The cAT project in Dessel

A long-term solution for Belgian category A waste

MARCH 2010
This Master plan describes the cAt project in Dessel, i.e. the integrated project for surface disposal of Belgian category A waste. The cAt project is the synthesis of a technically safe solution for category A waste and social and economic projects with a positive impact on prosperity and well-being in the region. Today, but also in the faraway future.
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This Master plan consists of three parts.

The first part introduces the **cAt project as a sustainable solution for category A waste**; it explains ONDRAF/NIRAS’s view of the cAt project and describes the structure of the project.

The second part describes the **building blocks of the cAt project**, one by one: the disposal, the communication centre, the Local Fund, participation, spatial planning and mobility, employment and retention of nuclear know-how and safety, environment and health. The cohesion between the individual project components and how they form one integrated project will become clear throughout the chapters. An overview of the current status and planned activities per project component is included.

The third part addresses the **preconditions required for streamlined realisation** of the cAt project: balanced funding, licensing procedures and general planning.
Introduction

Since 2006, ONDRAF/NIRAS, the body responsible for radioactive waste management in Belgium, has been working on materialising an integrated project of category A waste surface disposal in Dessel (cAt project). This cAt project is now beginning to take shape. A solid legal framework to safeguard funding, the planning route and a multitude of license applications are all being prepared.

This Master plan contains a first description of all aspects of the cAt project: a unique concept, integrating the Dessel repository into a project with long-term social and economic added value for the region.

The Master plan aims at informing a wide audience about the cAt project: the local partnerships STORA (Dessel) and MONA (Mol), the municipal authorities involved, waste producers, licensing bodies at several policy levels, the nuclear companies in the Dessel-Mol region, the people living in the neighbourhood, etc. Based on the report of the partnership STOLA Dessel of November 2004, it defines the March 2010 vision on the cAt project carried by ONDRAF/NIRAS. ONDRAF/NIRAS is committed to shape the cAt project over the next couple of years and realise it in accordance with this vision. The Master plan does not consider any changes, preconditions or limitations that may be enforced in the scope of the Safety Cases.

This Master plan will evolve in the years to come. With time, it will be concretised on the basis of detailed implementation plans. It will thus develop into a final Master plan when all sub-projects are ready for implementation.
Summary

**Introduction**
Since 2006, ONDRAF/NIRAS, the body responsible for radioactive waste management in Belgium, has been working on the realisation of the cAt project: an integrated project for surface disposal of category A waste in Dessel. This Master plan is the first description of all aspects of the cAt project. The Master plan describes the March 2010 vision on the cAt project of ONDRAF/NIRAS and the local partnerships and aims at informing a broad audience.

1 / ONDRAF/NIRAS and its mission in Dessel
On 26 June 2006, the Federal Government commissioned the realisation of the cAt project to ONDRAF/NIRAS. This project offers a solution for disposal of category A waste in Belgium, i.e. low-level and medium-level radioactive short-lived waste. ONDRAF/NIRAS’ mission was to develop the cAt project in close collaboration with the local partnerships, to obtain the necessary licenses for construction and operation and to realise balanced funding for the entire project.

2 / An integrated project for surface disposal of category A waste
The repository at Dessel will provide a solution for disposal of the Belgian category A waste. This includes category A waste that is produced today and temporarily stored in the Belgoprocess buildings, as well as category A waste generated in the future, for instance after nuclear facility dismantlement. The radioactive waste involved has been processed and conditioned and contains a limited amount of radioactive substances, a very small portion of which is long-lived. Due to these properties, category A waste is safe for surface disposal.

Radioactive waste management aims, 1) at immobilising radioactive substances, which prevents their entry into the environment, and 2) at separating those substances, to prevent any contact with human beings. Surface disposal is a long-term solution, immobilising waste passively and separating it from humans and the environment during the time it needs to lose most of its radioactivity through decay of short-lived elements (300 years). This guarantees safety, without the need for active intervention by future generations.

As is the case for all nuclear facilities, safety and technical performance are priorities for surface disposal of category A waste. This cAt project is unique, however, in that it combines a safe and technologically feasible solution for Belgian category A waste with socio-economic added value for the region: stimulating use and retention of nuclear know-how, anticipating spatial opportunities, organising health monitoring, the establishment of a Local Fund for financing socio-economic projects and activities... These added values are a fair appreciation for the solution municipalities Dessel and Mol offer to a problem that involves the entire Belgian population.
Integration is essential for the cAt project: a safe and effective repository that can count on continuous support from the population at the same time. Safety and technological feasibility, sustainability, openness, transparency and "collective design", integration in the landscape and the social surroundings are key concepts in the implementation of the cAt project.

3 / The structure of the project
The cAt project is a vast project. To enable adequate realisation, it was subdivided in seven subprojects: disposal, the communication centre, the Local Fund, participation, spatial planning and mobility, employment and retention of nuclear know-how and finally, safety, environment and health. Cohesion between these building blocks, both on an organisational level and on site, is essential; it guarantees the integrated character of the cAt project.

4 / Disposal
Summarised, the disposal procedure of the category A waste is as follows:
1. The waste is placed in concrete caissons and subsequently encapsulated with mortar to form a monolith. The monoliths block radioactive radiation and immobilise radioactive substances, thus constituting a key safety element.
2. The monoliths containing the waste are placed in modules: concrete bunkers with thick reinforced walls. After backfilling, the modules are closed off with a concrete cover. A permanent roof covering all modules will offer protection against weather conditions before, during and after backfilling.
3. In time, the fixed roof will be replaced by a permanent, virtually waterproof final cover. Our offspring will decide when to place that final cover. Nothing but two tumuli will remain after that.

For realisation of this surface disposal process, the Dessel repository comprises the following components:
- the quay for delivery of materials for the repository via the canal;
- the caisson plant for the manufacture of the caissons;
- the monolith production facility (MPF) where the waste is encapsulated into monoliths;
- the disposal modules;
- the peripheral provisions: the administration building, the storage zone, the maintenance building...

The repository currently provides for storage of 1,000 monoliths per annum. That implies waste for 15 years of operation by 2016 – the expected start of the operation phase. Once this stock has been stored completely – probably by 2031 – the further strategy for storing the waste from the dismantled nuclear facilities will be determined.
5 / The communication centre
Radioactive waste management is a delicate and social issue. Open and proactive communication about the subject is in the interest of the local communities. A communication centre will therefore be established at the storage site, serving as the core of all information and communication on the cAt project, radioactive waste management and radioactivity in general.

The communication centre will consist of three sections:
- a contact and reception centre: the contact point for people living in the neighbourhood on everything pertaining to the cAt project and the nuclear facilities in the region;
- a digital and interactive network (DIN), which will allow local communities to get information from a distance, i.e. via tv and website, about the cAt project and nuclear activities in the region. The network can also be used for initiatives from the neighbourhood, such as community television. Operation and feasibility of the DIN are currently being tested as a pilot project;
- a theme park about radioactive waste management: a tourist and educational activity centre for all age groups.

6 / The Local Fund
Radioactive waste repositories have a very long life cycle. Their impact on the surrounding area will continue even after operation and closure of the disposal modules and after the monitoring phase. The socio-economic added values connected with the repository must also be safeguarded in the future. A Local Fund (LF) will be established for this purpose.

The LF will support and finance projects and activities that create sustainable opportunities for the local communities and improve the quality of life of the local population in the short, medium and long term. The nature of projects and activities financed by the LF may vary: they may have a social, economic or cultural character or be aimed at the environment, health, welfare, etc. The LF thus provides additional opportunities for social, cultural, ecological and economic added values that surpass the added values created by the cAt project itself (employment, retention of nuclear know-how, spatial opportunities, etc.).

Management of the LF will be in the hands of the local partnerships in Dessel and Mol. It will consist of one joint fund with two equal sub-funds. A scientific study showed that a reasonable value for the LF is between 90 and 110 million euros (euro March 2010).

7 / Participation
An extraordinary participation model has developed with respect to disposal of category A waste over the years. The inhabitants of the Dessel and Mol municipalities are closely involved in the realisation of the aggregated cAt project via the local partnerships STORA and MONA. The success of the primary goal of the cAt project, i.e. safe disposal of category A waste, largely depends on the relationship with the social environment and on support for the repository.
Since participation is intended to remain an essential part of the cAt project in the future, ONDRAF/NIRAS is committed to maintain a partnership with the local communities throughout the duration of the project. The functions of the partnership and its operational shape may evolve in time.

Apart from having a close watch on the cAt project itself, the population wishes to be actively involved in other nuclear activities in the area. This is already being implemented today and the partnerships will also keep a broad mission in the long term, through participation in all nuclear activities in the region in a format to be decided at a later stage.

8 / Spatial planning & mobility
The cAt project will take up a considerable area in the northern nuclear zone of Dessel-Mol. The planning and licensing part involved in the construction of the repository is a prerequisite for the realisation of the cAt project. In addition, the cAt project creates a number of distinct spatial opportunities for Dessel. ONDRAF/NIRAS has undertaken to effectuate maximum realisation of these spatial win-win opportunities in the scope of the cAt project.

As regards mobility, ONDRAF/NIRAS opts for rational access to the disposal site. Maximum use of the canal for delivery and transport of (raw) materials minimises impact from the cAt project on road traffic. ONDRAF/NIRAS also closely monitors the authorities’ initiatives for improvement of the regional traffic situation. A quick connection of the N118 with the E313 and E34 for maximum relief of the Geel and Retie centres is crucial in that process.

9 / Employment and retention of nuclear know-how
Regional employment stimulus is one of the distinct opportunities resulting from the repository. The disposal site will provide temporary jobs during the construction starting in 2012, and employment in the medium term as from the operational phase in 2016. The disposal project also holds indirect positive effects for employment. The caisson plant will be operated by a private partner. If legally permitted, this party can develop activities other than manufacturing and supplying caissons.

Thanks to years of experience, the area has built up unique nuclear expertise, recognised on a national as well as an international level. For the sake of employment, but also for the sake of safety, it is imperative to keep that expertise within the region. ONDRAF/NIRAS will establish a knowledge centre in the area to further develop know-how in the field of radioactive waste management. Preparing qualified personnel for the cAt project requires specific training in radiological protection and radioactive waste management. Such training programmes already exist but deserve extra attention within the framework of the cAt project.
10 / Safety, environment and health

Safety is essential for a repository of radioactive waste. It must be guaranteed in the short term, i.e. during operation and after closure of the disposal, and in the long term, i.e. after the disposal has been sealed off. The safety strategy for the repository describes how that safety is ensured and is the starting point for safety development and evaluation with respect to the entire repository (waste, monoliths, modules, site). Together with leading national and international research centres and specialised research consultancies, ONDRAF/NIRAS is conducting a wide range of safety studies. Their aim is to provide feedback for the development of the repository, to evaluate the design’s safety and to establish the allowed quantities of long-lived radioactive substances.

A nuclear site needs to be monitored in order to guarantee the safety of the people living in the vicinity at all times. ONDRAF/NIRAS is developing a programme to monitor the safety of the repository and its surroundings in accordance with legislation. This repository monitoring programme can also be integrated into general information about the wider nuclear site.

No matter how thorough and well thought-out the repository’s safety management may be, accidents can never be ruled out. For this reason, ONDRAF/NIRAS is preparing an emergency plan; a script containing the key risks at the site, including relevant strategies, plans of action, procedures and instructions to organise help and to minimize the consequences of a possible nuclear accident for humans and the environment.

Dessel and Mol citizens and their offspring must be able to trust that the repository does not affect their health. Establishing that trust would fulfil a key condition for a long-lasting future of the repository for radioactive waste. ONDRAF/NIRAS will organise a health monitoring programme for the Dessel and Mol inhabitants. Together with leading knowledge organisations ONDRAF/NIRAS is conducting a pilot project that will establish whether humane bio-monitoring would be an appropriate method.

11 / Funding

Guaranteed funding of disposal of the Belgian category A waste is essential for all parties involved – ONDRAF/NIRAS, producers, local communities and society; today, but also in the faraway future. Two ONDRAF/NIRAS funds will generate the necessary means for the cAt project: the Long Term Fund (LTF) and the Medium Term Fund (MTF).

The LTF finances all parts of the project directly servicing the waste producers, such as the repository, the quay, the caisson plant... LTF financing is based on compensations paid by the waste producers for ONDRAF/NIRAS’ services in proportion with the waste taken in by ONDRAF/NIRAS. The part of the cAt project as described in this Master plan that is to be financed by the LTF is currently estimated at 734 to 878 million euros (euro March 2010). This estimate is based on disposal of 30,000 monoliths at a rate of 1,000 monoliths per annum.

The MTF finances all project components not directly servicing the waste producers, but benefiting the local communities. These components, e.g. the Local Fund, health monitoring, etc. help to safeguard support for the disposal, now and in the future. The MTF is fuelled by taxes and retributions and has been estimated at 110 to 130 million euros (euro value March 2010).
12 / The licensing procedures
The realisation and operation of the cAt project and all its components requires a great number of licenses. The nuclear license will impose conditions regarding establishment and operation of the repository. An adapted licensing procedure has been developed by the Federal Agency for Nuclear Control (FANC) for the purpose. ONDRAF/NIRAS is currently preparing the license applications based on a number of safety studies. In addition, a conventional (urban development and/or environmental) license is required for several components of the cAt project. These procedures are also systematically initiated in the run-up towards the construction phase.

13 / General planning
Until 2012 the cAt project is in its design phase: the draft and detailed design of the individual project components are being developed, the legal framework to ensure funding realised, and the planning route and license applications prepared. The design phase is followed by construction of the repository and realisation of all relating sub-projects. The operation phase, i.e. when the repository begins its operation, is expected to start in 2016.
presentation of the cAt project

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ONDRAF/NIRAS and its mission in Dessel

In 2006, the federal government gave the all-clear for the cAt project in Dessel. The project offers a solution for disposal of low-level and medium-level short-lived radioactive waste (in short: category A waste) in Belgium. ONDRAF/NIRAS was ordered to further develop the cAt project in close consultation with the partnerships STORA (Dessel) and MONA (Mol).

This chapter
→ gives an explanation of category A waste;
→ clarifies ONDRAF/NIRAS’ mission in Dessel;
→ provides a summary of the history of the cAt project and introduces the partnerships STORA and MONA.

1.1 / Who is ONDRAF/NIRAS?

ONDRAF/NIRAS is the Belgian Agency for Radioactive Waste and Enriched Fissile Materials. As per 1980, it has been responsible for radioactive waste management in Belgium. With the establishment of ONDRAF/NIRAS, the Belgian government concretised its desire to offer effective protection against the possible dangers of radioactive waste for the population and the environment, whereby safety and protection come first.

Radioactive waste management is based on two principles:
1. immobilisation of radioactive substances so as to prevent their release into the environment;
2. separation of the radioactive waste, thus preventing direct contact with humans.

It covers each and every step of the waste life line, from its production to temporary storage in specially designed buildings, awaiting a long-term solution. ONDRAF/NIRAS has defined conditions the waste must comply with in order to ensure its safe management and checks compliance with these conditions before accepting the waste. Nowadays, day-to-day management of radioactive waste is safe and fully under control.

In 2006, the federal government ordered ONDRAF/NIRAS to develop an integrated surface disposal project in Dessel as a long-term solution for Belgian category A waste. Through immobilisation and separation, the disposal aims at providing a safe final destination for the waste that does not require human intervention or activities in the long run.
1.2 / What is category A waste?

Category A waste is low-level and medium-level short-lived waste. Category A waste has been processed and conditioned and contains a limited amount of radioactive substances (a very small portion of which is long-lived). Consequently, this waste is safe for surface disposal.

Why is there a need for a long-term solution? Daily radioactive waste management (processing, conditioning and temporary storage) requires continuous supervision, control and maintenance in order to safeguard safety. This is not appropriate for long-term management. Disposal is a long-term solution, passively immobilising waste and separating it from humans and the environment during the time it needs to lose most of its radioactivity through decay of short-lived elements (300 years). This guarantees safety without the need for active intervention by future generations.

