetable depends on a number of factors, however, in particular the time needed to reach a binding agreement and for ONDRAF/NIRAS to obtain the “creation and operating” licences referred to in the Royal Decree of 20 July 2001 “*comprising general rules for protection of the population, workers and the environment against the danger of ionising radiation*” [25]. These licences will be issued to it by the competent authorities subject to conclusive examination of the licence application file. This file must contain a safety report and a MER relating to the radiological and non-radiological impact of the facility on the environment.

The main factors relating to creation and operating licences that are likely to have an impact on the duration of the project phase are as follows (see also Annex A3).

- *ONDRAF/NIRAS must be able to organise its work efficiently and must therefore receive certain pieces of information from FANC in good time.* Those pieces of information are of two different types: licensing procedure modes, which are imperative, and items of regulatory “guidance”.
  - ▶ The licensing procedure is currently being adapted by FANC. The Royal Decree of 20 July 2001 does indeed not distinguish between repositories and other Class I nuclear facilities, such as nuclear power plants or facilities for processing and conditioning radioactive waste. The existing licensing procedure is not appropriate for disposal facilities, since it does not take account of certain special features of

such facilities, such as the fact that, unlike other nuclear facilities, they are closed and not dismantled when they cease to be operated. The new licensing procedure will be included in the regulatory framework.

- ▶ The regulatory “guidance” items required in order to be able to carry out the safety assessments necessary for preparation of the safety report for the repository are being drawn up. They relate, in particular, to the safety criteria (dose, risk or other criteria) against which the calculated long-term radiological impact must be compared and the way in which the intrusion scenarios must be handled (scenarios, timescales and comparison criteria). The Royal Decree of 20 July 2001 indeed sets the limit for the effective dose received by members of the public (1 mSv per year) and by workers exposed in the course of their work (20 mSv per sliding period of 12 successive months), but does not lay down any specific provision for repositories.
- *ONDRAF/NIRAS must be able to duly ensure that the focus of its work keeps complying with the safety requirements and must therefore be formally followed up by FANC.* This formal follow-up will be organised within the existing FANC-ONDRAF/NIRAS contact committee created in 2003 in line with the provisions of Article 33, final paragraph<sup>18</sup>, of the Royal Decree of 20 July 2001. It will be based on predefined milestones preceding submission of the licence application file to FANC, with regard to which milestones FANC is already to issue an interim advice and inform ONDRAF/NIRAS of its comments and recommendations concerning safety. FANC would issue interim advices on aspects of the selected integrated disposal project requiring particular attention by ONDRAF/NIRAS, the general description of the disposal facility, the methodology and tools used for safety assessments and the qualification files of the models and codes used. The final results of the safety assessments will be included in the licence application file.
- *The current legal uncertainties regarding the allocation of competences for the assessment of the MER must be eliminated in time for the start of preparation of the MER.* The Royal Decree of 20 July 2001 does indeed not specify the way in which the regional bodies responsible for environmental protection are to assess the MER to be submitted to FANC at the time of the licence application. This aspect must be specified in the collaboration agreements between FANC and these bodies.

In addition, the law of 13 February 2006 [26] transposing European Directive 2001/42/EC of 27 June 2001 [27] requires ONDRAF/NIRAS (Article 6, § 1) to assess the impacts of the “*general programme for the long-term management of radioactive waste provided for in Article 2, § 3, of the Royal Decree of 30 March 1981 determining the missions and setting out the operating modes*” of ONDRAF/NIRAS [28]. ONDRAF/NIRAS will meet this requirement in its general plan for the management of radioactive waste. It considers that it has already substantially complied with the legal requirements for category A waste, in particular by the studies that formed the basis for the decision by the Council of Ministers, in 1998, to choose a long-term management solution that was definitive in nature, progressive, flexible,

---

<sup>18</sup> “The Agency shall conclude with ONDRAF/NIRAS an agreement aimed at mutual consultation and the exchange of information concerning those aspects of radioactive waste management that might affect the way the two institutions exercise their competences.” (translation)

reversible and controllable, and by setting up a participative methodology from 1998 onwards.

The project phase will be financed by agreements between ONDRAF/NIRAS and the waste producers and by the Belgian State in its capacity as the party financially responsible for the liabilities (Section 6.2.1). It could, however, also already include the introduction of *ad hoc* mechanisms for financing certain parts of the integrated disposal project on condition that all the parties concerned agree to it.

## **5.2. Implementation phase**

The implementation phase of the integrated disposal project will comprise

- the construction of the disposal facility;
- the simultaneous implementation of the conditions associated with the disposal facility.

The implementation phase is expected to take about five or ten years, depending on whether the repository to be constructed is a surface disposal facility or a deep disposal facility. It shall be completed on confirmation of the creation and operating licences by the competent authorities. By that date, the associated conditions must have been met and all of the agreed resources must have been placed at the disposal of the local beneficiaries. It shall be financed by FLT and by the new mechanism(s) that will have been created for this purpose (Section 6.2.2).

## **5.3. Operational, closure and institutional control phases**

The operational, closure and institutional control phases are defined in terms of the stage reached by the disposal facility.

- The operational phase, which will itself be carried out in a number of phases, is the phase during which the radioactive waste will be placed in the disposal facility. It will continue until closure of the facility, which may commence around 2045. It is conceivable, however, that closure of the facility may be deferred for a number of years for control purposes (in the case of deep disposal) or a number of decades (in the case of surface disposal) after completion of operation, which would make it possible to change the planned closure method if necessary.
- The closure phase is the phase during which all the means of accessing the waste placed in the disposal facility will be gradually closed and during which the last engineered barriers will be constructed. It will take a few years.
- The institutional control phase is the phase during which the disposal facility will be monitored after its closure. Its duration will be defined by FANC and by future generations. ONDRAF/NIRAS currently envisages it lasting between 200 and 300 years in the case of surface disposal. In the case of deep disposal in Boom Clay, institutional control could be virtually limited to measures intended to preserve the memory of the repository's location, in order to limit the risks of human intrusion.

The operational, closure and institutional control phases will be financed by FLT.

## **6. Financing of the future programme**

Because the local partnerships methodology resulted, in 1998, in the expansion of the disposal facility project from what had always been imagined previously in order to transform it into an integrated project comprising both technical and societal components, it will also be necessary to widen its financing accordingly. This will result in the application of different mechanisms depending on the stage reached in the programme (Section 6.2). In any case, these mechanisms, one or more of which have yet to be established, must meet certain basic principles (Section 6.1).

### **6.1. Basic financing principles**

Financing of the integrated disposal project to be proceeded with must meet certain basic principles. These principles have been the subject of exploratory discussions with Electrabel (the main producer of category A waste) and have been explained to STORA and MONA. They comprise a priori at least the following five principles:

- the integrated disposal project will be financed in its entirety by the producers of the waste to be disposed of and by the Belgian State in its capacity as the party financially responsible for the liabilities<sup>19</sup>;
- there may be derogation from the strict application of the previous principle for the purpose of financing conditions that may be associated with the presence of both the disposal facility and other nuclear facilities, on condition that financing remains the responsibility of the nuclear sector;
- all the financing mechanisms must have a legal basis in order to ensure the legal security of the parties, which will require changes to the existing legal and regulatory framework;
- provision of the financial means necessary for implementation of the conditions associated with the disposal facility must be linked to the speed of implementation of the disposal facility and be completed in time for the facility to be commissioned;
- the total costs of the integrated disposal project must be in proportion to the costs of the disposal facility, given the fact that the costs of disposal will not be affected by the number of municipalities concerned.