What happens to category A waste? Category A waste that is generated today is processed and conditioned into a solid, compact and chemically stable end product, either by the producers or in the CILVA facility (Central Infrastructure for low-level solid waste) of Belgoprocess (the industrial daughter company of ONDRAF/NIRAS in Dessel). The aim of this process is to reduce the waste volume, to concentrate radioactivity and to immobilise it in drums. The result of this conditioning process is a stable end product. The containers with category A waste are temporarily stored, awaiting their final disposal.

Category A waste will be generated in the future, among other things upon dismantlement of nuclear facilities. The new repository built by ONDRAF/NIRAS in Dessel will provide a long-term solution for both existing and future waste streams.

From a temporary to a final solution for category A waste

In their own facilities, radioactive waste producers apply a prevention policy. This means that they endeavour to avoid and minimise their waste production, for instance by recovering and recycling materials. As is the case with the selective collection of household waste, the producers are required to sort their waste. They also have to clearly indicate its content.

→ Processing
Most radioactive waste is processed in the Belgoprocess facilities. The aim of the process is to reduce the waste volume, to concentrate radioactivity and to immobilise it in drums. The result is a stable end product that is safe for storage.

→ Temporary storage
The drums with processed waste are stored in special buildings on the Belgoprocess site. The buildings are designed to protect humans and the environment from the potential harmful effects of radioactive waste. Although storage of radioactive waste is safe in the short and medium term, it is only a temporary solution, whereas a repository can evolve into a final solution in the long run. [On 16 January 1998, the federal Council of Ministers decided to opt for a solution that would be or could become definitive for the long-term management of Belgian category A waste.}
1.3 / The search for a long-term solution for category A waste

An extensive process preceded the 2006 federal government decision for surface disposal of category A waste in a facility on the territory of the Dessel municipality. What started as a search mission for a purely technological and safe solution in the 1980’s eventually became an active participative process in which ONDRAF/NIRAS and the local communities developed several safe and technologically feasible but also socially acceptable options.

Sea disposal no longer an option. In 1984, Belgium voluntarily endorsed the international moratorium on sea disposal of radioactive waste. At that moment, sea disposal of category A waste became a thing of the past. As a result, ONDRAF/NIRAS had to find another safe and technologically feasible solution for managing Belgian category A waste.

A purely technological approach met with social constraints. Starting in the 1980s, ONDRAF/NIRAS investigated various options for long-term category A waste management. The initial approach was mainly scientific and technological. ONDRAF/NIRAS conducted several trial studies which led to a safe and technologically operable disposal concept. Based on purely technological criteria, 98 possible establishment zones were listed. In all of Belgium, however, none of the pre-selected municipalities were prepared to accept a repository on their territory. ONDRAF/NIRAS thus became aware that in its search for a long-term solution, it had to take account of social acceptance as well. In other words: from that moment on, support from the local population was incorporated as an inextricable part of the long-term solution for category A waste.

Local partnerships were established. Based on a trial study conducted by ONDRAF/NIRAS, the Council of Ministers decided to opt for a definitive solution of category A waste, or at least a solution that has the potential to become final. The Council ordered ONDRAF/NIRAS to develop methods for local integration of a disposal project, in a dialogue with the population. ONDRAF/NIRAS materialised this participation by establishing local partnerships. The npo STOLA-Dessel (Studie- en Overleggroep Laagactief afval = study and consultation group for low-level waste, 1999) was created in cooperation with the Dessel municipality, the npo MONA (Mols Overleg Nucleair Afval Categorie A = Mol consultation on category A nuclear waste, 2000) together with the Mol municipality. ONDRAF/NIRAS also formed a partnership with the Walloon municipalities Fleurus and Farciennes, the npo PALOFF (Partenariat Local Fleurus Farciennes – Local partnership Fleurus Farciennes, 2003).

Three partnerships, three integrated solutions. Each partnership was ordered to develop an integrated preliminary design for a disposal project on their municipality’s territory: a technologically sound repository that would find acceptance from the population. This procedure gave the concerns of the population in the areas of safety, environment and health, a prominent place in the pilot study of the disposal project.

The three partnerships were organised such that they could live up to their role as a representative, transparent, open and independent local discussion platform. The municipal council however would have the last word to either accept or refuse the proposal. The councils of Dessel and Mol were the only ones to agree to the proposal developed by the partnership (in Dessel in January 2005, in Mol in April 2005), and two options remained: surface disposal and deep disposal. The Fleurus council rejected the PALOFF proposal.
in February 2006, and the Farciennes council subsequently withheld judgment on the file. Dessel and Mol thus remained the only candidates for definitive disposal of Belgian category A waste. ONDRAF/NIRAS submitted the integrated proposals of the STOLA-Dessel and MONA partnerships to the competent minister. The assignment entrusted upon ONDRAF/NIRAS by the Council of Ministers was now complete.

After submission of a final report, the partnerships remained operational and contacts between ONDRAF/NIRAS and both candidate-municipalities were maintained. MONA continued its operation under that name. STOLA-Dessel was transformed into a new npo “STORA” (Studie- en Overleggroep Radioactief afval – Study and consultation group radioactive waste). Since the decision of the Council of Ministers to opt for the STOLA-Dessel proposal (see below) both partnerships remain ONDRAF/NIRAS’ privileged partners in the realisation of the integrated disposal project.

1.4 / An integrated surface disposal project in Dessel: 
a clear mission for ONDRAF/NIRAS

After studying the final dossiers of the partnerships and ONDRAF/NIRAS’ final report, the federal Council of Ministers decided on 23 June 2006 to store category A waste in a surface disposal facility in the Dessel municipality. The repository will be erected at a site on Dessel territory, bordering the Mol municipality.

ONDRAF/NIRAS was ordered to further develop the integrated disposal project, to obtain the required licenses, and to conclude a binding agreement between the parties involved for implementation of the relevant conditions (based on the principle “the polluter pays”). The ONDRAF/NIRAS director-general has full power to negotiate with all parties involved (municipalities, partnerships, waste producers, etc.) to achieve this agreement.
The 23 June 2006 government decree read as follows (letter of the competent minister to ONDRAF/NIRAS dated 05.07.2006):

“In its meeting of 23 June 2006, the Council of Ministers has made various important decisions as regards the disposal of category A waste:

First, the Council of Ministers has noted that ONDRAF/NIRAS has completed the mission entrusted upon it by the decision of the Council of Ministers dated 16 January 1998, and finds that it is now possible to move from the preliminary project phase to the project phase.

The Council of Ministers has opted for surface disposal and has chosen the Dessel municipality as the location for the repository.

The Council of Ministers orders ONDRAF/NIRAS as follows:
- to sustain the participative process;
- to continue the development of the integrated disposal project;
- to propose a legal and regulatory framework to guarantee judicial safety of the integrated project, in particular as regards funding of the relevant conditions;
- to submit by the end of 2008 a detailed review of the costs of the relevant conditions and their funding methods.

Finally, the Council of Ministers authorises ONDRAF/NIRAS’ director-general to negotiate with all parties involved to reach a binding agreement for the implementation of the relevant conditions. The director-general will report his progress to the Minister of Energy at regular intervals; the reports will include the status of the talks on establishment of the Medium Term Fund.

As regards this last issue, I would like to draw your attention to the necessity of sustaining the participative process, primarily with the Dessel municipality that was chosen as the location for the repository and which is therefore the first negotiation partner, but also with the Mol municipality.”
The cAt project: an integrated project for surface disposal of category A waste

Long-term radioactive waste management is a delicate social issue. It involves a general concern at a macro-social level, but also at the level of the local communities. It is only fair to give the local population added values in return for their willingness to accept a repository. Unique of the cAt project is the way in which the repository in Dessel is integrated into a long-term social added value project for the region.

This chapter
- introduces the cAt project;
- clarifies the vision on the cAt project;
- formulates the goals and basic principles.

2.1 / What is the cAt project?

With the surface disposal in Dessel, ONDRAF/NIRAS and the local partnerships have made a straightforward choice for an integrated project. It was named the cAt project, which stands for “integrated project for surface disposal of category A waste in Dessel”. The cAt project is the integration of a technically safe disposal project with various added value projects that positively impact prosperity and well-being in the region, not only today, but also in the faraway future.

2.2 / Vision: integration as leading theme

Long-term radioactive waste management obviously has consequences for the local community. Disposal of radioactive waste in itself hardly offers direct benefits to the people living in the vicinity. The choice for a surface disposal implicates a long-term claim of terrain that in different circumstances, could have been used for other socially useful purposes. Furthermore, a surface disposal cannot be hidden in the landscape; it evidently has a strong visual impact on its surroundings. And in addition, the social effects of the repository and its activities will continue for a long stretch of time. Several generations will be faced with the consequences. In short: a repository has an undeniable impact on the people in the neighbourhood.
Appreciation for societal services. Through active participation in a solution for category A waste, the Dessel and Mol municipalities help to solve a problem that affects the Belgian society. It is therefore only fair to offer social added values or benefits to the inhabitants in return for this service. First and foremost, the local community demands that general conditions in the areas of safety, environment, health, communication and participation will be met. In addition, it requires a clear appreciation for its contribution to a large societal problem in the form of social and economic added values. Those added values are a constant element in all building blocks of the cAt project.

Technically reliable and acceptable on a societal level. First of all, the local community must be guaranteed a safe and robust concept and technical realisation of the repository that meet the most stringent quality requirements. In other words: the people living in the neighbourhood must rest assured that both the construction and the operation of the repository are and will remain safe.

But it is just as important that the entire repository is acceptable for the local community. Only then will the project receive continued support of the population. The fact that ONDRAF/NIRAS and the partnerships have been actively looking for solutions together from the beginning helps in establishing that sustainable support.

2.3 / Elaboration of the cAt project vision

2.3.1 Starting point: to manage category A waste as a good housekeeper
ONDRAF/NIRAS is genuinely dedicated to optimum management of category A waste and offers a technologically reliable disposal solution that also provides the necessary guarantees in the field of safety. At the same time, this solution accommodates concerns that live in society. The technological and societal dimensions of the cAt project cannot be separated from each other, it is fundamental that they are considered as a whole. This integration is demonstrated both in the structure of the project and in the physical planning of the site.

Based on the STOLA-Dessel preliminary project, ONDRAF/NIRAS and the local partnerships are developing a solid technical concept for the surface disposal. That concept guarantees technical feasibility, it ensures short- and long-term safety, limits the repository’s impact on humans and the environment and comprises permanent monitoring and control of the facilities and their impact on the area. The dossier for application of the required licenses for the repository is currently under preparation.
At the same time and again together with the local partnerships, ONDRAF/NIRAS is working on realistic added values for the inhabitants of Dessel, Mol and the region. Among these added values are a fund to support local projects and activities, realisation of spatial opportunities and a positive impact on local employment. ONDRAF/NIRAS guarantees participation during all phases of the disposal project and incorporates openness and transparency, both in the approach and in the design of the project. It conducts open, transparent and complete communication about the cAt project and endeavours to create and maintain a relation of trust with the people living in the vicinity. And finally, it is committed to develop and solidify the support for the cAt project vis-a-vis all those involved (STORA and MONA, the municipality and neighbouring municipalities, the waste producers, regional and federal government, etc.).

2.3.2 Incorporation in the landscape and visual integration
ONDRAF/NIRAS gives ample attention to the scenic incorporation of the entire site into the area. After all, societal acceptability of the cAt project is also determined by its physical planning and by how the repository is incorporated in the area. Synergy between the various project components and between the project and its surroundings is essential. By actively searching for synergy, the repository becomes a part of its surroundings, and can even co-determine its character.

The first goal is maximum visual integration of the repository in the area. The basic concept that nothing but two hills will prove the existence of the project in the long term is fully tuned to that integration. Furthermore, a congruent logistics chain, coherent spatial arrangement of the components and optimum access to the site add to a clear design. The harmony between the various components is further amplified by the physical links (e.g. access roads) created between them.

2.3.3 Sustainability and biodiversity
Sustainable entrepreneurship. Through transparent and open communication, responsible use of raw materials, investments in participation and dialogue, attention for nature and the environment, and an open eye for innovation, the cAt project contributes to sustainable development and raising awareness on the issue.

Sustainable construction. Both ONDRAF/NIRAS and the local partnerships want to stress the necessity of sustainable management of energy and raw materials. The partners want to give the right example in the construction of the repository. Where possible and taking into account the technical and safety specifications of certain facilities, the principles of sustainable construction will be applied. The communication centre, for instance, will be an energy-saving or even passive building, focusing on well thought-out use of space and (raw) materials. The centre will both live up to this sustainability message and explicitly proclaim it.
**Sustainable mobility.** In view of the cAt project, the mobility issues of the entire Dessel-Mol region are being investigated. The facility itself will have little impact on road traffic and materials will be supplied via the canal where possible. Sustainable mobility is clearly ONDRAF/NIRAS’ aim at the site as well. Arrangement of the individual process components as a logical chain ensures minimum transport at the site.

**Biodiversity.** This too is a point of concern for ONDRAF/NIRAS and the partnerships. After all, the area surrounding the planned location of the repository has a rich flora and fauna. Through green arrangement of open spaces, ONDRAF/NIRAS will ensure maximum integration of the disposal site into its natural surroundings. Scenic elements and plantation of trees and plants characteristic to the region will in fact provide an extension of the natural biotopes into the disposal site. As it will not be used for construction or economic purposes for a long period of time, the disposal site could even add to the biodiversity in the long run.

**2.3.4 Collective design, collective realisation**

Openness, transparency and cooperation are of the essence in the realisation of the cAt project. Through the partnerships, the Dessel and Mol inhabitants were already closely involved in the construction of the repository’s draft. The principles of collective design remain valid throughout the further elaboration of the project and its realisation. All aspects of the disposal project are controlled by a joint steering group comprising members from ONDRAF/NIRAS, STORA and MONA, in which the Dessel and Mol mayors have an advisory role.

**2.4 / Balanced funding**

Arranging funding is a huge challenge for any ambitious and large-scale project. Compared to other industrial and infrastructural projects, time is an additional uncertain element in the cAt project. But not only must the means for technical realisation and operation of the disposal be available, the socio-economic added values must be ensured as well.

ONDRAF/NIRAS is responsible for safeguarding funding of the cAt project in such a manner that the project can be realised in its entirety, i.e. all its components and during the whole life cycle of the facility. In parallel with the specifications of the project, ONDRAF/NIRAS is therefore developing legally sound funding mechanisms according to the principle “the polluter pays”.
2.5 / The cAt project in phases

The cAt project is currently in its project phase, which runs until 2012 and aims at accomplishing two goals:
- to achieve binding agreements with all stakeholders regarding the project details of the integrated disposal project, the different management structures, further timing and funding methods;
- to obtain the necessary licenses from the different authorities, i.e. the nuclear license for establishment and operation of a repository, the environmental licenses and the urban development licenses.

The project phase is followed by the implementation phase, i.e. the construction of the repository and realisation of all related sub-projects. The repository’s operation phase is expected to start in 2016.
3 / Structure of the project: seven building blocks, one single integrated project
The cAt project is a vast project with many side-projects. For the sake of effective realisation it was subdivided into seven subprojects: disposal, the communication centre, the Local Fund, participation, spatial planning and mobility, employment and retention of nuclear know-how and finally, safety and environment & health. Cohesion between these building blocks, both on an organisational level and on site, is essential; it guarantees the integrated character of the cAt project.

This chapter
→ gives a short description of each component of the cAt project;
→ explains how the various building blocks of the cAt project form one integrated whole with maximum benefit for all stakeholders.

3.1 / The building blocks of the cAt project

Below is an introductory short description of the various building blocks of the cAt project. Part 2 of this Master plan contains a separate chapter dedicated to each individual project component.

3.1.1 Disposal
Disposal is the centre of the cAt project. This key subproject comprises the detailed elaboration of the repository: the disposal modules, the caissons and monoliths and the monolith production facility, the final cover, the various annexes, etc. Safety has top priority in this sub project, in both the short and the long term.