### **6.2. Financing of the future programme**

The financing of the future programme will be different depending on whether the integrated disposal project is in the project phase (Section 6.2.1) or has reached the implementation stage (Section 6.2.2).

---

<sup>19</sup> This principle is not in line with the position of STOLA-Dessel (Section 4.2.1) and STORA regarding the financing of the "Fund for a sustainable Dessel".

### 6.2.1. Financing of the project phase

According to the provisions of the Royal Decree of 16 October 1991 “*amending the Royal Decree of 30 March 1981 determining the missions and setting out the operating modes*” of ONDRAF/NIRAS (Article 3, § 2) [29], the project phase will be financed by agreements between ONDRAF/NIRAS and the waste producers and by the Belgian State in its capacity as the party financially responsible for the liabilities. These agreements will be completely separate from the financing agreements of FLT. If applicable and subject to agreement between all the relevant parties, certain parts of the integrated disposal project may already be partly completed during the project phase and be financed by *ad hoc* mechanisms agreed between the parties.

### 6.2.2. Financing from the implementation phase

The financing of the integrated disposal project from the implementation phase must apply at least two different mechanisms:

- the existing FLT mechanism (see box on the following page);
- another mechanism to be developed, which could be called “medium-term fund” (FMT).

Apart from the fact that the legal framework relating to ONDRAF/NIRAS permits a certain ambiguity of interpretation of the types of costs that FLT can finance<sup>20</sup> [29] (does this or does this not relate exclusively to technical costs?), the FLT mechanism is indeed not appropriate for ensuring full medium-term financing of all the conditions associated with the disposal facility, for the following two reasons.

- FLT is funded according to a contractual rate mechanism calculated to cover the costs of the technical operations necessary for implementation of a disposal facility, which therefore do not include any non-technical costs. (The rates are calculated on the assumption of a surface disposal facility.)
- FLT is funded as waste is received by ONDRAF/NIRAS and it is not limited in time, whereas the financing necessary to cover the costs of the conditions associated with the disposal facility must have been placed fully at the disposal of the parties responsible for implementing them by the time the disposal facility is commissioned at the latest. This constraint makes it necessary to disconnect this part of the financing from the rate at which waste is received by ONDRAF/NIRAS.

According to exploratory discussions held by ONDRAF/NIRAS with various waste producers, it should be possible to organise, in a few years, a fund to which the waste producers and the Belgian State (in its capacity as the party financially responsible for the liabilities) would

---

<sup>20</sup> According to Article 16 of the Royal Decree of 16 October 1991, FLT must (translation) “*cover the costs of activities necessary for the disposal of radioactive waste, in particular their possible disposal in geological layers.*” Although, in the integrated project approach, all the conditions associated with the preliminary disposal facility project are part of the “*activities necessary for the disposal of radioactive waste*”, the fact that the costs items that must be included in calculating the amount of the fees that ONDRAF/NIRAS must impose on the beneficiaries of its services must be submitted for comment to the Permanent Technical Committee (Article 15, § 4) suggests that the only costs that can be covered by FLT are the technical costs of the long-term management of waste.

contribute on the basis of the most objective code currently in existence, i.e. the reservation of capacity code (see box below). This medium-term fund would be created at the start of the implementation phase. It would be used to finance the implementation of conditions that cannot be financed by FLT, such as the constitution of a local development fund. Changes to the existing legal and regulatory framework will be necessary. If applicable, FMT could be supplemented by any *ad hoc* mechanisms introduced during the project phase.

### The long-term fund in short

Under the legal provisions of the Royal Decree of 30 March 1981 defining the missions of ONDRAF/NIRAS and determining its operating modes, ONDRAF/NIRAS has set up a tool, the long-term fund (FLT), in order to ensure that it will have in good time the necessary means at its disposal to finance the technical operations, including interim storage, which are needed to complete its long-term radioactive waste management mission. This means that future generations will not have to bear the consequences of activities from which they have not benefited. Taking the mechanism of a pension fund as a basis, ONDRAF/NIRAS has chosen for FLT a funding system to which the waste producers and the Belgian State (in its capacity as the party financially responsible for the liabilities) contribute whenever they hand waste over to ONDRAF/NIRAS and of which ONDRAF/NIRAS accepts ownership. Such a transfer of ownership is subject to verification that the waste complies with the relevant acceptance criteria.

The funding mechanism for FLT ensures that ONDRAF/NIRAS will be able to cover its fixed costs under all circumstances and will enable it to cover its variable costs as they arise. It is based on the following three basic ideas:

- *reservation of capacity*, which means that each of the main producers notifies ONDRAF/NIRAS of its total waste production programme, enabling ONDRAF/NIRAS to share its fixed costs between the producers;
- *tariff payments*, which means that each producer pays FLT a contribution based on the total costs of the long-term management of the waste handed over to ONDRAF/NIRAS;
- *contractual guarantee*, which means that each of the main producers commits itself to pay FLT the balance of the fixed costs attributable to its waste that has not already been covered by the tariff payments.

The provisions according to which FLT must operate are set out in agreements between ONDRAF/NIRAS and the waste producers together with the Belgian State (in its capacity as the party financially responsible for the liabilities). These agreements also provide mechanisms intended to make it possible, if applicable, to make advance payment of the funds necessary for the implementation of a disposal facility for the amounts of the contractual guarantee. The working assumptions of ONDRAF/NIRAS and the contractual quantities announced by the producers are adjustable every five or ten years in principle, or earlier in the case of *force majeure*. Regarding category A waste, the main economic assumptions of the outstanding agreements are that it will be *disposed of on the surface, on one site only*. However, the next review of rates is scheduled for 2008, in order to make the contractual due dates coincide with the federal contribution.

The assets of FLT are managed in line with the provisions of the Royal Decree of 4 April 2003, amending the Royal Decree of 30 March 1981, requiring ONDRAF/NIRAS to invest its assets exclusively in financial instruments of the Federal State of Belgium.

## 7. Final considerations

In this report, which follows on from the files relating to the integrated disposal projects developed by STOLA-Dessel [3, 7], MONA [4, 8] and PaLOFF [5, 6, 9], ONDRAF/NIRAS supplies the final information necessary to enable the Federal Government to take an informed decision on the continuation of the programme for the disposal of category A waste. Whereas until 1997, ONDRAF/NIRAS was unable to offer a concrete solution to the issue of the long-term management of such waste, since all the municipalities potentially concerned by the setting up of the generic disposal concept being considered at that time were opposed to it, the situation is now very different: two municipalities (the municipalities of Dessel and Mol) have declared themselves willing to consider the implementation on their territory of the surface or deep disposal facility developed by their respective partnerships subject to compliance with the conditions associated with the setting up of these facilities. These conditions specifically reflect the concerns and values of the community from which they originate and are justified by the fact that the municipality that agrees to the setting up of a disposal facility on its territory will provide a considerable service to all the people of Belgium.