3.1.2 The communication centre
Open and proactive communication about radioactive waste management and about the cAt project in particular is crucial. The communication centre will be the core of all information and communication about radioactive waste management and the cAt project. In addition, the centre will offer information about radioactivity and nuclear issues in general.
The communication centre will consist of three sections:
- a contact and reception centre;
- a digital and interactive network (DIN);
- a theme park about radioactive waste management; this will be a tourist and educational activity centre for people of all ages.

3.1.3 Local Fund
The creation of added values for the population requires funding, not only today, but also in the near and faraway future. A fund is therefore created that generates the required means in the short and long run: the Local Fund (LF). This fund will support or finance projects and activities that help to improve the quality of the living, housing and working environment. The fund will allow for anticipation on the changing needs and developments in society, enabling future generations to apply their own (contemporary) accents at all times.

3.1.4 Participation
Participation forms an inextricable part of the cAt project. Today, concretisation and manifestation of participation is the responsibility of the partnerships STORA (Dessel) and MONA (Mol), but participation must be guaranteed in the future as well, also as regards nuclear issues affecting the region.

3.1.5 Spatial planning & mobility
The cAt project creates opportunities for expansion of the spatial living and employment options in the Dessel municipality. Maximum realisation of these win-win opportunities is guaranteed in the scope of the cAt project. The impact of the project on traffic intensity will be very limited. Furthermore, supply of (raw) materials will mainly take place via the canal, thus reducing road transport to a minimum. The access roads to the site will be used to improve the regional traffic situation.

3.1.6 Employment and retention of nuclear know-how
Retention of nuclear know-how in the region is of key importance, and will be manifest through an extensive knowledge centre and network for radioactive waste management. Availability in the area of a unique combination of study centres, industrial companies, agencies and the government, covering various aspects of management of all types of radioactive waste, may be of help in the longer term. ONDRAF/NIRAS strives for maximum local employment both during the realisation of the cAt project and its operation.

3.1.7 Safety, environment & health
ONDRAF/NIRAS is developing a programme to monitor the repository. A whole set of measurements and observations will thus confirm the safety of the repository for humans and the environment. This information will be fully transparent and accessible for consultation by the public as well. ONDRAF/NIRAS will create an emergency plan for the repository and is examining possible improvements to the existing emergency planning of the entire nuclear zone. It is also investigating suitable methods to monitor the local inhabitants’ health.
The seven building blocks of the cAt project

Cohesion between the seven components of the cAt project, both from an organisational point of view and at the disposal site, is essential. It safeguards the integrated character of the disposal project.
3.2 / Integration in project structure and the plan

Cross-fertilisation within the project structure. Each project component consists of actions and research that form a logical entity and can therefore best be approached as a whole. The division into sub-projects offers plenty of benefits on an organisational level but does not aim at pigeonholing the cAt project, for indeed the separate components share elements that necessitate exchange and cross-pollination; only then will all opportunities be put to maximum use.

Several functions (economic, social, educative, tourist) exist within each sub-project; these, too, must be regarded conjointly.

Examples:
- the raw materials and construction materials for the repository will preferably be supplied via the canal. Construction of an offloading quay is planned for the purpose. Companies in the vicinity can also deliver and transport their materials via the quay. Tourist boats can moor at the quay as well and visitors of the communication centre will then also be able to use the quay (interaction between the disposal, mobility and the communication centre).
- A factory will be built at the site for production of the caissons that will encapsulate the waste. ONDRAF/NIRAS seeks to come to an agreement with a private company for its operation. This private company will have the opportunity to develop an additional, non-nuclear activity, which in turn provides an extra impulse to local employment (interaction between the disposal and local employment).
- Safety surveillance is a key priority in the cAt project. A whole range of measuring data will be made available to the population via a digital information network which will be part of the communication centre (interaction between safety and communication centre).

Physical integration. The construction of the repository forms the physical manifestation of the integration between the various project components. This will be clarified in the next chapter.
the cAt project in its entirety

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The disposal modules are built in Dessel, on the border with Mol, running parallel with the Europalaan.
Disposal: the heart of the cAt project

Disposal is the key sub-project of the cAt project. It comprises the detailed implementation of the repository: the caissons, the monoliths, the caisson plant, the monolith production facility (MPF), the disposal modules, the roof structure of the facility, the final cover, the various annexes, etc. Until now, safety, technical performance and functional aspects constituted the main concerns of this sub-project. Its further specification will include the site’s scenic integration and conceptual quality as well.

This chapter
➔ explains the principles and process of surface disposal;
➔ discusses the individual parts of the repository;
➔ explains how the prototypes must improve the knowledge about the behaviour of the repository over time and thus help to safeguard its long-term safety;
➔ explains how the site’s architecture will be shaped in the near future.

4.1 / What is surface disposal?

The category A waste will be disposed of at Dessel in modules above ground: this is called surface disposal.

Surface disposal immobilises and isolates radioactive waste in a manner that guarantees optimum protection of humans and the environment both during the 300 year period of active monitoring of the repository and beyond. Once the disposal is closed, the last barriers for passive immobilisation and isolation of the waste have been put into place, and it then becomes a passive system. Active intervention of next generations to safeguard its safety is then no longer required. Surveillance remains possible, however, for as long as future generations might wish.

By contrast, temporary disposal does require active intervention from future generations to guarantee its safety. Surface disposal is therefore considered a sustainable long-term solution for category A waste. The concept is already applied elsewhere in the world, for instance in France, Spain and Japan.
Surface disposal meets the condition of retrievability: the possibility, during a certain period of time, to safely retrieve the waste with the use of identical or comparable means as the ones used for its disposal.

4.2 / A short overview of the disposal process

The total amount of category A waste that will be stored in the Dessel facility has been estimated at 70,500 m³, counting with a 40 year life span of the nuclear facilities. There are various forms of category A waste:
- conditioned waste, a part of which is already stored in the special buildings of Belgoprocess;
- bulk waste that will be generated in the future as a result of nuclear facility dismantlement and which will be conditioned directly in monoliths.

Surface disposal aims at immobilising and isolating the waste to prevent any risks for humans and the environment by applying consecutive barriers around the waste. Safety thus does not depend on the functionality of one single barrier. In the event of a shortfall of one barrier, other barriers must guarantee its uncompromised safety.

Summarised, the disposal procedure is as follows:

From waste to monoliths. The waste drums are usually placed in concrete caissons four at a time and subsequently encapsulated with mortar to form a monolith. A monolith thus created blocks radioactive radiation and immobilises radioactive elements. Bulk waste is encapsulated directly with immobilisation mortar in the caissons.

From monoliths to modules. The monoliths are placed into modules: concrete bunkers with thick reinforced walls. Each module has a capacity of around 900 monoliths. Backfilling the modules is a semi-automated process and will take at least thirty years. This has to do with the pace of waste production and the timing for dismantlement of the nuclear facilities.

After filling, the modules are closed off with a concrete cover. A fixed roof covering all modules will offer protection against weather conditions before, during and after filling.

Final cover of the modules. In time, the fixed roof will be replaced by a permanent, virtually waterproof final cover. Our offspring will decide when to place the final cover. The design and plans are prepared at present.
The final cover will consist of a carefully designed system of natural materials and foils. It must offer protection to, e.g., invading roots and digging animals and minimise water infiltration.

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**Pace of the waste disposal**

The repository currently provides for disposal of 1,000 monoliths per annum. By 2016 – the probable start of the operation phase – the temporary storage at Belgoprocess will contain a waste stock equivalent to approximately 15,000 monoliths. At a disposal pace of 1,000 monoliths per annum, this implies a waste quantity equalling a 15 years’ operation of the repository.

By the time this stock is stored completely, probably in 2031, there will be more clarity about the programme for dismantlement of the nuclear facilities. The further strategy for disposal of the decommissioning waste will be decided at that point.

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### 4.3 / Siting of the repository

The Dessel repository comprises a number of components that all contribute to the surface disposal process. They have a distinct function in that process, yet also anticipate on opportunities for other functions, such as local employment and tourism.

**The quay** serving the ships that deliver materials for the repository from the canal. Chapter 8 (Spatial planning and mobility) deals with the quay in more detail.

**The existing storage buildings of Belgoprocess**, the current storage location of category A waste.

**The caisson plant** where the caissons are manufactured. This factory is located near the repositories, close to the quay.

**The monolith production facility (MPF)** where the waste is encapsulated in the caissons to form concrete monoliths. The monoliths will be stored in the MPF until they can be transported to the disposal modules by rail.

**The disposal modules**: the concrete constructions containing the monoliths that will be finalised as two tumuli in the landscape.

**The peripheral provisions**. The peripheral provisions on the disposal site don’t have a safety function in itself, they facilitate the disposal operation. They include the administration building, the storage zone, the maintenance building...
The order in which all these components will be located on the site will form a logical process chain. This minimises the distance the waste, the raw materials, the caissons and the monoliths need to travel.

The communication centre will also be located near the repository (see Chapter 5).

4.4 / The monoliths: key to safety

A monolith is a caisson (a covered concrete case with a 12 cm thick wall) in which the waste will be encapsulated with immobilisation mortar.

Functions of monoliths.
1. The monoliths facilitate the operation of the disposal as follows:
   - they enable far-reaching standardisation of the MPF machines and the repository (since there are only three types of monoliths);
   - they limit the variety of waste recipients, allowing for efficient stacking in the modules;
   - they allow for waste recuperation if necessary;
   - they provide for safe transport of the waste.
2. The monoliths increase the safety of the disposal operation as follows:
   - they ensure mechanical durability during transport;
   - they guarantee the necessary barrier during the entire disposal process, from storage in the MPF to placement in the disposal modules.
3. The monoliths guarantee long-term safety as follows:
   - due to their physical properties, concrete and mortar immobilise radioactive substances;
   - they safeguard mechanical and chemical conditions for the waste and the disposal;
   - they minimise water infiltration, which in turn stops leaching of radioactive substances to the surrounding area;
   - they protect the waste against disturbances from the surrounding area.

Types of monoliths. ONDRAF/NIRAS has developed three different monoliths.
- Type 1, suitable for encapsulating standard drums (220 litres – five drums per monolith, and 400 litres – four drums per monolith). The outer dimensions of this type are $1.95 \times 1.95 \times 1.35$ m.
- Type 2, suitable for non-standard drums (various volumes – one single drum per monolith). Apart from its height of 1.62, the outer dimensions are identical to those of type 1.
- Type 3 for bulk waste, mainly originating from dismantling the nuclear facilities. The outer dimensions of type 3 are identical to those of type 2. This type is equipped with a steel container to hold the bulk waste. The design of the covers allows for safe transportation of the caisson.

Use of materials. The selection of base materials – concrete and mortar – ensures the monoliths’ durability and hence their long-term safety.
1 → Caissons
Caissons are the concrete cases that will serve to pack category A waste. They will be manufactured in a caisson plant located at the disposal site.

2 / 3 → Monoliths
Category A waste will be encapsulated into concrete monoliths with immobilisation mortar. A monolith contains radioactive elements and blocks radiation. There are three types of monoliths: one for standard drums, one for non-standard drums and one for bulk waste.
4.5 / The caisson plant

On site caisson manufacture. ONDRAF/NIRAS ordered a comparative study of caisson production on site versus outsourcing their manufacture. Both options proved comparable. ONDRAF/NIRAS chose a local production unit for the following benefits:
- The caissons are a barrier for blockage of radiation and immobilisation of radioactive substances and hence form an essential prerequisite for safe disposal. Close monitoring of the compilation and durability of the caissons is hence of utmost importance. A close-by factory facilitates quality control of production and technical conditions. It also provides additional security as regards supply of caissons to the MPF.
- The nearness of all components ensures logical and efficient organisation of the process. Transport chains are minimised and material streams optimised.
- On site production contributes to local employment (see Chapter 9. Employment and retention of nuclear know-how).

Cooperation with private partner. Producing concrete parts is not a key activity of ONDRAF/NIRAS or Belgoprocess. ONDRAF/NIRAS will therefore seek a private partner for operation of the caisson plant.

One or more invitations for tenders in respect of the caisson plant must be issued. Tenders must comprise design and realisation of the factory and supply of caissons according to fixed conditions and methods. ONDRAF/NIRAS is also investigating the possibility to have the private partner develop additional, non-nuclear activities at the available grounds. These activities could provide additional employment plus a lower cost for the caissons.

4.6 / Monolith production facility (MPF)

At the MPF, the waste is placed in a caisson and filled with mortar to form concrete monoliths. The monoliths will be stored at the MPF until they can be transported to the disposal modules by rail. Annual monolith production at the MPF will amount to approximately 1,000.

The MPF will be located at the Belgoprocess site, more precisely at the terrain south of the existing processing facility (CILVA). The terrain is close to the quay, the caisson plant, the disposal site and the Belgoprocess storage buildings.
The caisson plant
The caissons will be manufactured at the caisson plant on the disposal site. ONDRAF/NIRAS will seek a private partner for its operation.
The MPF can be compared with existing conditioning facilities at Belgoprocess. Its main parts are:

- **An input buffer** for storage of waste drums and empty caissons, awaiting their processing into monoliths.
- A zone for **production of immobilisation mortar**.
- A **filling and conditioning zone**. At the filling zone, a caisson is filled with waste. It is then filled with mortar in one of two conditioning lines. Conditioning line 1 is equipped for treatment of caissons with waste drums. Conditioning line 2 can also handle caissons with bulk waste.
- A zone where the monoliths can **cure**: the environmental parameters (temperature and humidity) are set to ensure optimum curing of the mortar.
- An **output buffer** for storage of the monoliths awaiting their disposal in one of the modules. Transportation of the monoliths from the MPF to the disposal modules occurs by rail.
- A **visitor’s gallery** from where visitors can view the various processes at the MPF.

**Quality and safety control.** The raw materials and the production processes at the MPF must comply with stringent requirements, for indeed, the finished monoliths must meet the acceptance criteria that will be established for waste entering the repository. Besides quality control, measures will be taken to ensure safe operation of the MPF.

**Well thought-out production, well thought-out placement.** Placement of the monoliths in the disposal modules is not a random procedure. Depending on their properties, the monoliths are preferably placed in certain zones in the modules. For instance, monoliths with the highest radiation levels are placed at the bottom of the monoliths, and differing heights of individual monolith types require atypical grouping in the modules.

For the monoliths to be placed into the appropriate zone in the modules, they must be constructed in a certain order at the MPF. The position of the existing waste drums in the storage buildings at Belgoprocess is also important in that process. For the sake of maintaining flexibility when emptying the storage buildings, of manufacturing the monoliths and selecting the monoliths ready for transport to the repository, the MPF has been equipped with adequate input and output buffer storage. All caissons and monoliths are given a unique number, which allows for permanent monitoring of the waste.

**Belgoprocess – operator.** ONDRAF/NIRAS developed the MPF concept together with Belgoprocess. Belgoprocess will be responsible for operation of the MPF. After all, the company has many years of practical experience in conditioning radioactive waste.
The MPF (Monolith Production Facility)

At the MPF, the waste is placed in a caisson and filled with mortar to form concrete monoliths. The monoliths will be stored at the MPF until they can be transported to the disposal modules by rail. The MPF will produce approximately 1,000 monoliths per annum.
4.7 / The disposal modules and the peripheral provisions

The disposal modules

The disposal modules are designed such that:

- waste disposal can be done in a robust and safe manner;
- nuclear safety is guaranteed in the long term as well.

Design of the modules. The disposal modules are concrete constructions in which the monoliths are stored. Each module measures 25 by 27 metres and can contain around 900 monoliths. The modules are built of reinforced concrete walls and floor plates and were designed to withstand accidental stress, such as a high intensity earthquake. The modules are equipped with an inspection gallery. Furthermore, each module has an inspection area at the bottom (across the entire surface) and a drainage system. These provisions allow timely detection of any cracks or water seeping in so that action can be taken if and as required. Robotic equipment will carry out inspections of the hard to access inspection area.

The modules will be covered with a fixed steel roof during the entire period of operation to protect them against weather conditions. The roof is attached to the side walls of the modules. The roller bridge that serves to place the monoliths in the correct position is attached to the roof construction and will also be used for closure of the modules.

The modules will be built on an embankment consisting of a 60 cm gravel layer with a two meter thick mixture of sand and cement on top. The gravel prevents moisture from rising. The embankment ensures that the modules are above water level at all times, even after heavy rainfall.

Operation of the modules. The monoliths stored in the output buffer of the MPF are transported to the repository by rail. Placed on a specially designed train, they are rolled to the centre of the modules. There, they are placed in a module with a roller bridge. Four modules are filled simultaneously each time. The specific design of the roller bridge and the grabber practically excludes a possible fall of a monolith. All operations are remote controlled from the control room. Control panels are provided in designated areas for use during maintenance or in extraordinary situations.
1 → **Disposal modules**
The disposal modules are concrete constructions in which the monoliths are stored. They are equipped with an inspection gallery for early detection of any cracks or water seeping in.

2 → **Fixed roof**
The modules will be covered with a fixed steel roof during the entire period of operation to protect them against weather conditions.

3 → **Inspection area**
Each module has an inspection area at the bottom (over the entire surface).

4 → **Final cover**
In time, the fixed roof will be replaced by a permanent, waterproof final cover.
**Operation phasing.** Based on the current prognosis, 34 modules are required to dispose of the entire amount of category A radioactive waste. They are divided over two areas – one of 20 and one of 14 modules – that in time will be covered to form a tumulus. The disposal modules will be built in two separate phases:

- The 20 modules lying closest to the MPF will be constructed in phase one and in two rows of ten. Once the first ten modules are complete, site operation can begin. The ten modules that directly adjoin the first series of ten will now be constructed. The modules are filled four at a time, starting with the ones closest to the MPF.
- When a group of four modules has been filled, they will be topped by a concrete cover. When all twenty modules have been filled and sealed, the roof can in time make place for the permanent cover.
- Construction of the next set of (14) modules will begin when filling the first set of 20 is almost complete. Exact timing and duration of this phase depends on future waste production and the dismantlement scenario of the nuclear facilities.

**The peripheral provisions**

The peripheral provisions comprise:

- the administration and control building: this will be the operation seat of the disposal site. Apart from administrative areas and changing rooms this building includes the disposal monitoring and control room, data storage areas for control, the surveillance post of the site and the archives.
- The maintenance building.
- Storage zone: storage of various materials, such as gravel, cover plates, etc.
- Rails and roads for transportation of monoliths and materials.
- Infiltration basin(s): the modules and the fixed roof take up quite a large area. Precipitation falling onto this area cannot penetrate the soil and is therefore drained to one or more basins where it can infiltrate the soil. A basin will remain in service after the final cover has been applied to allow infiltration of the precipitation on the tumuli.

**ONDRAF/NIRAS takes the operation of the disposal modules in its own hands.**

Operation of the repository will be done by ONDRAF/NIRAS itself. After all, as the body responsible for waste management, it has the necessary expertise to complete disposal in a safe manner; it has knowledge of the source term, the expertise required for correct placement of the monoliths in the repository and the know-how to guarantee long-term safety.

The waste must meet certain disposal criteria and be accepted according to a transparent procedure. A distinct separation of responsibilities is crucial in this process. For this reason, ONDRAF/NIRAS established an operation company at Dessel.

ONDRAF/NIRAS will apply for a license from FANC for the construction and operation of the disposal. The operation conditions will be laid down in this license.
Operation phasing

The construction of the modules and their operation run parallel.

1. 10 modules of the first set are ready; the first four are being filled.
2. 20 modules of the first set are ready; the second batch of four is being filled.
3. 14 modules of the second set are ready; the first batch of four is being filled.
4.8 / The prototypes

The repository’s safety is key. To test and further substantiate the selected designs, ONDRAF/NIRAS will prepare a number of prototypes. At first they thought of a pilot tumulus, a test cover on a concrete disposal module. A more detailed presentation of the pilot tumulus, however, showed that a breakdown into three separate prototypes would be preferable:

– A demonstration test comprising part of the module, including the inspection area.
– A subsidence test monitoring the subsidence of the underground under a weight comparable to that of a filled module.
– A test cover monitoring and studying the behaviour of the covering layers during several decades.

The benefits of separate prototypes are:

– Scientific or technological goals can be checked in the different prototypes, allowing for independent comparison of the results.
– Separate prototypes require a smaller ground surface.
– Separate prototypes offer a better cost-benefit balance.

Separate tests will not allow a study of the relation between the cover and the module. Mathematical models however, have shown that its influence is minimal.

4.8.1 The demonstration test

The demonstration test is a reconstruction of different building blocks of the disposal modules:

– the drainage layer at the bottom;
– the embankment of sand and cement;
– the foundation plate, columns and uppermost floor plate forming the inspection area;
– part of the walls of the modules;
– the inspection gallery.

The demonstration test aims at:

– testing the construction techniques and phasing;
– testing and monitoring a number of construction parameters (bearing power, concrete curing and crimp, formation of cracks...);
– substantiating the more detailed design: use of the inspection camera, filling the inspection area...
– making the various components of the disposal modules visible to visitors.

The demonstration test will occupy a surface of approximately 20 x 25 metres in total, and will be 8 metres high. It will be built between the future communication centre and the Belgoprocess site. This location allows for its inclusion in future tours.
1  ➔  Demonstration test
The demonstration test is a reconstruction of different building blocks of the disposal modules.

2  ➔  Test cover
The test cover is a real scale simulation of the final cover: a surface of 40 x 60 metres and a height of 6 to 7 metres.

3  ➔  Subsidence test
The subsidence test aims at making an estimate of subsidence that can occur in reality.
4.8.2 The subsidence test
Subsidence can be calculated on the basis of in situ or laboratory measurements and on analytical or numerical models. In reality, however, subsidence usually proves to be much less than calculated with traditional calculation methods. For a better estimate of subsidence occurring in reality, ONDRAF/NIRAS will undertake a subsidence test. A certain volume of terrain will be raised and subsidence behaviour of the underlying surface will be measured during at least six months. The dimensions of the uppermost surface of the embankment roughly equal those of a disposal module; the bottom of the embankment measures 60 x 60 metres. The height of the pilot is 20 metres.

Test results can be used for more accurate and more realistic subsidence calculations. The outcome thereof is necessary to enable:
- proper design of the roller bridge;
- adaptation of phased filling of the modules to the expected subsidence.

The subsidence test will be performed at the location of the future MPF. The embankment material will not be removed after the test. It will be used to raise the MPF building and other constructions of the disposal site at a later stage.

4.8.3 The test cover
After completion of the operation phase, the concrete disposal modules will be covered with several natural layers and geomembranes (the final cover). The main purpose of the final cover is to minimise water infiltration and to prevent damage to the disposal by animals or vegetation.

In order to get to know the behaviour of a final cover, ONDRAF/NIRAS will install a test cover at the disposal site, a real scale simulation of a final cover. The test cover measures 40x60 metres and has a height of 6 to 7 metres.

The purpose of the test cover is threefold:
- to demonstrate technological feasibility of constructing and monitoring complex covering systems;
- to monitor long-term (several decades) performance of the final cover, for which both hydraulic behaviour and processes such as subsidence and erosion will be studied on the basis of samples and measurements;
- to introduce the public to the final composition of the repository.

The key components of the test cover are:
- A vegetation layer, that 1) promotes the growth of vegetation and thus increases the top layer’s stability, and 2) releases water from the system through evapotranspiration.
- An intrusion barrier, preventing animals or plant roots from disturbing the underlying infiltration barrier.
- An infiltration barrier, minimising water infiltration.
Management of the test cover comprises:
- research into long-term behaviour of the final cover (from a hydrological, chemical and temperature viewpoint, etc.);
- regular basic reports for partnerships and other stakeholders on the function and performance of the final cover, whereby safety-related parameters such as infiltration will be a focal point;
- set-up and continuous fine-tuning of a groundwater balance model for the tumulus.

In the course of 2009, several points of the original design of the test cover were amended on the basis of conclusions and recommendations from an expert panel. Experience with existing final covers and similar prototypes in France has been taken into account. Besides a few technological improvements to the profiles and instruments, a visitor passageway will be provided on top of the test cover. The test cover will be built next to the communication centre, to allow its inclusion in site tours.

### 4.9 / Separation nuclear and non-nuclear zones

The nuclear and non-nuclear parts of the disposal will be separated, so that non-nuclear operations (such as construction of the modules) cannot interfere with nuclear operations (such as placement of the monoliths in the disposal). The nuclear parts will be fenced off. The nuclear zone will further distinguish between a guarded area and a controlled area. In the controlled area, everyone must wear a personal dosemeter. Contamination of individuals is thus checked upon exiting the controlled area. A green fence will hide the repository from view from the cycle path along the canal.

### 4.10 / Care for environmental quality and architecture

Environmental quality is a key issue in the architecture of the disposal site and will be given special attention in the plans for designers and architects.

Until now, safety and functional aspects were the focal points of the project design. As these are now well-defined, the peripherals for panoramic quality can be determined. In order to guarantee the integrated character of the project, it is important that this runs synchronous with further specification of the separate components.

In the next few months, ONDRAF/NIRAS will prepare a global vision of the environmental quality of the site, including a framework for the environmental quality of the buildings and the open space as well as a reference design of the layout of the outdoor areas. As the layout of a certain part of the project becomes clearer, more detailed plans will be developed.
4.11 / Status quo and planned activities

4.11.1 Monoliths and study of materials

Status quo

Preparatory studies have been finished. In the period 2008-2009, detailed designs of the three monolith types have been prepared; the composition of the concrete of the caissons and the immobilisation mortar were studies as well. Another study aimed at evaluating corrosion resistance of the steel braces of the monoliths over a period of 300 years. The results of the study allow for dimensioning of the braces, taking account of the requirement that the monoliths must be recoverable.

Planning

Continued studies. A number of optimisation studies will be continued in 2010 (tests of the composition of the concrete and research into the sensitivity of the concrete and mortar compositions in view of the design of the machines for the caisson plant and the MPF).

Manufacture of the prototypes: 2010. ONDRAF/NIRAS has launched a programme for the construction of prototypes of each monolith type. The programme aims to:

- confirm the design by checking reliability of the caisson production process (placing reinforcement, measurement tolerance, mechanical fixture of the cover…), of placement of the waste drums and of pouring the immobilisation mortar (requirements with respect to deviating dimensions, porosity…);
- confirm the properties of the concrete and the mortar during their preparation and immobilisation at a representative scale;
- perform the required tests for classification of the monoliths as qualified transport packaging;
- check certain practical aspects for the module filling process (e.g. stacking the monoliths, stability of the stacks, friction, etc.).

Manufacture of the first prototypes started in February 2010. The tests will take approximately eight months.

4.11.2 Caisson plant

Status quo

Preparatory studies are complete. ONDRAF/NIRAS has had several preparatory studies carried out to make an estimate of the investment, the required space, the required personnel and the cost of operation of an on site factory for caisson production.
Planning
Decision about the PPP procedure by end 2010.
Target: caisson plant to be operational and recognised by ONDRAF/NIRAS at the beginning of 2015.

4.11.3 The MPF
Status quo
Basic concept MPF complete. The MPF concept was completed in 2009. A next step will be a more detailed description of the conceptual design, so that construction can begin.

Planning
Detailed studies in 2010 – start of construction in 2012 – start of production in 2015. The safety studies and detailed studies will be executed in 2010. In 2011, Belgoprocess will apply for the necessary licenses in order to start construction works in 2012. Completion of the works is foreseen in 2014. Monolith production is expected to start in 2015. During the first year, monoliths will be stored in the buffer storage zone and transported to the repository as from 2016.

4.11.4 Disposal modules and peripheral facilities
Status quo
Draft design of the disposal modules is completed. Detailed calculations of the various components are underway. The walls and floor plates will be calculated on the basis of, among other things, the prototypes and the analysis of the earth quake risks (exact quantity of reinforcement for the walls, required thickness...) which will result in technical specifications for the construction of the modules and the peripheral infrastructure.

Preparatory studies started. In 2009 ONDRAF/NIRAS started drawing the zoning of the repository and mapping the streams of goods and individuals. This will provide important information for the study of the operational safety on the site. 2009 also saw the start of a needs definition regarding the administration building and the workshop which will be finished in 2010. An architect will be assigned who must ensure that all project components fit into one single panoramic quality plan.

Planning
Preparation of license application at FANC. ONDRAF/NIRAS is preparing a document describing the design method of all elements of the repository in accordance with the safety strategy it developed. ONDRAF/NIRAS is also preparing a document describing all elements of the repository including their justification with respect to the safety strategy. This description of the design in preparation of the license application dossier, will be complete at the beginning of 2011. Completion of further details and preparation of the individual technological specifications is planned by mid 2012. This leaves enough time for preparation of the public procurements for the building phase during FANC’s evaluation of the license application file.
Start of construction works: halfway through 2013. Construction works are expected to start by mid 2013; building the first 10 modules and peripheral infrastructure will take approximately three years.

Start of operation: end of 2016. After performance of the necessary tests the repository can assume operation by the end of 2016.

4.11.5 The prototypes

Demonstration test: status quo and planning
The design of the demonstration test was as good as complete by the end of 2009. Construction of the test will be commissioned by mid 2010 and is expected to take about six months, which implies that the demonstration test will be realised by the end of 2010.

Subsidence test: status quo and planning
Realisation of the subsidence test has been started in February 2010. Construction and start of measurements are expected to take place in the first half of 2010.

Test cover: planning
Start of construction phase: 2012. In the course of 2011 the design will be finished and the tender procedure initiated. The construction phase will start in 2012 and take about one year. The monitoring phase will hence start in 2013 and continue for at least 30 years.

Point of attention: the final cover cannot be applied before completion of the disposal operation. It is logical to decide upon the final cover only then and to include the results of the test cover and technical evolution in the decision.
## 4.12 / Planning

### Disposal (Chapter 4)
- **Caisson plant**
  - Preparatory study
  - Licenses
  - Public procurements
  - Detailed study and construction
  - Start of operation
- **Caisson plant**
- **Disposal modules & peripheral infrastructure**
- **Prototypes**
  - Test cover
  - Demonstration test
  - Subsidence test
  - Design
  - Public procurement
  - Construction

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**MPF**
- Design
- Licenses conventional
- Licenses nuclear
- Public procurement
- Construction and testing
- Start of operation

**Disposal modules & peripheral infrastructure**
- Design
- Licenses conventional
- Licenses nuclear
- Public procurement
- Construction and testing (first 10 modules)
- Start operation

**Prototypes**
- Test cover
  - Design
  - Licenses
  - Public procurement
  - Construction

**Demonstration test**
- Design
- Public procurement
- Construction

**Subsidence test**
- Design
- Public procurement
- Construction

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55 / Disposal: the heart of the CAT project
The communication centre: the core of information on radioactive waste management
Radioactive waste disposal is not an everyday activity. Inhabitants of the surrounding municipalities therefore require clear and transparent information. Additionally, Dessel, Mol and Geel are the pre-eminent Belgian nuclear regions. The inhabitants expect the nuclear sector to conduct high quality communication and to make every endeavour to create a relationship of trust. The communication centre will constitute an accessible and attractive collection of all information regarding the cAt project. It has to become the local reference point par excellence for information on category A waste disposal and in a broader sense on radioactive waste management and its context.

This chapter
- sheds light on the set-up of the communication centre;
- describes the components and construction of the communication centre;
- explains which activities will already be started by ONDRAF/NIRAS while the licensing procedure for the communication centre is underway.

5.1 / The set-up: information about radioactive waste management and its context

Three components, one concept. The concentration of nuclear activities in Dessel, Mol and Geel has been a unique phenomenon for more than half a century. This region represents an extraordinary cluster of activities dealing with radioactive waste management: processing, conditioning and disposal of radioactive waste, research into disposal and protection against radiation, and with the cAt project, disposal of category A waste.