According to ONDRAF/NIRAS, the four integrated disposal projects submitted to the Government are sufficiently mature to be the subject of detailed studies in the project phase: it considers that they meet the conditions set out by the Council of Ministers in its decision of 16 January 1998 and, according to the exploratory discussions conducted with various waste producers, it should be possible to secure full financing for them.

- **Participative process** The integrated projects have been developed by the partnerships in compliance with the modes of the participative process. Approval without amendment of the final reports of STOLA-Dessel and MONA by their respective general assemblies and by the local councils of Dessel and Mol also shows that the four integrated projects enjoy good local support. In both Dessel and Mol, neither the partnership nor the local council has expressed a preference for either of the two technical solutions developed. Finally, the participative process is being continued both in Dessel and in Mol, in the respective forms of the STORA and MONA partnerships, and has been extended to include the management of radioactive waste in general.
- **Technical conditions** At the current level of knowledge, and in view of the legal framework in force, ONDRAF/NIRAS considers that the four preliminary disposal facility projects that have been proposed can offer sufficient protection to man and the environment in both the short and the long term and that they are technically feasible. The two preliminary surface disposal projects are the outcome of a systemic approach followed in partnership: these are made-to-measure projects adapted both to the characteristics of the sites selected by the partnerships for their setting up and to the actual wishes of the partnerships. They are just as valid, in terms of safety, as the relatively simple preliminary project developed in the nineties by ONDRAF/NIRAS for areas of a particular type in Belgium.

Furthermore, the four preliminary projects are definitive in nature and meet the conditions of progressiveness, flexibility, retrievability and controllability. The latter three characteristics are, however, less marked for deep disposal than they are for

surface disposal. They are also less important for deep disposal, especially with regard to retrievability and controllability, in view of the excellent confinement capacity of Boom Clay, which is present under the ground of the municipalities of Dessel and Mol.

Finally, FANC and the Flemish regional bodies responsible for environmental protection have not made any comments likely to cast fundamental doubt on the four preliminary disposal facility projects that have been developed.

- **Financial aspects** The extension in 1998 of the concept of disposal project, which had up to then been limited to infrastructures of a strictly technical nature, to the concept of *integrated* disposal project, implying the integration of the disposal project in a wider project offering added value at a local level, naturally has an impact on the total costs of the project and therefore on its financing, which must therefore be widened as a result.

The technical costs of the integrated projects are covered by the existing FLT mechanism. Because the rates for the collection of waste have been calculated on the assumption of surface disposal, they would need to be significantly increased to be able to cover the costs of an integrated deep disposal project.

Coverage of the costs of the associated conditions lying outside the scope of the activities covered by FLT makes it necessary to develop one or more additional financing mechanisms. According to exploratory discussions conducted with various waste producers, the constitution over about ten years of the new fund being considered, FMT, seems to be a reasonable solution. If applicable, this fund could be supplemented by *ad hoc* mechanisms.

Therefore insofar as

- ONDRAF/NIRAS has completed the missions it was given by the Council of Ministers in its decision of 16 January 1998,
- in this report, ONDRAF/NIRAS provides the Government with the final items in its possession that are likely to be of assistance in decision-making,
- the four integrated disposal projects proposed to the Government by the municipalities of Dessel and Mol currently enjoy good local support,

**ONDRAF/NIRAS requests the Government to decide to proceed with the development of one of the integrated disposal projects submitted by STOLA-Dessel or MONA. Such a decision requires**

- **a choice of disposal option (surface or deep disposal);**
- **designation of a location for the disposal facility in a municipality;**
- **a mission to specifically develop the conditions associated with the project.**

Such a decision is necessary for the following reasons:

- to avoid passing on to future generations burdens resulting from activities from which they have not benefited;
- to avoid confronting the municipalities in which waste is currently stored with a *de facto* situation of extended storage;
- to permit efficient industrial management of waste in the short and medium terms;
- to keep local support at its current level;
- to ensure continuity of the disposal programme, *which otherwise will come to a halt*;

- to keep the costs of studies in the project phase within reasonable limits.

The municipality of Dessel and STORA, the municipality of Mol and MONA and ONDRAF/NIRAS also wish this decision to be taken as quickly as possible.

The development of the selected integrated disposal project must take the project from its current status to the status of a project that is ready for implementation, which may be reflected by the following two objectives for the project phase, which is expected to last five years:

- the signing by all the parties concerned of a binding agreement setting out the modes of implementation of the selected integrated project and the rights and duties of the parties;
- obtaining all the necessary licences and permits from the competent authorities.

The signing of a binding agreement between the parties and obtaining the necessary licences and permits require a number of conditions to be met, however. It would be necessary, in particular,

- *for ONDRAF/NIRAS to be able to take the initiatives necessary to maintain and widen the participative process and to strengthen local support:* ONDRAF/NIRAS envisages, in particular, redefining the modes of the participative process at the start of the project phase in order to take account of local realities and the needs of the project phase, on the understanding that it is the integrated disposal project selected by the Government that will provide the basis for future discussions and negotiations;
- *for ONDRAF/NIRAS to be able to negotiate with all the parties concerned the binding agreement that must enable the selected integrated project to be implemented;*
- *for ONDRAF/NIRAS to be able to work out proposals for the changes to the legal and regulatory framework that will be necessary to ensure the legal security of the parties;*
- *for FANC to provide ONDRAF/NIRAS with various pieces of information in good time, i.e.*
  - ▶ the amended licence application procedure;
  - ▶ the regulatory “guidance” items necessary for safety assessments;
  - ▶ the modes on the basis of which the competent regional bodies will participate in assessment of the MER;
- *for FANC, in view of the pioneering nature of the project, to formally follow up the work of ONDRAF/NIRAS and provide provisional interim advices on the previously agreed upon topics, in particular a systematic analysis of items relating to the selected integrated project that require special attention.*



# **Annexes**



## A1. The integrated disposal project of PaLOFF

The preliminary half-buried disposal project developed by PaLOFF [5, 6] comprises three cylindrical concrete silos, each with an inside diameter of 57 metres and an inside height of 27 metres (Figure 7). Beneath each of the silos, there is an inspection “basement”, which is intended to be used to monitor evolution of the facility. The “basement” communicates with the annular space between the silo and the little permeable moulded wall, which provides insulation from the water table. It is accessed by means of a side gallery situated just below ground level. A discharge gallery linked to the annular space collects any uncontaminated water penetrating from the water table and makes it flow into the Sambre, at the bottom of the site. When filled, the silo is sealed off with a concrete slab. This is finally covered with a multi-layer cover several metres thick in the form of a tumulus of about 90 metres in diameter, which protects it against penetration by rainwater, and whose summit reaches 9 metres above ground level. A control tank beneath the silo collects the rainwater that will eventually penetrate and that might be contaminated by the waste.