All these activities form an important part of the industrial heritage in the area. The link with radioactive waste management can become a specific trump card, of key interest for the tourist development of the region. For that reason, the communication centre will not only focus on the region’s inhabitants, but also aim at a broader and varied public from outside the area. Particularly the theme park about radioactive waste management and its context which forms part of the communication centre should become a great tourist attraction.
Because the infrastructure of the communication centre should allow for use by the inhabitants of the region as well, it will be a flexible concept, including, for instance, a multifunctional room that will not only serve to accommodate lectures, congresses and training programmes, but which can be used for social events as well.

The communication centre will comprise three complementary and physically integrated components:

– a contact and reception centre;
– a digital and interactive network;
– a theme park.

Together, they offer a broad range of services and functions for a varied target audience.

5.1.1 The contact and reception centre: central point of contact for the people living in the neighbourhood

The contact and reception centre will be the central contact point for people living in the neighbourhood on everything that has to do with the cAt project and nuclear facilities in the region. It comprises several services:

– **Information.** Visitors receive clear and objective information on the nuclear activities in the area, but also about safety plans, results of repository-related measurements, nuclear transports, etc. All nuclear parties from the region and government bodies involved (e.g. security authorities) can introduce themselves here. Local services relating to the nuclear activities will be located at the centre.

– **Ombuds service.** The address for persons and organisations with questions, suggestions or complaints about the nuclear activities in the region.

– **Mediatheque.** An extensive mediatheque issues publications and multimedia materials about nuclear subjects for a broad public and offers access to virtual scientific libraries.

– **Communication programme.** An active communication programme will be established at the contact and reception centre. Open and proactive communication about radioactive waste management and the cAt project will be manifest through newsletters, information sessions, etc. A multifunctional room will be available for lectures, congresses, debates, etc., but also for local community activities.

5.1.2 Digital and interactive network

Today’s communication technology offers plenty of opportunities for distribution of information in a trustworthy manner, for invoking a dialogue and for transparent communication. ONDRAF/NIRAS will therefore establish a digital and interactive network (DIN).

The data on the network will allow inhabitants to obtain information about the cAt project from a distance, via tv or website. The network will also provide extensive yet accessible information about the nuclear activities and companies in the region, and about preventive and safety measures. The network can also be used for initiatives from the local communities, such as community television.
5.1.3 The theme park: information park for all ages

The theme park will host attractively arranged information about radioactive waste management and its broader context. It aims at a broad and diverse public including schools, families, groups and clubs and companies. It can accommodate around 40,000 visitors per year.

The theme park will consist of an activity area with up to one hundred interactive set-ups, annual temporary exhibitions, a scientific theatre and rooms for workshops.

Besides the educative aspect, relaxation is also an important element of the theme park: the pleasure of exploration comes first. To realise that goal, the theme park will use the latest technology, interactive set-ups and experience-oriented components, technological tours de force, multimedia and high technology.

5.1.4 Multifunctional provisions combined in a central square

Many of the provisions at the communication centre have a multifunctional character: a reception desk both for the contact and reception centre and the theme park, a multifunctional room that can serve various purposes, smaller rooms for workshops, meetings and group receptions, a catering facility, etc. These provisions are clustered in a covered central square.

**Agora.** The agora is the central access area to the communication centre. It contains the reception, checkout and ticketing office for the theme park and the first contact desk for the contact and reception centre. The agora also houses a wait and picnic area, a cloakroom and lockers. At peak hours, the agora can serve as an extension of the café cum restaurant and as a foyer for the multifunctional room.

**Presentation area about nuclear activities in the region.** A presentation area showing the nuclear history and companies of the region will be located in or adjacent to the agora.

**Tourist information centre.** The tourist information centre will be an interactive set-up providing regional tourist information.

**Café cum restaurant with outdoor terrace.** A catering facility will serve as a cafeteria for the contact and reception centre and as a lunchroom for theme park visitors. It will also have the ability to function autonomously, hence outside normal opening hours of the contact and reception centre and the theme park.

**Shop.** A small shop adjacent to the agora and the theme park will offer gadgets, didactic material, popular scientific literature, etc.
5.2 / Location, architecture and access

5.2.1 Where is the communication centre going to be located?
The communication centre’s planned location is on a terrain in Dessel’s nuclear zone, where de Gravenstraat and the Kastelsedijk intersect. The immediate proximity of the repository is an important reason for positioning the communication centre within the nuclear zone; after all, a combined visit to the communication centre, the repository and the prototypes must be possible. The Gravenstraat currently serves as the central access road to the nuclear zone north and south of the canal. Due to the location of the communication centre at the Gravenstraat and its accessibility via this road, it becomes a functional part of the nuclear zone forming its most northern end. Positioning the communication centre at the Gravenstraat also clearly constitutes a relationship between the nuclear zone and Dessel’s centre.

Effective realisation of the communication centre at the chosen location requires a revision of the regional plan. The only way to achieve that is by preparing a Spatial Implementation Plan (SIP). The planning process required for this purpose is described in Chapter 8. Spatial planning and mobility.

5.2.2 Architecture
Care for the environment and the surroundings and consideration towards the local communities are key values of the cAt project. Architecture and layout of the communication centre must translate these values to the visitors. In scope thereof, the design of the communication centre will follow the principles of energy-economical or even passive construction and pay ample attention to well though-out use of space and materials.

5.2.3 The outer area
In order for the communication centre to become an attraction area, the layout of the outer area must also be attractive and functional. Nice surroundings not only add to the attraction of the site, they also offer added value to the people who live in the vicinity. The layout of the site must therefore fit in with this green neighbourhood with its rich flora and fauna.

A nice square will be created in front of the communication centre, and a terrace and picnic meadow to the northwest side. The picnic meadow will be used for interactive outdoor presentations. A small, adjacent meadow will offer room for small events. The picnic meadow can also serve as the outdoor area of the multifunctional room, for large receptions for instance.

A first parking is planned between the Gravenstraat and the front square, which can be expanded into a second, semi-paved zone to the north. If the second zone remains unused it will become part of the green zone alongside the Gravenstraat. More to the north is an unpaved area under the high voltage line, which can be used as a parking during peak hours. Because this zone will not be paved it remains part of the green edge of the site.
**Communication centre**
The communication centre will be the contact point for people living in the neighbourhood for everything that has to do with the cAt project and nuclear facilities in the region. The theme park will be an educational park about radioactive waste management.

**Location**
The communication centre’s planned location is in Dessel’s nuclear zone, where de Gravenstraat and the Kastelsedijk intersect. Its location close to the repository is important: it allows a combined visit to the communication centre and the repository and prototypes.
5.2.4 Visiting the repository

ONDRAF/NIRAS seeks open communication about the disposal works. To view the facilities, a footpath takes visitors from the communication centre to close by the first disposal module. Information panels about the disposal and the activities will be placed there as well. The footpath is open to everyone. There are plans for future guided tours of the repository.

5.2.5 Recreational educational route

The footpath will be continued along the canal up to the towpath, creating a 4.5 km loop for walkers and cyclists around the nuclear site.

The part north of Belgoprocess will be arranged as a nature education trail, including information panels about the flora and fauna of this heterogeneous piece of nature. The point more to the west where the path bends 90 degrees south would be suitable for a panorama tower with free access and offering a view of the repositories and the surrounding area. The tower could also serve as a beacon on the crossroads of the two axes: from the Gravenstraat along the nature education trail and from the Kastelsedijk along the Zandbergen.

When in the future the sand reclamation operation east of the Gravenstraat is complete, a pedestrian and cyclist route can be created along the banks of the pond. It would nicely seal off the cycling and walking loop up to the communication centre.

Operation of the communication centre

The local communities have clear expectations from ONDRAF/NIRAS as regards the communication about the waste and repository management. They count on ONDRAF/NIRAS to live up to its responsibility and to materialise it by turning the communication centre into a centre of information about radioactive waste management in general and the cAt project in particular. Accessible, proactive, stimulating, open and transparent communication is key and accessibility of the facilities crucial.

A management structure will be developed for operation of the communication centre to concretise this commitment. How the various participants (partnerships, municipalities, nuclear companies) can be involved in the establishment and operation of the communication centre must be investigated in that process. It would seem evident that the partnerships offer an important contribution as regards the distribution of information that is of interest to them (see Chapter 7. Participation). As for other parts of the communication centre (catering, shop...), possible concession of operation to an external partner will also be examined.
5.3 / The test project digital and interactive network and the information path: activities brought forward in time

Due to the fact that several planning and licensing procedures must be fulfilled (see Chapter 8, Spatial planning and mobility, and Chapter 13, Licensing) the communication centre will not open its doors before 2016.

Still, ONDRAF/NIRAS wishes to concretise communication on the cAt project as soon as possible. It therefore brings a couple of realisations forward: a test project for the digital and interactive network and a path with information panels for visitors.

5.3.1 Test project digital and interactive network

The digital and interactive network (DIN) does not rely on the construction of the communication centre and hence offers the opportunity to extensively communicate about the cAt project with the local population before the centre opens. The DIN is a unique and ambitious initiative, and the start of a test project therefore justified. This test project should answer the question whether the DIN has the potential to offer confidence-building information and to inspire the dialogue about the cAt project with the population. The community television concept must be tested as well: will viewers like the idea and will enough volunteers be motivated to supply film material?

The test project will check the DIN’s technological, organisational and communicative operation and feasibility. It will also serve as a communication tool offering low-threshold information about the integrated disposal project to the local population. Finally, the test project will serve as a tool for communication from within the local communities and thus strengthen the cohesion thereof.

Together with the local partnerships ONDRAF/NIRAS has embarked on the test project at the beginning of 2010. The content will be prepared by a production company and a group of volunteers who will be trained for this purpose. The results can be viewed via digital television and on a website. All inhabitants in the region who have an internet connection or digital television are thus served a taste of the real DIN. The DIN test project will run from 2010 to 2012. A thorough evaluation of the project is foreseen for the end of 2012. ONDRAF/NIRAS and the local partnerships will then make an evaluation of any necessary adjustments to the concept before the real DIN will be created.

5.3.2 Path with information panels

A path with information panels leading up to the location of the disposal modules will be created in the short term as well. The temporary path follows the track of the future walking route from the communication centre to the repository.

This path opens up the site to the general public and enhances transparency about what is going on. Panels with well-defined information along the path can provide early communication with the population from the heart of the disposal project, long before realisation of the communication centre itself.
Visiting the repository

A footpath runs from the communication centre to close by the first disposal module with information panels about the disposal concept and works. The footpath will be continued along the canal up to the towpath, creating a 4.5 km loop for walkers and cyclists around the nuclear site. The part north of Belgoprocess will be arranged as a nature education trail, including information panels about the flora and fauna of this heterogeneous piece of nature.
5.4 / Status quo and planned activities

**Preliminary study finished, further fine-tuning in progress.** Over the past few years, a multidisciplinary team of specialists has carried out a preliminary study into the communication centre. The proposals from this study are currently worked out in more detail with the parties involved. Given the size and complexity of the project, the studies have been divided into sub-projects. Some parts will not yet be started to avoid that decisions become outdated before the project is finished. Other components can only be realised after certain milestones have been achieved: approval of the SIP (no earlier than end 2011), construction permit (no sooner than 2012), et cetera.

**Trial project started.** The DIN trial project took off at the beginning of 2010 and the temporary information path will also be laid shortly.

5.5 / Planning

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The Local Fund: sustainable long-term opportunities for Dessel and Mol

It is only fair that the cAt project would offer benefits to the local communities with whom ONDRAF/NIRAS, by way of a participative process, has built up societal support for the repository. These added values are included in all building blocks of the cAt project and hence inextricably connected with it. Furthermore, a Local Fund (in short: LF) will be created as a means to realise additional socio-economic added value projects.

This chapter
- describes the why and how of the LF;
- gives a short description of the organisation and the articles of association of the LF;
- formulates the method determining the value of the LF.

6.1 / Why a Local Fund: added values for successive generations

One characteristic of radioactive waste repositories is their long life cycle (several hundreds of years). Their impact on the surrounding area will continue even after operation and closure of the disposal modules and after the monitoring phase.

A fund is a suitable instrument to create a continuum of socio-economic values: it ensures a permanent source of funds for many generations. Furthermore, a fund allows for anticipation on changing needs in society. After all, it is neither possible nor desirable at this moment, to make an estimate of the types of projects and activities that will provide added value to local communities a few decades from now.

6.2 / Purpose of the fund: sustainable added values for the local communities

The LF must create sustainable opportunities for the local communities and improve the quality of life of the local population in the short, medium and long term. Projects and activities must therefore produce a long-term positive effect.
The nature of projects and activities financed by the LF may vary: they may have a social, economic or cultural character or be aimed at the environment, health, welfare, etc. The projects and activities of the LF promote social life and stimulate creativity and originality without imposing an additional financial burden on the inhabitants. The LF thus provides opportunities for social, cultural, ecological and economic added values that surpass the added values created by the cAt project itself.

The precise conditions to be met by projects and activities have yet to be defined. Of further importance is the fact that the projects and activities financed by the LF may not pertain to the regular responsibilities of the (local) authorities, although there may be overlap.

The Local Fund will be managed equally (50-50) by the local partnerships of Dessel and Mol. The Local Fund thus constitutes one common fund with two equal sub-funds and this corresponds to the common standpoint of the local partnerships (dated 18 June 2008).

6.3 / Organisation of the LF: form, Articles of Association and management methods

The legal establishment of the LF is carried out in consultation with the local partnerships.

6.3.1 Legal form and funding
The LF is a fund with its own legal structure in the form of a private foundation. Offering the most flexible structure for incorporation of a number of bespoke preferences of the partnerships, this legal form was therefore chosen by the partnerships. The LF will be fuelled from the Medium Term Fund (MTF).

6.3.2 Articles of Association
At this moment, there is consensus about the Articles of Association of the foundation with both STORA and MONA on the basis of the currently available information.

The Articles of Association describe the purpose, the organisation and management of the foundation.

Purpose. The foundation realises its purpose through direct or indirect support, participation in and/or development of projects and/or activities that may not form part of the regular responsibilities of local authorities, although they may show a certain overlap.

Organisation. The capital of the foundation will consist of three compartments, each comprising a separate part of the capital of the foundation that may only be used for a specific activity:
- The treasury compartment: for management of the start capital contributed by the founder and every addition to it.
- The Dessel compartment: for the activities of the foundation related to the Dessel municipality.
- The Mol compartment: for the activities of the foundation related to the Mol municipality.

**Management.** The Foundation is managed by a Board of Directors consisting of at least six and at most eight directors, all natural persons and appointed as follows:

- Both STORA and MONA will each appoint three directors of the foundation, on the understanding that:
  - one of these directors must be a member or representative of the municipal council of the relevant municipality;
  - one of these directors must be a member or representative of, or otherwise connected with a typical economic organisation operating in the relevant municipality;
  - one of these directors must be a member or representative of, or otherwise connected with another typical social organisation (e.g. of a socio-cultural or ecological nature) operating in the relevant municipality.
- Besides the three directors mentioned above, each of the partnerships is entitled to appoint a fourth director in the foundation. If either partnership uses this right, the other partnership must also proceed to such appointment.

The Board of Directors will choose one chairman from its midst who will be appointed intermittently from the STORA and MONA boards every three years. If the chairman is chosen from one partnership, the vice-chairman will be appointed from the other partnership.

**6.3.3 Management methods**

The management methods of the LF will be defined in the course of 2010 and 2011 on the basis of the Articles of Association. They will comprise the financing and expenditure methods and the basic principles of financial management.

It has been established that the LF will be fuelled from the MTF, but the exact method has yet to be decided. ONDRAF/NIRAS will also consult with the partnership about the best appropriation of the funds: annual limits, criteria for the projects and activities, etc.

Furthermore, the basic principles of financial management will be established: how will the funds be managed; who will manage them; how will management be monitored; which method of reporting will apply; what kind of audits are required; what is the tax situation of the fund...?
6.4 / Value of the LF

The LF forms an important project component and will be fuelled by the Medium Term Fund (MTF). The MTF finances certain project parts of the cAt project that are not covered by the Long Term Fund (LTF) (see Chapter 11. Balanced funding via two ONDRAF/NIRAS funds). Developing a legal basis for the MTF forms part of the task bestowed on ONDRAF/NIRAS by the Council of Ministers. The MTF will be created through an Act which, among other things, will establish the size of the MTF. It is therefore important that the value of all project components to be financed by the MTF and hence also of the LF, is known. Furthermore, it is crucial that the value of the LF is determined in a scientific manner.

To furnish the talks about the value of the LF, three preliminary studies were carried out in 2009:
- a cost-benefit analysis;
- an eclectic multi-criteria analysis;
- a comparative study of ‘community benefits’ abroad.

The three studies are discussed below, followed by a proposal for the determination method of the value of the LF and application of this principle.

6.4.1 The cost-benefit analysis: which is the minimum amount required for economic compensation of the consequences of the disposal?

Set-up of the study. A cost-benefit analysis was carried out upon ONDRAF/NIRAS’ request. It is a method to establish which amount would be required for economic compensation of the consequences of the disposal that most certainly would not set back the inhabitants of Dessel and Mol.

The cost-benefit analysis aimed to provide an objective, scientifically underpinned reference point that could furnish the talks between the different stakeholders about the added values the local partnerships are entitled to. The stakeholders are the radioactive waste producers, the local partnerships and ONDRAF/NIRAS.

The study makes an estimate of the maximum disadvantage suffered by the local population as a result of their acceptance of the repository. Taking account of a number of hypotheses and applied for a couple of scenarios, it calculates the value of the LF required for economic compensation of that disadvantage. In other words: the study defines from which point the LF offers added values to the local communities.

Assumptions. The ‘disadvantage’ of the repository can only be calculated against a reasonable alternative, i.e. a situation without a repository. The study compares the best possible, but realistic course of a repository in Dessel with the best possible, yet realistic application of means (especially terrains) if no disposal were to be erected in Dessel.
A first assumption relates to what would happen to the site if no disposal were to be created there. The researchers assumed that the optimum economic valorisation of the terrain would be the development into an SME zone and they also assumed that the municipality would succeed in obtaining all necessary adjustments to the spatial planning for such a destination.

A second assumption is that, given the very low unemployment rate in Dessel and Mol, offering employment closer to home would constitute the key benefit of a new SME-zone. The advantage hence mainly constitutes savings on commuting costs, not in an increase of the population’s employment rate. There is no multiplier effect and no increase of the added value, because practically the entire population already has employment and only the employment location could change.

A third assumption looks into the interest rate and the time line. The objective is to convert the maximum disadvantage over the entire disposal period into a one-off sum in the present (a “fund”). A period of 52 years is taken as the starting point. This corresponds to the period starting in 2008 (the year the disposal terrain was purchased) up to and including 2060 (the expected end of the disposal activities). This period was chosen on the basis of available information on the disposal project and a number of financial-economic factors such as the availability of long-term information about unemployment, economic activity and capital markets.

**Conclusion of the cost-benefit analysis.** The research team made an effort to produce a list as complete as possible of all the effects that can be expressed in money. The sum of the values of these effects equals the minimum value of the LF. The study calculated this reference point to amount to 32 million euros.

**6.4.2 Eclectic multi-criteria analysis: basis for integrated weighing of effects**

Following a request from MONA an eclectic multi-criteria analysis (EMCA) was carried out to get a better apprehension of the social preference for certain alternatives.

What is an EMCA? In order to determine the value of the LF, other effects besides those that can be expressed in money must be examined. Qualitative effects such as nature, mobility, quality of life, sense of safety, ethical criteria, and strategic objectives have significance as well. After all, they play an important part in the assessment by the different shareholders of the disposal project against other alternatives.

An EMCA allows for integration of all those effects into one single analysis and hence offers a rational framework that can serve as the basis of a broader socio-economic evaluation. An EMCA provides insight into the social decision-making process on the basis of expert information. Thanks to the analytical-hierarchical process (a scientific method to categorise preferences), contradictions in “value” or “preference” are presented in an objective and quantifiable manner.
From preferences to multipliers. The study makes an assessment of the preference for radioactive waste disposal – both the general social preference and the preference of each individual stakeholder. It uses criteria that represent the elements stakeholders include in their choice: what is important to them, and what isn’t, or less?

By comparing the categorisation of preferences between the parties involved, researchers check for differences between the preferences and how big those differences are. A large distance between the participants’ preferences affects the added values that must be created in the project and hence affects the value of the LF. Based on the EMCA the researchers calculate a factor – also called a multiplier – that reflects the differences in preference.

EMCA results. The EMCA shows a general social preference for surface disposal. The EMCA results thus confirm that the government decision of 2006 on the chosen technological option, namely surface disposal, reflects society’s general expectations.

However, a number of differences exist between the stakeholders and alternatives:
- The local communities prefer deep disposal with economic development above ground, causing the first difference in preference.
- The preference for surface disposal is less distinctive among the local communities than among the federal government and waste producers. This constitutes the second difference in preference.

The final scores for each stakeholder reflect the weight they allocate to the various alternatives. On the basis of the preferential differences, the EMCA calculates the following ratios:
- The ratios reflecting the difference in preference for surface disposal between the local communities on the one hand, and the federal government and waste producers on the other;
- The ratios displaying the difference in preference from the perspective of the local communities, between surface disposal on the one hand and deep disposal with economic development above ground on the other.

EMCA conclusion. The EMCA shows that a multiplier of 1.34 to 2.79 seems appropriate to quantify the differences in preference. The bottom end (1.34) marks the difference in preference among the local communities for surface disposal versus deep disposal with economic development above ground. The upper end (2.79) marks the difference in preference for surface disposal between the federal government and waste producers on the one hand, and the local communities on the other.
6.4.3 A comparative study of community benefits by the EDRAM countries

ONDRAF/NIRAS ordered a comparison of so-called community benefits in EDRAM countries (International Association for Environmentally Safe Disposal of Radioactive Materials). The study aimed at providing insight into how other countries implement added values or socio-economic support measures in the process of constructing facilities for radioactive waste management.

The EDRAM study showed that socio-economic added values usually exceed the added values that follow directly or indirectly from the facility itself. This implicates a broad recognition of the fact that communities that are prepared to offer a service of public value by taking in a facility for radioactive waste management, are entitled to clear added values that increase their social and economic well-being.

Types of socio-economic added values. The added values can have different shapes, but can roughly be split into five categories:

– additional investments in local infrastructure;
– attraction of additional local activity;
– specific funds and grants;
– support in the form of training and logistics;
– the establishment of community funds for local development.

Only a few countries apply a special tax or tax rate for nuclear facilities. Practically all countries launch concrete initiatives to establish local funds for socio-economic development. Most funds have a broad field of application.

Size of the funds. The size of the funds varies greatly between systems. First, the studied funds are linked to different types of facilities, with varying investment and cost structures. Management structure and operational conditions also greatly differ from country to country: funds are usually managed by the waste manager or operating body, or by a specific entity that during a certain period, pays a specific amount to the host municipality and its neighbours. Furthermore, they are installed in areas with different demographic, socio-economic and political climates. As regards size, few concrete conclusions can be drawn.

Table 1 gives an idea of the size of a few funds.
Table 1. Examples of funds and their sizes from the EDRAM study.

<table>
<thead>
<tr>
<th>Annually available amount (reference year 2008)</th>
<th>Time span</th>
<th>Beneficiaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada (Kincardine: deep disposal of low-level and medium-level waste)</td>
<td>approx. 0.55 million euros</td>
<td>30 year period</td>
</tr>
<tr>
<td>Zwitserland (ZWILAG: Central storage of low-level, medium-level and high-level waste)</td>
<td>1.1 million euros</td>
<td>25 year period (with option to extend the contract)</td>
</tr>
<tr>
<td>Spanje (El Cabril: surface disposal of low-level and medium-level waste)</td>
<td>1.24 million euros</td>
<td>300 year period in principle (until dismantlement)</td>
</tr>
<tr>
<td>USA (WIPP: deep disposal of long-lived waste of military origin)</td>
<td>3 million euros</td>
<td>Indefinite (but dependent on annual Senate decision)</td>
</tr>
<tr>
<td>Frankrijk (Bure: URL, underground laboratory for disposal of high-level waste) / Phase 1</td>
<td>20 million euros</td>
<td>8 year period</td>
</tr>
<tr>
<td>Frankrijk (Bure: URL) / Phase 2</td>
<td>40 million euros</td>
<td>Indefinite (but re-negotiable at next phase)</td>
</tr>
</tbody>
</table>

6.4.4 Proposal for the method of determining the value of the LF

The three abovementioned studies provide important input to define the desired value of the LF. Which value is acceptable for all parties is still a subject of discussion. To define the order of magnitude of the LF, ONDRAF/NIRAS suggests combining the results of the EMCA study and the cost-benefit analysis.

For a fair calculation of the LF value, the appropriate multipliers from the EMCA study, reflecting the difference in preference between the various stakeholders and alternatives, can be applied to the annual economic compensation at least required according to the cost-benefit analysis. The multiplier indicates the factor by which the economic compensation must be multiplied to take account of the added values the local communities are entitled to on the basis of the difference in preference. The multiplier acts as the “added value coefficient”.

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The thus obtained range defines the required limits of the fund’s annual income in order to include:
- the economic compensation, and
- the added values the local communities are entitled to and which show from their preferences.

This method can determine the required yield on any given capital to provide added values corresponding to a specific added value coefficient. A next step can calculate the amount of the basic capital, taking account of a specific added value coefficient and a specific net interest.

6.4.5 The principle applied: defining the value of the LF

**Step 1. Which annual yield is required to create the added values?**

In order to achieve the full economic compensation of 32 million euros, based on an interest rate of 1.5% as applied in the cost-benefit analysis and a period of 52 years, a minimum amount of 880,000 euros is required per year.

Applying the multipliers 1.34 and 2.79 to this annual economic compensation results in a range between 1,179,200 euros and 2,455,200 euros. Hence the annual yield of the LF must lie between these two limits in order to contain the added values defined in the EMCA study.

The annual net amount the LF must yield in order to provide added values corresponding to a certain multiplier can be deduced from Table 2. For example: the LF must yield a net amount of 1,610,000 euros per annum to contain added values corresponding to a multiplier 1.83. It must generate a net amount of 2,323,200 euros to reach a multiplier 2.64.

**Table 2. Range of the annual net yield of the LF as calculated by combining the cost-benefit analysis and the EMCA**

<table>
<thead>
<tr>
<th>Ratio</th>
<th>1.34</th>
<th>1.50</th>
<th>1.67</th>
<th>1.83</th>
<th>1.99</th>
<th>2.16</th>
<th>2.32</th>
<th>2.48</th>
<th>2.64</th>
<th>2.79</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>880.000</td>
<td>1,179,200</td>
<td>1,322,904</td>
<td>1,466,608</td>
<td>1,610,400</td>
<td>1,754,104</td>
<td>1,897,808</td>
<td>2,041,600</td>
<td>2,182,400</td>
<td>2,323,200</td>
</tr>
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</table>
Step 2. Which net interest figure is plausible?

**Net returns.** In order to calculate the net interest figure, inflation must be taken into account. This is important for avoiding devaluation of the base capital, since the LF will be an “eternal” fund. Every year, part of the gross income must therefore be used to keep the basic capital at a constant level. Deduction of the withholding tax on movable property must also be taken into consideration.

**Safe investment.** The choice for a low risk investment implies a choice for a relatively lower yield. The average net yield from a typical low profile investment is 1 to 2.5%, which can vary over the years.

Step 3. What should the basic capital amount to?

After the multipliers have been applied to the annual economic compensation a calculation can be made of the basic capital that, taking into account a certain net interest, is required to reach a certain added value coefficient.

Table 3 provides an overview of the value of the LF based on a certain net interest and added value coefficient.

The range in which the added value coefficient is situated has been scientifically substantiated as described above. The interest rate, however, is an uncontrollable variable that is expected to fluctuate over the years between 1 and 2.5%.
Table 3

Application of added value coefficient from EMCA study to annual economic compensation from the cost-benefit analysis

<table>
<thead>
<tr>
<th>Added value coefficient (EMCA)</th>
<th>1</th>
<th>1.34</th>
<th>1.50</th>
<th>1.67</th>
<th>1.83</th>
<th>1.99</th>
<th>2.06</th>
<th>2.16</th>
<th>2.32</th>
<th>2.48</th>
<th>2.64</th>
<th>2.79</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real annual economic compensation (cost-benefit analysis)</td>
<td>880.000</td>
<td>1.179.200</td>
<td>1.322.904</td>
<td>1.466.608</td>
<td>1.610.400</td>
<td>1.754.104</td>
<td>1.812.800</td>
<td>1.897.808</td>
<td>2.041.600</td>
<td>2.182.400</td>
<td>2.323.200</td>
<td>2.455.200</td>
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</table>

Calculation of eternal fund at a certain net interest and a certain real annual compensation

| Real annual economic compensation | 880.000 | 1.179.200 | 1.322.904 | 1.466.608 | 1.610.400 | 1.754.104 | 1.812.800 | 1.897.808 | 2.041.600 | 2.182.400 | 2.323.200 | 2.455.200 |

<table>
<thead>
<tr>
<th>Net interest</th>
<th>1.00%</th>
<th>1.25%</th>
<th>1.50%</th>
<th>1.75%</th>
<th>2.00%</th>
<th>2.25%</th>
<th>2.50%</th>
</tr>
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<tbody>
<tr>
<td>88.000.000</td>
<td>117.920.000</td>
<td>132.290.400</td>
<td>146.660.800</td>
<td>161.040.000</td>
<td>175.410.400</td>
<td>189.780.800</td>
<td>204.160.000</td>
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<tr>
<td>160.832.000</td>
<td>189.780.800</td>
<td>210.656.000</td>
<td>231.520.000</td>
<td>252.384.000</td>
<td>273.248.000</td>
<td>294.112.000</td>
<td>314.976.000</td>
</tr>
<tr>
<td>193.240.000</td>
<td>223.104.000</td>
<td>252.960.000</td>
<td>282.816.000</td>
<td>312.672.000</td>
<td>342.528.000</td>
<td>372.384.000</td>
<td>402.240.000</td>
</tr>
<tr>
<td>215.648.000</td>
<td>245.520.000</td>
<td>275.392.000</td>
<td>305.256.000</td>
<td>335.120.000</td>
<td>364.984.000</td>
<td>394.848.000</td>
<td>424.712.000</td>
</tr>
<tr>
<td>237.440.000</td>
<td>267.304.000</td>
<td>297.168.000</td>
<td>327.032.000</td>
<td>356.896.000</td>
<td>386.760.000</td>
<td>416.624.000</td>
<td>446.488.000</td>
</tr>
</tbody>
</table>

Conclusion

The table shows the calculation of the LF at a certain net interest between 1 and 2.5% and a certain annual economic compensation between 1,179,200 euros and 2,445,200 euros.

The table shows two extremes:
1. a minimum interest of 1% combined with the lowest added value coefficient (1.34);
2. a maximum interest of 2.5% combined with the highest added value coefficient (2.79).

The diagonal formed by the two extremes reflects the variation in net interest rates (uncontrollable) and added value coefficients (scientifically determined). The variation represents the scientifically determined and reasonable range in which the basic capital of the LF should be found. That basic capital lies between 90 and 100 million euros.
6.5 / Decision

The Local Fund is established to realise additional socio-economic added value projects, on top of the added values realised by the cAt project itself. The LF must create sustainable opportunities for the local communities and improve the quality of life of the local population in the short, medium and long term. The projects and activities must cause a long-term positive effect and their nature can vary: they may be social, economic or cultural or aimed at the environment, health, welfare, etc.