According to the studies by PaLOFF, the half-buried disposal facility should have been set up close to the centre of the IRE site. The selected ground is located in the most favourable area according to ONDRAF/NIRAS from the viewpoint of stability of the ground and takes account of its hydrogeological characteristics and of the industrial and residential environment.

The half-buried disposal facility has capacity for 36000 monoliths, i.e. 15% more than the number of monoliths corresponding to the waste inventory of 2003.

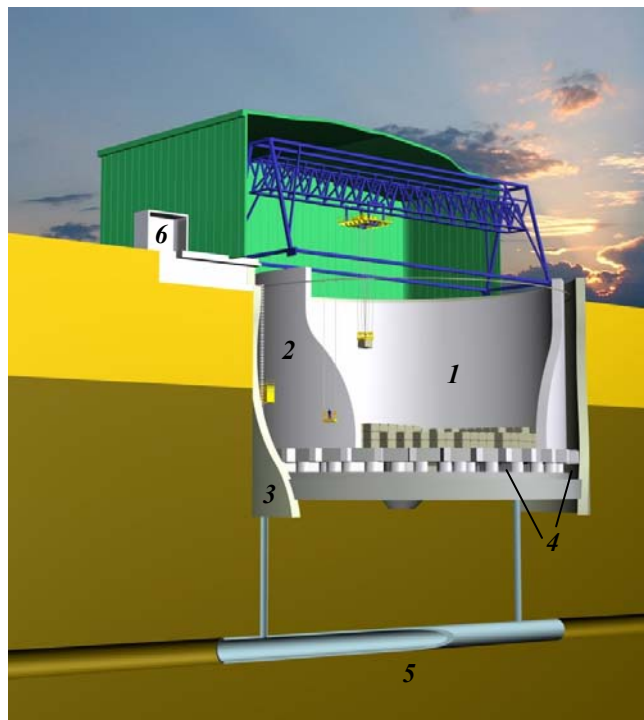


Figure 7 – The preliminary half-buried disposal project developed by PaLOFF showing, in particular, the monoliths (1), the containment silo (2), the moulded wall (3), the inspection “basement” and the annular space (4), the discharge gallery (5) and the side access (6) [credit Belgatom].

**The associated conditions** linked by PALOFF to its preliminary disposal facility project have been summarised by PALOFF as follows (translation) [5].

*“A local property corporation, several crèches and a projects exchange will be set up in Fleurus.*

- *The local property corporation will carry out property renovation and community infrastructural development operations and provide assistance for people involved in the housing sector. In an initial phase, 120 new or renovated homes will be created. Structures for accommodating crèches and community centres will also be made available for the inhabitants of Fleurus with the most needs: people whose mobility is limited by age or disability, people who are being reintegrated into society, young children and teenagers requiring extra-curricular support, senior citizens and young families.*
- *Opening and managing crèches meets the expectations of young families and constitutes the second kind of development to be carried out.*
- *The Projects Exchange will have the function of supporting district events and new projects arising from the process of participation by the inhabitants, paying special attention to initiatives that bridge the generations.*

*At Farciennes, monuments bearing witness to a pre-industrial and industrial past have been included in view of their potential as structures owned by and providing a service to the community.*

- *The restoration of the Vieux Château [Old Castle] will have an impact on the heritage from the past while at the same time significantly affecting areas such as support to associations, education, culture, discovery of a complex environment, leisure, economic development, educational activities and energy savings.*
- *The conversion of the Cultural Centre to an efficient theatre will make it possible to considerably increase the quality and quantity of musical and theatrical events.*
- *The transformation of the Tour du Roton [Roton Tower] into an “Extreme tower” will turn this into a site devoted to climbing sports that is unique in Belgium or even Europe. This primary function will be supplemented by highly original museum and catering facilities (in particular, a panoramic restaurant).*
- *A Projects Exchange will supplement this facility by creating and encouraging any relevant local development initiative.*

*In addition to these projects specific to the two entities, two joint projects have been prepared [...].*

- *The first is to establish a direct public transport link between the centres of Farciennes and Fleurus.*
- *The second is to set up a Health and Welfare Monitoring Centre, whose basic function will be to collect, process and analyse as much significant information as possible about living conditions in Fleurus and Farciennes in order to be able to propose activities intended to permanently improve health and welfare. Such a monitoring*

*centre would have both a participative and a scientific approach and be both autonomous and involved in the life of the communities.”*

Regarding maintenance of the participative structure, Article 4, 2. of the articles of association of the non-profit organisation PALOFF states that (translation) *“If, at the end of the studies provided for in Article 4, 1., a proposal for a preliminary integrated project for the disposal of short-lived low-level radioactive waste is submitted to the Federal Government and if the Government accepts the proposal, the association will follow up the due execution of the subsequent phases of the project.”* In view of the decision by the local council of Fleurus to terminate the studies and the decision by the local council of Farciennes to refrain from expressing an opinion on the file, it was decided to disband PALOFF.

## **A2. Outline of the work programme for the project phase**

The work programme for the project phase must *take the integrated disposal project from its current status to the status of a project ready for implementation*. The integrated project may be considered to be ready for implementation when two objectives have been reached (Section A2.1), at the end of a series of tasks that have yet to be completed (Section A2.2).

Throughout the project phase, it will be essential to retain the current level of local support and even increase it. The participative process will therefore retain pride of place throughout the project phase, in particular with regard to all aspects of the discussions and negotiations concerning specification of the associated conditions.

The following outline of the work programme, which is displayed in Figure 8, relates to all the activities to be carried out within the framework of the participative process in order to achieve the objectives of the project phase. The outline of the work programme is to a considerable extent independent of the technical option (surface disposal or deep disposal) chosen. The tasks specific to either of the two options are identified as such, however.

### **A2.1 Objectives**

The integrated disposal project can be implemented when the following two objectives have been met:

- a *binding agreement* comprising at least the following four aspects must be signed by all the parties concerned, when the remaining negotiations have been completed:
  - ▶ the detailed description of the integrated project to be implemented, as regards both the disposal facility and the associated conditions;
  - ▶ the (participative) management structure of the integrated project from the start of its implementation, including definition of the roles and responsibilities of the various parties;
  - ▶ the financing modes for the integrated project;
  - ▶ the general timetable for implementation of the integrated project.
- obtaining *all the necessary licences and permits* from the competent authorities, mainly comprising
  - ▶ the nuclear creation and operating licences (unless preference is given to a global application for all the nuclear facilities at the disposal site);
  - ▶ the environmental permits (insofar as they are not included in the nuclear creation and operating licences);
  - ▶ the building permits (for the actual repository and other buildings on and outside the disposal site);
  - ▶ if applicable, the *ad hoc* permit for construction of an underground facility.

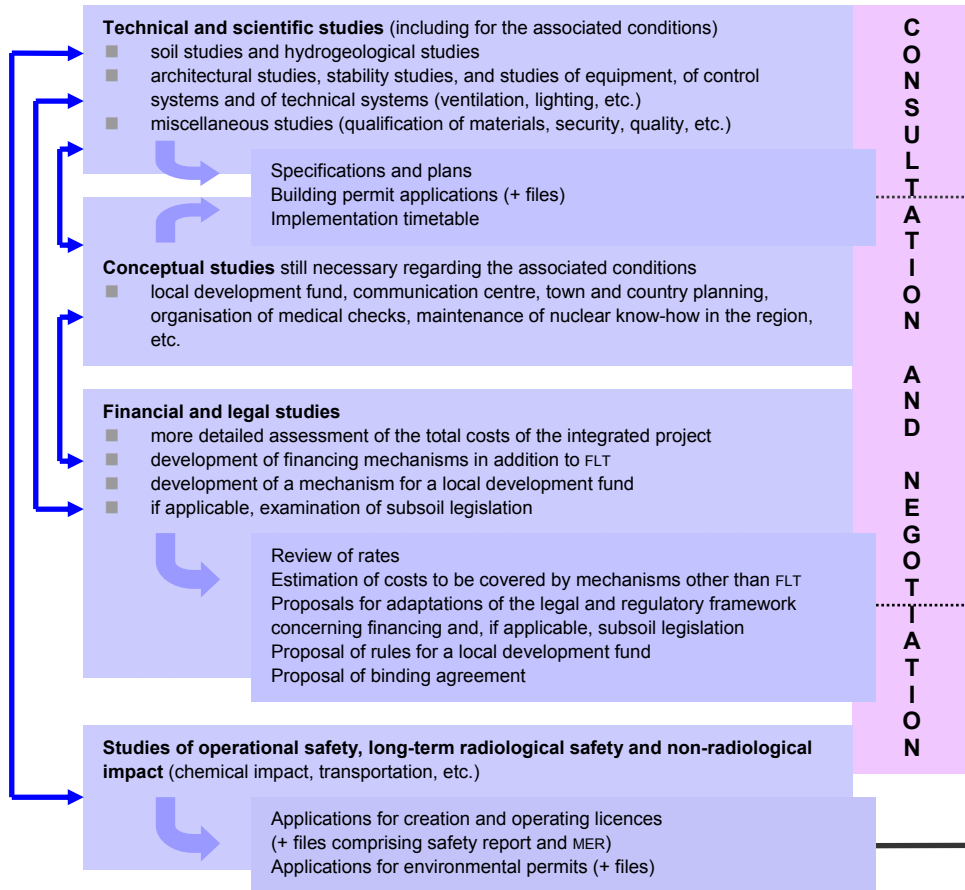
## PREPARATORY ACTIVITIES

- development of a participative model appropriate to local realities and to the needs of the project phase
- establishment of the detailed work programme for the project phase
- procedures for awarding public contracts for the project phase

## OTHER ACTIVITIES

- preparation of the phases subsequent to the implementation phase (revision of acceptance criteria, definition of acceptance procedure, preparation of procedures for emptying storage buildings, organisation of operational safety, studies of the closure of the disposal facility and of the dismantling of other facilities, organisation of knowledge management, etc.)
- if applicable, implementation of certain associated conditions
- acquisition of the land necessary
- procedures for awarding public contracts for implementation purposes
- ...

## DETAILED STUDIES FOR IMPLEMENTATION PURPOSES



## OBJECTIVES

- Signing of a binding agreement between all the parties concerned relating to**
- the detailed description of the integrated project to be implemented
  - the participative management structure of the integrated project
  - the financing modes for the integrated project
  - the general timetable for implementation of the integrated project

## Obtaining licences and permits, mainly

- creation and operating licences for nuclear facilities
- environmental permits
- building permits
- if applicable, *ad hoc* permit for construction of an underground facility

## RESULT

**Integrated disposal project ready for implementation**

Figure 8 – Outline of the work programme for the project phase: main activities planned. These activities, which fit in with the participative framework, are closely linked to one another and most of them will be carried out at the same time.

## **A2.2 Activities**

The project phase will be devoted to three groups of activities: preparatory activities (Section A2.2.1), detailed studies of different types (Section A2.2.2) and a number of activities that do not fall within either of these two groups (Section A2.2.3). All these activities are closely linked to one another and most of them will be carried out at the same time.

### **A2.2.1 Preparatory activities**

The preparatory activities will at least comprise the following activities:

- development of a participative model (ONDRAF/NIRAS, municipality where the disposal facility will be set up, other municipality that has submitted a file to the Federal Government, etc.) appropriate to local realities and to the needs of the project phase;
- establishment of the detailed work programme (timetable, organisation and budget) for the project phase and approval;
- procedures for awarding public contracts for work, supplies and services for the project phase.

### **A2.2.2 Detailed studies for transition to the implementation phase**

The project phase will be essentially devoted to the detailed studies necessary to generate all the information and permit the preparation of all the documents required to be able to establish the binding agreement between the relevant parties and to be able to submit all the licence and permit applications to the competent authorities.

**The technical and scientific studies**, including those necessary for implementation of the associated conditions, must, together with the conceptual studies still necessary for specification of the associated conditions, provide all the information needed to

- draw up specifications and construction plans for public contract award procedures for the implementation phase;
- prepare building permit applications, including construction files;
- prepare the timetable for implementation of the integrated project.

These studies must also provide basic data for financial and legal studies and for safety and environmental impact studies (see below).

They will be of the following types, in particular:

- studies of the ground: soil studies, hydrogeological studies, etc.;
- architectural studies for the various buildings and infrastructures, including the buildings and infrastructures that are included in the associated conditions;
- stability studies for these various buildings and infrastructures;
- specific studies: handling techniques, production of the caissons, post-conditioning building equipment, cover of the repository and experimental tumulus if applicable, surveillance and control systems, etc.;
- studies for the selection and qualification of monolith construction materials and, in the case of a surface repository, of module construction materials;

- studies relating to operational safety during the implementation phase;
- studies relating to preparation of the quality control system.

**The conceptual studies that are still necessary for the specification of the associated conditions** must, together with the technical and scientific studies, provide all the information needed to

- draw up specifications for implementation of the integrated project;
- prepare the timetable for implementation of the integrated project.

These studies must also provide basic data for financial and legal studies (see below).

They will relate to aspects such as the following ones:

- a local development fund;
- the communication centre (reception centre, theme park and digital and interactive network);
- town and country planning;
- organisation of medical checks for the community and health studies;
- maintenance of nuclear know-how in the region.

**The financial and legal studies** must, on the basis of information provided by the other types of studies and through discussions and negotiations between all the relevant parties, make it possible to

- revise waste collection rates;
- estimate the costs to be covered by mechanisms other than FLT;
- draw up proposals for adapting the legal and regulatory framework to permit financing of the integrated disposal project as a whole and therefore to ensure legal security for the relevant parties;
- draw up a proposal for the rules of a local development fund;
- if applicable, draw up a proposal for adapting the legal and regulatory framework to authorise the construction and operation of a deep disposal facility under a third party's property;
- draw up a proposal for a binding agreement relating to the modes of implementation of the integrated project and determining the rights and duties of the parties, in particular regarding provision of the financing necessary for implementing the associated conditions.