The LF will be a common fund with a sub fund for Dessel and a sub fund for Mol.

Taking account of the fluctuating interest rate and in order to reach an added value coefficient between 1.34 and 2.79, a start capital between 90 and 110 million euros is required (euro March 2010).

6.6 / Status quo and planned activities

Detailed plan by the end of 2011. The legal framework, funding methods, expenditure pattern, management structure and basic principles for financial management should be defined by the end of 2011. All these principles will be laid down in close consultation with the local partners.

Fuelling the LF. The set-up of the LF is linked to fuelling the MTF. The waste producers start fuelling the MTF no later than three months after the establishment license for the repository has been granted. This is currently estimated to take place late 2013. No more than three months after the operating license for the repository has been granted, the MTF amount must correspond with the amount determined by law. At that moment, the LF should be fuelled.

6.7 / Planning

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6 / The Local Fund: sustainable long-term opportunities for Dessel and Mol
Assure participation: today, tomorrow and beyond

From the very beginning, participation has formed an essential part of the cAt project and it must stay that way in the future. ONDRAF/NIRAS is therefore committed to maintain a partnership with the local communities throughout the duration of the cAt project. Apart from having a close watch on the cAt project itself, the population wishes to be actively involved in other nuclear activities in the area. Today, that wish has already materialised in the two partnerships.

This chapter

- describes the role the partnerships can play between ONDRAF/NIRAS and the local communities during the different phases of the cAt project;
- describes the role of the partnerships in the longer term in involving the local communities in the nuclear activities in the region.

7.1 / Continuing participation: an advantage for all parties involved

An indispensable partnership. In the course of the years, an extraordinary participation model has developed around disposal of category A waste. The inhabitants of the Dessel and Mol municipalities are closely involved in the realisation of the aggregate cAt project via the local partnerships STORA and MONA. ONDRAF/NIRAS seeks a balanced and stable relationship between the disposal project and its surroundings, both on an environmental, scenic and social level. Not only is it important that the repository is integrated responsibly into the surrounding area; the success of the cAt project’s primary objective – safe disposal of category A waste – also largely depends on the relationship with the social environment. A partnership between ONDRAF/NIRAS, the municipalities involved and their citizens is therefore indispensable throughout the duration of the cAt project. Both local partnerships have also made maintenance of participation a condition for accepting the repository.

A broader view. Apart from monitoring the developments in the cAt project from design to realisation, local society also wishes to have a broader view and the role of the partnerships was therefore expanded on several occasions. Their involvement is meant to continue in all nuclear activities and events in the region.
7.2 / A to Z of participation in the cAt disposal project

**Six project phases.** The cAt project progresses step-by-step, over a period of several decades. By and large, six phases can be distinguished in the life cycle of the repository:
- the preliminary phase (1999 – 2006) during which a suitable disposal solution and site were sought;
- the project phase (2006 – 2013), during which the project is being worked out in more detail and the required licenses, funding and engagements are being acquired;
- the construction phase (2011 – 2016), during which the aggregate project will be realised (2016: first series of 10 modules completed);
- the operation phase (2016 – at least 2046), during which the repository will be backfilled systematically and actively managed;
- the closure phase, comprising the transfer from active into passive management of the repository;
- the post-closure period.

Decisions beyond the day-to-day operation will be required at several moments: the construction of the second series of modules, adjustments of the waste volumes, closure of the modules... To ensure a socially acceptable course of action as regards that process, ONDRAF/NIRAS wishes to maintain a solid relationship with the surrounding area. It also wants to contribute to a sound awareness and knowledge about the disposal project among the population.

**Starting points.** Just like today, the starting point of the partnerships remains an independent local participation structure with a permanent character and a representative composition, in active pursuit of close involvement of the population. It is important that lessons and achievements from the first phases are carried forward to the next, now and in the future. Furthermore, there must be room for any adjustment required in the future, for instance as a result of social evolutions.

**7.2.1 Participation in the construction phase: keep the current momentum**

The construction phase forms the concrete transfer from plan to actual realisation; it is the extension of the project phase. During this period, participation is mainly about follow-up of the various project components. Each project implementation must count with unforeseen circumstances. A local consultative structure as a fixed point of contact is then useful to decide about possible course adjustments.

In this phase, the work method of the current partnerships can be a close fit with the approach in the project phase. Until this day, both local parties and ONDRAF/NIRAS are satisfied with this work method. As long as the partnerships operate to everyone’s satisfaction, remain representative for their local community and keep their independent character, there is no reason to change their structure or redesign the cooperation method. ONDRAF/NIRAS therefore proposes to continue the current operation of the partnerships during the construction phase.
7.2.2 Participation in the operation phase: various phases and roles for the partnership

The transfer from the construction phase to the operation phase will probably occur gradually. Some project components will be realised and operational earlier than others. The role of the partnerships, the municipality and its citizens in the follow-up of the cAt project will shift along with that process. In other words, the function of the local partnership may differ per subproject.

- **As regards the repository**, the evolution will probably be one from relatively active follow-up during the project phase and realisation, to a more passive involvement during the operation phase. From collective design and implementation, activity will move to actual operation of the site. This remains ONDRAF/NIRAS’ responsibility at all times and may not be delegated to third parties – neither to the partnerships, nor to the municipalities. Operation must occur in an open and transparent atmosphere, however, whereby the population is entitled to information and a critical evaluation of the activities on the site.

- **For other project components, such as the Local Fund**, the local participants become the active parties in the operation phase. In the field of openness, transparency and critical monitoring, the roles are now in fact reversed. Besides offering the population the opportunity to monitor and direct its representatives in the management bodies, the local partnership also provides ONDRAF/NIRAS and the federal government with a means of information about the initiatives and the operation of a subproject linked to their mission.

- **Other project components, such as the communication centre**, are again subject to more intensive cooperation and this may also apply to operation of the quay if its use will surpass supply of the repository only.

The partnerships will hence be faced with multiple roles and tasks in the future. In some cases, they will have an executive role with concrete responsibility (e.g. management of the Local Fund); in others, they will have more of an advisory role towards the councils and other organisations involved.

7.2.3 Participation in the faraway future: more active input yet again?

For the Local Fund and the communication centre, the role of the local partnership will be fairly constant. For other subprojects, its function may evolve over time. As regards the repository in particular, it is impossible to predict the evolution of society up to the moment the construction will be covered and closed. It is not unlikely that increased input from the population is again required around that milestone.

Since closure will not occur before 2056, it seems premature to draft concrete proposals for that process at this time. A distinct commitment in the form of an agreement between the government partners involved (at least ONDRAF/NIRAS and the municipalities) is however important and must safeguard the support for the cAt project during its entire life cycle. The partners must also be committed to incorporate participation of the population during the entire process.
7.3 / Participation in nuclear activity in the region

Looking beyond the waste issue. Besides participation in the cAt project, at present the partnerships already have the opportunity to look into the nuclear activities and events in the region. On the one hand these comprise the activities of ONDRAF/NIRAS which include processing, storage and disposal of the category A waste, as well as storage of and research into category B & C waste.

On the other hand, Mol and Dessel are located in a nuclear region where other actors are active as well, such as the nuclear companies or FANC. That means that other, domestic nuclear activities may also have repercussions on the Dessel-Mol region.

A broad vision guaranteed, now and in the future. ONDRAF/NIRAS cannot commit itself on behalf of these other participants, but does fully endorse the necessity of partnerships with a broad mission:
- to monitor, and for some components help to manage and implement the ONDRAF/NIRAS activities that impact the municipalities;
- to monitor all other nuclear activities in the region.

Although in the meantime, this role has been laid down both in the Articles of Association and in the actual operation of the partnerships, at this time the accent is still very much on their role in function of the cAt project. That will also be the case during the construction phase. It is possible that a transfer to a new phase of the participative process will take place at the start of the operation phase which according to current prognoses will take place around 2016. It therefore seems premature to go deeply into a more concrete manifestation at this point. For the moment it seems plausible that given their flexible structure, the existing partnerships should be capable of adapting to changing contexts and needs over the next few years. This does make it more difficult to provide fixed funding beforehand. A probable solution could be periodical funding (e.g. five-yearly), to be renegotiated by the parties involved on the basis of concrete future plans and budgets.

7.4 / Status quo and planned activities

ONDRAF/NIRAS has planned the following action to concretise participation:
- Record the modalities (funding, among other things) for continuance of the partnerships until the end of the construction phase.
- Make plans regarding the implementation of their future, changing roles with the partnerships and municipalities involved.
- Make long-term agreements on evaluation moments and mechanisms.
The inhabitants of the Dessel and Mol municipalities are closely involved in the realisation of the aggregate cAt project via the local partnerships STORA and MONA.
Spatial planning and mobility

The cAt project will occupy a considerable area in the northern nuclear zone of Dessel-Mol. The planning and license part involved in the construction of the repository is a prerequisite for the realisation of the cAt project. The cAt project also creates a number of distinct spatial opportunities for Dessel. ONDRAF/NIRAS is committed to ensure maximum realisation of these spatial win-win opportunities in the scope of the cAt project.

ONDRAF/NIRAS opts for rational access to the disposal site. Maximum use of the canal for delivery and transport of materials minimises the impact of the cAt project on road traffic. ONDRAF/NIRAS also closely monitors the authorities’ initiatives for improvement of the regional traffic situation.

This chapter
→ provides an overview of planning and transport at the site;
→ describes how maximum access of the site from the canal will be realised;
→ explains the necessary zoning changes and the linked planning initiatives;
→ explains the spatial opportunities that ONDRAF/NIRAS helps to realise in the scope of the cAt project;
→ describes how ONDRAF/NIRAS tries to speed up initiatives for improvement of the current traffic situation.

8.1 / Siting

The realisation of the cAt project involves the siting of various project components in the nuclear zone north of the Bocholt-Herentals canal:
- a quay for delivery of materials;
- a caisson plant for manufacture of caissons (concrete cases); this factory may also be used for other activities, not necessarily falling under the nuclear sector;
- a monolith production facility (MPF);
- the disposal modules;
- prototypes: demonstration test, test cover, subsidence test;
- the peripheral facilities: roads, public facilities, administration building, infiltration basin…;
- the communication centre including three physically integrated components: a contact and reception centre; the theme park; the digital and interactive network;
– the transition of unused parts of the nuclear zone to SME-zone:
  – an extension of the SME-zone Stenehei including approximately 10 hectares eastward;
  – a possible additional extension at a later stage in accordance with changing needs.

The total surface of the disposal site will amount to some 30 hectares.

8.2 / Transport at the site and access

8.2.1 Transport at the disposal site: logical infrastructural planning for minimum transport

Logical infrastructural planning for minimum transport. Logical infrastructural layout of the site and clustering of the various process components will limit transport at the site to a minimum. The logistics chain will ensure that the distances to be covered by materials, caissons, waste and monoliths will be as short as possible:

– The MPF will be located near CILVA and the existing Belgoprocess storage building.
– The caisson plant will be located near the quay, where (raw) materials will be delivered.
– The caisson plant and the MPF are situated next to each other for efficient transport of the caissons to the monolith production location.
– The MPF provides direct access to the disposal modules. Transport of the monoliths from the MPF to the disposal modules will occur by rail.

Logical infrastructural position of the communication centre. The communication centre’s planned location is in the northeast corner of nuclear zone, where de Gravenstraat and the Kastelsedijk intersect. This zone is located in the vicinity of the repository but not far from the Dessel centre.

A footpath from the communication centre to the disposal modules will be provided for visitors of the disposal site, including information panels about the disposal and the activities. Placement of a panorama tower is an additional option.

8.2.2 The quay: maximum access from the water

A quay with various functionalities. Goods and materials will have to be transported during the construction and operation of the disposal site. In order to minimise impact from the disposal site on road traffic, ONDRAF/NIRAS opted to build a quay at the nearby Bocholt-Herentals canal.

The estimated transport volumes will not be constant throughout the years. First peak volumes are expected during the construction of the disposal site, when over the course of a few years, significant amounts of building materials such as sand, gravel and cement must be delivered to the site. A second peak will be caused when the final cover is being placed; this will require a large supply of materials.
1 → **Infrastructural planning of the site**
1 quay  
2 caisson plant  
3 MPF  
4 disposal modules  
5 communication centre and prototypes  
6 expansion of the SME zone

2 → **The quay**  
Optimum delivery of goods and materials via the Bocholt-Herentals canal. A loading/unloading quay will be built at the disposal site.
The quay not only provides access to the disposal site. It can also fulfil a tourist function and provide access by water to companies in the vicinity and any additional activities that might be developed in the caisson plant.

**Basic design.** The quay will be located at the northern bank of the Bocholt-Herentals canal, between locks V and VI. Here, the quay is close to the caisson plant, the MPF and the actual repository. The canal’s capacity is not unlimited. It can accommodate ships of up to 600 tonnes only, and the locks’ dimensions are also limited. As long as the required ships are available, however, the quay can fulfil its designated role and help reduce road transport volumes.

The quay consists of various components:
- The actual quay wall with a length of some 100 metres.
- Loading and unloading equipment. Mobile cranes will be used: they are more flexible than fixed cranes – an added advantage in view of the varying volumes delivered via the quay.
- A zone for goods transfer and temporary storage.

**Access to the quay.** For quick access of the quay from the road, ONDRAF/NIRAS will build a new access road. It will also provide access to the caisson plant and run from the Europalaan alongside the repository. Additionally, the current, intensively used towpath will be rerouted in places. This should ensure a safe flow of cycling traffic alongside the quay. The preferable rerouting method is currently being investigated. Rerouting will be either temporary – during the periods when the quay is in use – or permanent.

**8.2.3 Access from the road**

**Upgrade of the N118.** The N118, located between Geel and the access complex of highway E34 at Retie, will be the most important access road to the disposal site. Connection of this road to both the E313 and the E34 produces traffic congestion at Geel (Sint Dimpna) and Retie (centre). The region has been asking for a solution to this traffic situation for some time. That solution requires an upgrade of the road from a local route to a higher category. The disposal project is not the main reason that increased capacity is required; after all: its impact on road traffic will be limited. First and foremost, an increase of capacity adds to improvement of the mobility situation in the wider region and in particular in Geel and Retie. The final STOLA-Dessel report also requests extension of the N118 as an access road for general traffic and for transport to and from the disposal site.

The province of Antwerp has recently carried out a mobility study for the N118. It aimed at defining the role of the N118 in scope of the mobility vision for the entire region. This study now forms the basis for further decisions on a local and supralocal level. The study showed that many measures are required to solve the mobility problems in the Dessel-Mol region:
- downgrading the role of the N18 (the road between Mol and Retie) (from a secondary type II road to a secondary type III road);
- upgrading the role of the N118 (from a local road between Geel and Retie to a secondary type II road);
Regional traffic situation

The N118 will become the main access road to the disposal site. The connection of this road to both the E313 and the E34 currently causes traffic congestion in Geel and Retie. The province of Antwerp is currently studying an upgrade of the N118.
- a connection between the N118 and the R14/Ring around Geel (either north or east);
- extending and restructuring the Ring around Retie up to the N118.
- a connection between the N118 and N18 near Mol Donk – Dessel Goormansdijk (for relief of the N18);
- imposing tonnage limits in Geel, Mol, Dessel and Retie to avoid lorry traffic in the centres.

The municipalities involved, the province of Antwerp and the Flemish Region have written a draft protocol, including an agreement on the vision and a commitment to implement the plan of action. ONDRAF/NIRAS concurs with this vision because it endorses the support for the cAt project in the broader region and will therefore contribute to facilitate and speed up implementation of the plan of action once the protocol has been signed.

The draft version of the new Spatial Structure Plan Antwerp (RSPA) shows an effective upgrade of the N118 from a local road to a secondary type II road. Although this version is not yet official, it does accommodate the requests from STORA and the Dessel municipality.