The financial and legal studies will relate to the following aspects in particular:

- more detailed estimate of the total costs of the integrated project;
- development of financing mechanisms additional to FLT: FMT, any *ad hoc* mechanisms, etc.
- development of a mechanism for a local development fund: constitution and management modes, nominal amount, etc.;
- if applicable, examination of existing provisions relating to subsoil legislation.

**The studies of operational safety, long-term radiological safety and non-radiological impact** must provide all the information necessary to

- prepare files for applications for licences to create and operate the repository itself and the other nuclear facilities, each such file having to include a safety report and a MER;
- if applicable, prepare files for environmental permit applications.

The safety and environmental impact studies will relate to the following aspects in particular:

- for the safety report:
  - ▶ preparation of the general methodology for safety assessments;
  - ▶ preparation of the qualification file of the conceptual models and calculation codes;
  - ▶ long-term radiological safety assessments;
  - ▶ operational safety assessments;
  - ▶ studies of the consequences of an aircraft impact;
- for the MER:
  - ▶ environmental impact studies (chemical impact, transportation, etc.);
  - ▶ consulting the public.

### **A2.2.3 Other activities**

The other activities to be carried out in the project phase will be as follows, in particular:

- preparatory studies for the phases subsequent to the implementation phase: revision of waste acceptance criteria, definition of the acceptance procedure, preparation of procedures for emptying storage buildings, organising co-ordination of operational safety, studies of closure of the repository and of dismantling of the other facilities, organisation of knowledge management, etc.;
- if applicable, partial or full implementation of some of the associated conditions;
- acquisition of the land necessary for implementation of the integrated project;
- procedures for awarding public contracts for work, supplies and services for the implementation phase.

### **A3. Proposal for structuring consultation with FANC during the project phase**

According to the Royal Decree of 20 July 2001 “*comprising general rules for protection of the population, workers and the environment against the danger of ionising radiation*” [25], a repository for radioactive waste is a Class I nuclear facility just like nuclear power plants or facilities for processing, conditioning and storing radioactive waste, for example. It is therefore subject to the same licensing rules.

The rules for licensing Class I nuclear facilities require a future operator wishing to obtain nuclear licensing for “creation and operation” to submit a licence application file to the competent authorities, i.e. FANC. Such a file must include a *safety report* and a MER<sup>21</sup>, which must cover both the radiological and the non-radiological impact of the facility to be created on the environment.

The existing licence application procedure for Class I facilities, which was designed for traditional nuclear facilities, is not wholly suitable for a disposal facility, however. It does not actually take account of certain special features of repositories, such as the fact that, unlike the other nuclear facilities, repositories must be closed, not dismantled, when they cease to be operated. According to its mission with regard to nuclear regulation, FANC is therefore currently preparing a licensing procedure that is appropriate to the disposal of radioactive waste, which it will submit for advice to its Scientific Council during 2006 and which it will then include in the regulatory framework.

Although the publication of an appropriate licensing procedure is an essential precondition for proper organisation of the disposal programme project phase, it is not sufficient on its own. ONDRAF/NIRAS actually needs a number of other items to be able to submit the application file for the licence to create and operate a facility and to obtain the requested licence within the timetable and within the budget determined for the project phase:

- ONDRAF/NIRAS must have at its disposal in good time a number of pieces of information that are essential for long-term radiological safety assessments (Section A3.1);
- ONDRAF/NIRAS must be able to regularly satisfy itself that its work complies with radiological safety requirements (Section A3.2);
- the competences of the Regions with regard to the assessment of the non-radiological aspects of the MER, which are currently subject to interpretation, must be clarified (Section A3.3).

In the continuing consultation of FANC that ONDRAF/NIRAS was requested to carry out by the Council of Ministers in the decision of 16 January 1998 concerning the long-term management of category A waste, and which is also provided for at a wider level by

---

<sup>21</sup> Consultation of the competent bodies during the preliminary project phase produced proposals for the contents of the safety report (consultation of FANC, assisted by AVN) and the environmental report (consultation of FANC and AMINAL, MER unit, for the Flemish Region, and DGRNE for the Walloon Region).

Article 33, last paragraph, of the Royal Decree of 20 July 2001<sup>22</sup>, FANC and ONDRAF/NIRAS therefore agreed to structure consultation between the two institutions concerning preparation of the licence application file by ONDRAF/NIRAS and its assessment by FANC. This decision was taken on 16 November 2005 by the FANC-ONDRAF/NIRAS contact committee, which is the organ created to implement the agreement concluded in 2003 by the two institutions in compliance with Article 33 of the Royal Decree.

The following proposal for structuring the consultation of FANC during the project phase is under discussion with FANC, which is a priori favourable to it. It is based on the three types of information identified above as being necessary to permit the proper progress of the project phase. These are fundamental milestones for the project to advance, in the sense that some of them relate to further explanations of the regulations and legislation in force to be provided by the competent authorities, including FANC. Others relate to interim advices to be given by FANC and its organs (Scientific Council). These advices, which will relate to specific aspects of the licence application file, will be issued subject to any amendments that may be subsequently made and any new information that might become available.

The following proposal is independent of the technical disposal option (surface disposal or deep disposal) that is chosen. ONDRAF/NIRAS considers that it will take three or four years to prepare and submit the licence application file. The consultation is planned for a period of three years, from the date on which the decision requested from the Government is obtained, in  $T_0$ .

### **A3.1 The regulatory “guidance” items for safety assessments**

The performance of the long-term radiological safety assessments necessary for preparing the safety report of the repository requires the definition of regulatory “guidance” items. The Royal Decree of 20 July 2001 actually sets the limit for the effective dose received by members of the public (1 mSv per year) and by workers exposed in the course of their work (20 mSv per sliding period of 12 successive months), but does not lay down any specific provision for repositories. These provisions relate, in particular, to the safety criteria (dose, risk or other criteria) against which the calculated long-term radiological impact must be compared and the way in which the intrusion scenarios must be handled (scenarios, timescales and comparison criteria). These specific provisions are currently being prepared by FANC.

***ONDRAF/NIRAS requests FANC to inform it, ideally in  $T_0$  or, if this is not possible, as soon as possible after  $T_0$ , of the regulatory “guidance” items necessary to be able to carry out the safety assessments required for preparing the safety report of the repository.***

---

<sup>22</sup> “The Agency shall conclude with ONDRAF/NIRAS an agreement aimed at mutual consultation and the exchange of information concerning those aspects of radioactive waste management that might affect the way the two institutions exercise their competences.” (translation)

### **A3.2 Interim advices prior to submission of the safety report**

ONDRAF/NIRAS must be able to duly ensure that its work complies with the radiological safety requirements and must therefore be formally followed up by FANC. This follow-up will be organised within the FANC-ONDRAF/NIRAS contact committee. It will be oriented around a number of key aspects, with regard to which FANC will issue an interim advice and inform ONDRAF/NIRAS of its comments and recommendations. The final results of the safety assessments will be submitted to FANC via the licence application file.

ONDRAF/NIRAS wishes FANC to issue an interim advice on the following four aspects:

- **points relating to radiological safety that require special attention**

In view of the intensive consultation carried out in the preliminary project phase with regard to the radiological safety of the preliminary disposal facility projects, FANC and ONDRAF/NIRAS are able to systematically analyse and to review the points concerning the integrated disposal project chosen by the Government that require the special attention of ONDRAF/NIRAS.

***ONDRAF/NIRAS requests FANC to inform it, ideally in  $T_0$ , or, if this is not possible, as soon as possible after  $T_0$ , of the points relating to the radiological safety of the integrated disposal project selected by the Government to which ONDRAF/NIRAS must pay special attention in its studies.***

- **general description of the disposal facility**

Although the final safety assessments will not be carried out until a later stage of the project phase, ONDRAF/NIRAS intends to carry out from  $T_0$  onwards preliminary calculations of safety and performances to support the detailed phenomenological and technical studies. FANC will be kept regularly informed of the progress of these studies.

At  $T_0 + 1$  year at the latest, ONDRAF/NIRAS will inform FANC about the following aspects:

- ▶ the general architecture of the disposal facility;
- ▶ the main choices of materials;
- ▶ the principles of the (radiological and non-radiological) control systems;
- ▶ the principles applicable to closure of the disposal facility;
- ▶ the contribution planned or expected to be made to safety by the various components, on the basis both of the knowledge acquired during the preliminary project phase and of preliminary calculations;
- ▶ the studies relating to transition to a system that ensures safety on a wholly passive basis.

***ONDRAF/NIRAS requests FANC to express an advice on the acceptability of the general description of the disposal facility, which it will submit to it at  $T_0 + 1$  year.***

- **methodology and tools used for safety assessments**

At  $T_0 + 1$  year, ONDRAF/NIRAS will submit the general methodology for safety assessments (for both operational and long-term safety) to FANC. Such a submission will relate to the following aspects:

- ▶ the general methodology, including, in particular, the handling of timescales and uncertainties, and safety indicators;
- ▶ the methodology used to define the scenarios (normal and abnormal operation, expected and altered evolutions of the disposal system, accidents);
- ▶ the conceptual models and calculation codes that will be used in the safety assessments.

***ONDRAF/NIRAS requests FANC to express an advice, on the basis of the information provided, on the acceptability of the methodology proposed for development of the scenarios, including the general description of the derived scenarios.***

■ **qualification file of the conceptual models and calculation codes used**

At  $T_0 + 1.5$  year, ONDRAF/NIRAS will submit to FANC the qualification file of the proposed conceptual models and calculation codes. It will, at the same time, provide an overview of the values of the parameters to be used for safety assessments, including the way of obtaining them and the approach adopted for handling the various types of uncertainties in the safety assessments (with regard to both operational and long-term safety).

***ONDRAF/NIRAS requests FANC to approve the use of the calculation codes proposed for carrying out the safety assessments to be included in the safety report.***

### **A3.3 Clarification of the legal framework relating to the MER**

The division of competences between the federal level and the Regions regarding the assessment of the non-radiological aspects of the MER to be submitted to FANC is currently subject to interpretation, which could undermine the proper progress of the procedure for applying for the licences to create and operate a facility. Furthermore, obtaining the building permit for the repository is conditional on approval of the non-radiological section of the MER by the Flemish Region.

ONDRAF/NIRAS will regularly notify FANC, for information and any comments, of the progress made in its work relating to preparation of the MER. It will also inform the relevant bodies of the aspects for which the Regions are responsible. The planned timetable is as follows:

from  $T_0 + 6$  months to  $T_0 + 18$  months: surveys of the ground in order to determine the reference values for the purpose of subsequent assessment of the environmental impact of the disposal facility;

from  $T_0 + 15$  months to  $T_0 + 29$  months: support studies and assessments necessary for preparation of the MER;

from  $T_0 + 26$  months to  $T_0 + 36$  months: preparation of the MER and submission to FANC.

***The modes under which the regional bodies competent for the non-radiological aspects of the MER will intervene in its assessment must have been clearly stated in the collaboration agreements provided for between FANC and these bodies in time for the start of preparation of the MER.***

## A4. Abbreviations

AMINAL	<i>Administratie Milieu-, Natuur-, Land- en Waterbeheer</i> [Department for Environment, Nature, Land and Water Management]
AVN	<i>Association Vinçotte Nucléaire</i> [Vinçotte Nuclear Association] (Brussels, Belgium)
DGRNE	<i>Direction générale des Ressources naturelles et de l'Environnement</i> [Directorate-General of Natural Resources and the Environment] (Namur, Belgium)
EIA	Environmental Impact Assessment
EPRI	Electric Power Research Institute (Palo Alto, California, United States)
FANC/AFCN	<i>Federaal Agentschap voor Nucleaire Controle / Agence fédérale de Contrôle nucléaire</i> [Federal Agency for Nuclear Control] (Brussels, Belgium)
FLT	<i>Fonds à long terme</i> [Long-term fund]
FMT	<i>Fonds à moyen terme</i> [Medium-term fund]
FUL	<i>Fondation universitaire luxembourgeoise</i> [Luxemburg University Foundation] (Arlon, Belgium)
IRE	<i>Institut national des radioéléments</i> [National Institute of Radio-elements] (Fleurus, Belgium)
MER	<i>Milieueffectenrapport</i> [Environmental Impact Report]
MONA	<i>Mols Overleg Nucleair Afval Categorie A</i> [Mols Consultation on Category A Nuclear Waste] (from 9 February 2000 to 24 November 2005) (Mol, Belgium)
MONA	<i>Mols Overleg Nucleair Afval</i> [Mols Consultation on Nuclear Waste] (from 24 November 2005) (Mol, Belgium)
ONDRAF/NIRAS	<i>Organisme national des déchets radioactifs et des matières fissiles enrichies / Nationale instelling voor radioactief afval en verrijkte splijtstoffen</i> [Belgian Agency for Radioactive Waste and Enriched Fissile Materials] (Brussels, Belgium)
OVAM	<i>Openbare Afvalstoffenmaatschappij voor het Vlaamse Gewest</i> [Public Waste Company for the Flemish Region] (Mechelen, Belgium)
PALOFF	<i>Partenariat Local Fleurus–Farciennes</i> [Local Partnership of Fleurus–Farciennes] (Farciennes, Belgium)
SCK•CEN	<i>Studiecentrum voor Kernenergie / Centre d'étude de l'énergie nucléaire</i> [Belgian Nuclear Research Centre] (Mol, Belgium)
STOLA-Dessel	<i>Studie- en Overleggroep Laagactief Afval</i> [Study and Consultation Group on Low-Level Waste] (Dessel, Belgium)

STORA      *Studie- en Overleggroep Radioactief Afval Dessel* [Dessel Study and Consultation Group on Radioactive Waste] (Dessel, Belgium)

UA          *Universiteit Antwerpen* [University of Antwerp] (Antwerp, Belgium)

## A5. References

- [1] Letter from the supervising Minister of ONDRAF/NIRAS to ONDRAF/NIRAS, *Décision du Gouvernement sur les déchets radioactifs de catégorie A*, ref. BL/vd/203-Cab, 26 January 1998
- [2] ONDRAF/NIRAS, *La mise en dépôt final, sur le territoire belge, des déchets radioactifs de faible et moyenne activité et de courte durée de vie — Rapport préparatoire à la remise par l'ONDRAF au Gouvernement fédéral des dossiers des partenariats locaux*, NIRONd report 2005–07 F, March 2005 (exists also in Dutch, under ref. 2005–07 N)
- [3] STOLA-Dessel, *Het Belgisch laagactief en kortlevend afval: thuis in Dessel? Een geïntegreerd bergingsproject met een technisch en een maatschappelijk luik*, November 2004
- [4] MONA, *MONA, een weg naar de aanvaardbaarheid van een berging van categorie A-afval in Mol?*, January 2005
- [5] PALOFF, *Fleurus-Farciennes — Avant-projet de dépôt final de déchets faiblement radioactifs et des mesures d'accompagnement requises, Version synthétique*, December 2005
- [6] PALOFF, *Fleurus-Farciennes — Avant-projet de dépôt final de déchets faiblement radioactifs et des mesures d'accompagnement requises, Version détaillée*, December 2005
- [7] ONDRAF/NIRAS, *La mise en dépôt final, sur le territoire belge, des déchets radioactifs de faible activité et de courte durée de vie — Rapport de l'ONDRAF relatif au projet intégré de dépôt final développé par STOLA-Dessel*, NIRONd report 2005–08 F, April 2005 (exists also in Dutch, under ref. 2005–08 N)
- [8] ONDRAF/NIRAS, *La mise en dépôt final, sur le territoire belge, des déchets radioactifs de faible activité et de courte durée de vie — Rapport de l'ONDRAF relatif au projet intégré de dépôt final développé par MONA*, NIRONd report 2005–09 F, June 2005 (exists also in Dutch, under ref. 2005–09 N)
- [9] ONDRAF/NIRAS, *La mise en dépôt final, sur le territoire belge, des déchets radioactifs de faible activité et de courte durée de vie — Rapport de l'ONDRAF relatif au projet intégré de dépôt final développé par PALOFF*, NIRONd report 2006–01 F, March 2006 (exists also in Dutch, under ref. 2006–01 N)
- [10] IAEA, *The principles of radioactive waste management*, IAEA Safety Series No. 111-F, Vienna, 1995
- [11] Letter from the Local Council of Dessel to ONDRAF/NIRAS, *Standpuntbepaling Gemeenteraad Dessel n.a.v. de beslissing van de gemeenteraden van Fleurus en Farciennes inzake de berging van laagradioactief afval*, 28 March 2006 and its annexes: *Uittreksel uit het register der beraadslagingen van de Gemeenteraad van Dessel, op datum van 16-03-2006*, and letter from the Local Council of Dessel to the supervising Minister of ONDRAF/NIRAS, *Standpuntbepaling Gemeenteraad*

*Dessel n.a.v. de beslissing van de gemeenteraden van Fleurus en Farciennes inzake de berging van laagradioactief afval*, 28 March 2006

- [12] Framework legislation (I) of 24 December 2002, “Moniteur belge” of 31.12.2002
- [13] Law of 29 April 1999 “*relative à l’organisation du marché de l’électricité*” (1), “Moniteur belge” of 11.05.1999
- [14] Law of 20 July 2005 “*portant des dispositions diverses*” (1), “Moniteur belge” of 29.07.2005
- [15] ONDRAF/NIRAS, *L’évacuation des déchets de faible activité : bilan et perspectives*, NIROND report 90–01, January 1990 (exists also in Dutch, under the same reference)
- [16] ONDRAF/NIRAS, *Le dépôt définitif en surface, sur le territoire belge, des déchets radioactifs de faible activité et de courte durée de vie : synthèse et recommandations*, NIROND report 94–04, April 1994 (exists also in Dutch, under the same reference)
- [17] ONDRAF/NIRAS, *Comparaison des diverses options pour la gestion à long terme des déchets radioactifs de faible activité et de courte durée de vie : aspects sûreté et différences de coûts*, NIROND report 97–04, June 1997 (exists also in Dutch, under the same reference)
- [18] ONDRAF/NIRAS, *Programme de travail de l’ONDRAF sur la mise en dépôt final des déchets de faible activité et de courte durée de vie — Dossier d’information*, NIROND report 00–01, January 2000 (exists also in Dutch, under the same reference)
- [19] Anne Bergmans, *Van “de burger als beleidssubject” naar “de burger als partner”: de Belgische queeste naar een langetermijnoplossing voor het beheer van het laagradioactief en kortlevend afval*, University of Antwerp, Faculty of Political and Social Sciences, 2005, PhD Thesis
- [20] Dealing with Interests, Values and Knowledge in Managing Risk, Proceedings of the 4<sup>th</sup> workshop of OECD/NEA Forum on Stakeholder Confidence, 18–21 November 2003, Brussels, NEA No. 5301, OECD 2004
- [21] ONDRAF/NIRAS, *Rapport d’avancement sur les travaux réalisés dans le cadre du dépôt final des déchets de faible activité et de courte durée de vie — 1998–2001*, NIROND report 2002–01 F, March 2002 (exists also in Dutch, under ref. 2002–01 N)
- [22] European Commission, ExternE, Externalities of Energy, Vol. 5: Nuclear, EUR 16524 EN, EC 1995
- [23] Letter from OVAM to ONDRAF/NIRAS, *Programma “Berging van categorie A afval” evaluatie van de chemotoxische impact*, ref. AB/AA/BT/03-347, 2 February 2004, and its annex
- [24] Letter from DGRNE to ONDRAF/NIRAS, ref. DPA/DCPP/2005/086/AB, 21 April 2005

- [25] Royal Decree of 20 July 2001 *“portant règlement général de la protection de la population, des travailleurs et de l’environnement contre le danger des rayonnements ionisants”*, “Moniteur belge” of 30.08.2001
- [26] Law of 13 February 2006 *“relative à l’évaluation des incidences de certains plans et programmes sur l’environnement et à la participation du public dans l’élaboration des plans et des programmes relatifs à l’environnement”* (1), “Moniteur belge” of 10.03.2006
- [27] Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment
- [28] Royal Decree of 30 March 1981 *“déterminant les missions et fixant les modalités de fonctionnement de l’organisme public de gestion des déchets radioactifs et des matières fissiles”*, “Moniteur belge” of 05.05.1981
- [29] Royal Decree of 16 October 1991 amending the Royal Decree of 30 March 1981 *“déterminant les missions et fixant les modalités de fonctionnement de l’organisme public de gestion des déchets radioactifs et des matières fissiles”*, “Moniteur belge” of 22.11.1991