**Emergency evacuation.** In the event of a nuclear accident, quick and efficient evacuation of the area is of utmost importance and the direction of evacuation one of its key elements. In this region, south-westerly winds prevail. In the event of an incident causing a pollution plume, it will most probably develop into a north-eastern direction. Evacuation must occur in the opposite direction (against the direction of wind), hence south-west. Evacuation options in that direction via the N118 must be examined. An upgrade of this road including a good connection to the ring at Geel would indeed benefit evacuation of the nuclear zone. This issue already surfaced during the meetings about the emergency plan for the nuclear zone Mol-Dessel-Geel (see Chapter 10. Safety, health and environment).

**8.3 / Zoning changes, spatial vision and planning route**

**Necessary zoning changes.** In the Spatial Structure Plan Flanders (RSV), the zone where the repository will be located is marked as an “area for establishment of nuclear facilities”. The current nuclear zoning plan perfectly fits incorporation of the disposal modules, the MPF, the quay, the prototypes and the peripheral facilities. It only requires application for the necessary licenses (urban development license and environmental license). As long as the caisson plant is used for the production of caissons and not for non-nuclear objectives, this project component does not require a zoning change.

However, the communication centre and the expansion of the SME zone Stenehei – these activities are not strictly of a nuclear nature – can only be planned in if the terrain is rezoned. This requires a revision of the regional plan through a Spatial Implementation Plan (SIP).
**Spatial vision and EIR (Environmental Impact Report) plan.** In support of the planning initiatives, ONDRAF/NIRAS chose to develop a spatial vision for the entire nuclear zone north of the Bocholt-Herentals canal and to draft an EIR plan (environmental assessment) for the purpose. The EIR plan, initiated by ONDRAF/NIRAS in the course of 2009, can be used at a later stage for the write-up of the spatial implementation plan for project components such as the communication centre or, if necessary, the caisson plant. The province of Antwerp is currently examining a possible eastward expansion of the SME zone Stenehei in view of demarcation of the micropolitan Mol area. The province will also draft an environmental assessment for this extension.

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**The EIR plan procedure**

ONDRAF/NIRAS started to draft an EIR plan in 2009. It studies the environmental impact of all project components in the northern nuclear zone. The first step in the EIR plan is the write-up of a notice. The notice introduces the plan and indicates possible environmental effects as a result of the plan's realisation. The notice also includes the methods to be used for examination and assessment of the environmental effects. The notice is submitted to the EIR department of the province of Antwerp. If the latter decides that the report contains all the information required, the official EIR plan procedure can begin. The notice is forwarded to various authorities for advice and deposited for public perusal for a period of 30 days. All parties interested may comment on the content of the EIR plan. The EIR department includes all advice and comments in guidelines for drafting the EIR plan. Recognised EIR experts use these guidelines to write the actual EIR plan. The EIR plan is then discussed with the EIR department and the other authorities, and finally approved by the EIR department.

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**Synchronisation with planning initiatives of the province of Antwerp.** The eastward expansion of Stenehei is examined by ONDRAF/NIRAS in its EIR plan, as well as by the province of Antwerp in view of the demarcation of the micropolitan Mol area. Proper harmonisation of both procedures is hence of the essence. The research method as regards the mobility impact of the disposal site will require specific attention. The notice was submitted to the EIR department late March 2010 and thus set-off the official EIR plan procedure. The full EIR plan procedure is expected to take about one year as from its starting point.

**Towards a Spatial Implementation Plan (SIP).** In the scope of the cAt project, a SIP must be formulated for the location of the communication centre and for the eastward expansion of Stenehei. The SIP for the communication centre will be drawn up by the Flemish government (Spatial Planning division of the Ministry of Spatial Planning, Housing Policy and Immovable Heritage). The SIP for expansion of Stenehei will be drafted by the province of Antwerp. Both SIPs must take account of the results of the environmental assessments.
The SIP procedure

The SIP procedure starts with the composition of a preliminary SIP design. The preliminary design is discussed in a plenary meeting with various advisory bodies. The meeting can only take place if an approved EIR plan is available. The preliminary SIP design is adapted after the plenary meeting, after which a draft SIP is submitted for provisional adoption by the Flemish Government. That provisional adoption sets the official SIP procedure in motion. After its provisional adoption, the provisionally adopted SIP is subject to public investigation for a period of 60 days. The EIR plan is added for perusal. The Flemish Commission for Spatial Planning (Vlaamse Commissie voor Ruimtelijke Ordening [Vlacoro]) compiles all advice, comments and objections collected during the public investigation. Definitive adoption of the SIP by the Flemish Government must occur no later than 180 days after finalisation of the public investigation. No more than 60 days later, the final adoption of the SIP is published in the Belgian Official Journal. The SIP enters into force fourteen days after this publication. The official SIP procedure covers a period of approximately one year. Adding the write-up of the draft SIP to that period, the entire procedure takes at least 1.5 years.

8.3.1 Licenses

The construction and in some cases, the operation of the cAt project components require application for the appropriate licenses (see Chapter 13. Licensing procedure).

8.4 / Spatial opportunities

The cAt project creates a number of distinct spatial development opportunities for the Dessel municipality. ONDRAF/NIRAS has made a commitment to STORA and Dessel to help realise those opportunities.

The following developments are involved:

- Upgrade Dessel from type 3 main village to type 2 main village, thus allowing creation of additional SME zones and construction lots;
- Linking-up the southern part of Dessel with the micropolitan Mol area in order to expand existing SME zones.

Upgrade Dessel from type III main village to type II main village. According to the current version of the RSPA, Dessel is a type III main village and the municipality is seeking an upgrade to type II main village. A type III main village is not allowed substantial expansion outside the existing judicial set of existing local companies. Although type III main villages are allowed to allocate an additional local industrial terrain, it can only be used for relocation of zone-foreign local companies and/or historically grown companies. Type III main villages may only build additional housing for accommodation of natural growth. Municipalities with a type II main village have more options. They may designate an additional local industrial terrain, both for new companies and for zone-foreign and/or historically grown enterprises. This village type also offers limited possibilities for realisation of more additional housing than would be required to cover natural growth. Developments in excess of natural growth are not encouraged.
An upgrade from type III main village to type II main village requires a revision of the RSPA. On 20 December 2007, the deputation decided to implement the RSPA revision side by side with the revision of the RSV and at two speed levels. The RSPA revision as regards the themes “living” and “working” has already been started. The preparations for general revision of the RSPA in 2012 were initiated simultaneously. It looks like the revised RSPA no longer distinguishes between types of main villages. The RSPA revision is not yet official. ONDRAF/NIRAS closely follows the developments.

Connection of the southern part of the Dessel municipality with the micropolitan Mol area.
Linking-up the southern part of Dessel with the micropolitan Mol area aims at expansion of existing SME zones in the municipality (Stenehei, Goormansdijk). Demarcation of the micropolitan Mol area falls under the competence of the province of Antwerp. In its demarcation of the micropolitan Mol area, the province has not included the entire southern part of the Dessel municipality, only the SME zone Stenehei. It foresees a 10 ha eastward extension of the SME zone Stenehei and thus partly grants the request to convert unused nuclear zoned areas into an SME terrain. As indicated above, the province will write up a SIP to realise this zoning change. The environmental assessment that must precede the change is currently underway.

8.5 / Status quo and planned activities

8.5.1 The quay
Quay construction – start 2011; operational – 2012. A feasibility study with respect to the quay was carried out first and co-formed the basis for the quay’s design. Together with the manager of the Bocholt-Herentals canal, ONDRAF/NIRAS will work out the design in more detail and list the technical specifications. Together with the company “De Scheepvaart”, it will examine how the existing grant options can be used for construction of the quay.

The aim is to begin the construction of the quay in the first half of 2011 and to have it operational by 2012.

8.5.2 The planning procedure
Start EIR plan procedure... During 2009, ONDRAF/NIRAS has been working on a spatial vision as regards the entire nuclear zone north of the Bocholt-Herentals canal. The write-up of an EIR plan for this spatial vision was started by the end of 2009. The first step in the EIR plan is the formulation of a notice, which was submitted to the EIR department late March and set-off the official EIR plan procedure

... which was followed by the SIP. The total lead time of the procedure for the write-up of the EIR plan as from its official start is about one year. The preliminary SIP design for the communication centre can be prepared during the EIR plan procedure. The official SIP procedure cannot start before approval of the EIR plan. Its exact timing is unknown. The initiative lies with the Flemish government.
8.5.3 Regional traffic situation and realisation of spatial opportunities.

N118 as access road and upgrade of Dessel. Both the extension of the N118 as an access road for general traffic and the disposal site and Dessel’s upgrade from type III main village to type II main village are included in the current version of the RSPA revision. If these elements remain unchanged, ONDRAF/NIRAS need not take further action for realisation of these spatial opportunities.

SME zone Stenehei. The conversion of unused nuclear zoned areas into SME terrain and more in particular the eastward expansion of Stenehei, does require further action. The SIP that will realise this conversion will be drafted by the province of Antwerp. This procedure is currently expected to be complete by the end of 2011.

8.6 / Planning

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Spatial planning (Chapter 8)

- Quay
  - Project
  - Licenses
  - Public procurement
  - Construction
Employment and retention of nuclear know-how

Stimulating employment is one of the distinct opportunities the repository offers to the region. Various project components will generate jobs and the disposal project will also create indirect positive effects for employment. Thanks to years of experience, the area has built up unique nuclear expertise, recognised on a national as well as on an international level. For the sake of employment, but also for the sake of safety, it is imperative to keep that expertise within the region.

This chapter

→ provides an estimate of the direct and indirect employment related to the cAt project;
→ explains the leverage function of the knowledge centre for radioactive waste and the expansion of a specific training offer for the retention of the nuclear know-how within the region.

9.1 / Employment in and around the repository

9.1.1 How many jobs does the cAt project generate?

Employment in the region has always been a concern of the local communities. Employment was therefore integrated into the cAt project as a separate project component from the beginning. Maximising employment is also a focal point in the development of several other project components. For instance, ONDRAF/NIRAS has explicitly opted to locate the caisson plant at the site, instead of somewhere else and instead of purchasing caissons from an existing factory.

Direct employment. Both the repository, the caisson plant, the MPF, the quay and the communication centre will generate employment. The disposal site will provide temporary jobs during its construction as from 2012, and during exploitation it will offer medium-term employment starting 2016.

Table 4 provides an estimate of the employment resulting from the cAt project. The full-time equivalents in the table are the direct consequence of the cAt project.
Table 4. Employment in the cAt project

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**Indirect employment.** The disposal also has an indirect positive effect on employment in the region. Although less quantifiable, it is definitely not less relevant. Planned expansion of the SME zone Stenehei, for instance, partly enabled thanks to the cAt project, will generate additional jobs. And the knowledge centre, planned by ONDRAF/NIRAS to retain nuclear know-how (see below) will have positive effects as well. If permitted by law the company operating the caisson plant will be able to develop activities other than manufacturing and supplying caissons. That additional activity will also provide jobs.

### 9.2 / Retention of nuclear know-how in the region

#### 9.2.1 The importance of nuclear know-how in the region: safety and employment

The nuclear site in the Dessel and Mol region is unique for Belgium. Many of the nuclear companies’ employees live in the area. As a result, the concentration of nuclear activity goes hand in hand with a concentration of nuclear knowledge in the surrounding municipalities. For the population, local retention of that expertise for the duration of nuclear activities in the region is of key importance, especially in the field of radiological protection and waste processing. A constant presence of expert personnel for safe management of these activities is crucial. Furthermore, retention of expertise benefits employment as well.

The local communities request from ONDRAF/NIRAS that it invests in training programmes for future employees and that the region gets preference for localisation of new (research) activities in the nuclear sector.
9.2.2 Towards a knowledge centre for nuclear waste management

ONDRAF/NIRAS takes due notice of those wishes and has therefore initiated the establishment in the region of a fully fledged knowledge centre and network on radioactive waste management in the broadest sense of the word. That knowledge centre aims to guarantee and further develop know-how in the following areas:

- the entire chain of collection, determination, conditioning, storage and disposal of radioactive waste;
- radiological protection and safety;
- environment and health;
- participation, social acceptability, ethical implications of radioactive waste management, etc.

**ONDRAF/NIRAS as driving force.** ONDRAF/NIRAS will assume the role of operator of the disposal site. It can therefore guarantee a seamless transition of the project to the location of operation, which will be at the Dessel site. From that position, ONDRAF/NIRAS can already act as the logical driving force for knowledge development and management in the field of radioactive waste.

More concrete, ONDRAF/NIRAS – currently from within the project team and in the longer term as an operator – can start and stimulate knowledge development in the following areas:

- radioactive waste packaging in concrete or other materials: monitoring markets for the development and manufacture of prototypes;
- waste conditioning facilities;
- disposal facilities;
- public participation;
- supervision of the surrounding area;
- health monitoring;
- ...

**Strategic partnerships.** It is by no means ONDRAF/NIRAS’ intention to devise and realise all these projects on its own. Nuclear companies and research centres with local establishments such as Belgoprocess, the Research Centre for Nuclear Energy (SCK), the partnership Euridice, the Flemish Institute for Technological Research (VITO), the operator of the future caisson plant, etc., are significant partners. Other companies, research agencies and institutes that are already supporting ONDRAF/NIRAS in the realisation of the cAt project, can also be involved in the development of the knowledge centre.

9.2.3 Education and training: prerequisite for qualified personnel

**Training in the field of waste management: Belgoprocess and SCK as main partners.** Preparing qualified personnel for the cAt project requires specific training in radiological protection and radioactive waste management. Such training programmes already exist but deserve extra attention in the scope of the cAt project. Furthermore, the existing training programmes are often not well-known; more explicit marketing and promotion seems to be required.
Local knowledge cluster is essential. In time, the aim must be to develop and provide an extensive and appropriate training programme for radioactive waste management. The – long-term – existence in the region of a unique combination of study centres, companies, agencies and government bodies covering various aspects of management of all types of radioactive waste is essential. ONDRAF/NIRAS can offer a significant contribution to this.

SCK as key figure. The SCK could become an important partner for set-up and development of permanent training programmes in cooperation with domestic and foreign universities and research centres. Regional universities must explicitly be included in this approach. The communication centre is an interesting channel to display the education offer and thus reach a broad target audience (e.g. final year high school students) in the future.

In order to guarantee training programmes that will provide future employees with the necessary knowledge and skills, programmes must be kept up-to-date, professors must keep a close tie with developments in their area and students must be able to get practical education alongside theoretical training. It is therefore important that the SCK continues to be a lively and broadly oriented institute, availing of sufficient means to participate in fundamental research at the Belgian universities and develop in the field of applied nuclear research. ONDRAF/NIRAS is committed to provide whatever support is needed to projects that fall within its mission as future operator of the repository.

Within the BNEN (Belgian Nuclear Higher Education Network, established in 2001 by five Belgian universities) for instance, a specific training programme could be arranged for expert radioactive waste management.

Apart from the scientific education programmes, radioactive waste management courses for the general public are planned as well. These will be organised from within the communication centre.
9.3 / Status quo and planned activities

9.3.1 Employment
Creating employment is linked to different cAt project components. The jobs will therefore be created parallel to the implementation of the subprojects.

9.3.2 Retention of nuclear know-how

Inventory of nuclear know-how. A first important step is to map the existing knowledge. ONDRAF/NIRAS has already reached an agreement with Euridice and SCK for that purpose.

A few specialist areas have been designated to receive priority. The current programme for design of caissons and monoliths (see Chapter 4. Disposal), for instance, can be the basis for the development of a knowledge centre for concrete packaging or prefab concrete structures.

Step-by-step plan: 2010. Next year, ONDRAF/NIRAS will draw up a step-by-step plan with all parties that will ensure retention and enhancement of know-how.
10

Safety, environment and health: top priorities

Safety, the environment and health of the people living in the neighbourhood are priority issues in radioactive waste disposal. In the design of the repository, ONDRAF/NIRAS has opted for technology that offers the best guarantees in the field of safety, environment and health. In addition, it takes maximum precaution to also guarantee safety during the entire lifecycle of the facility. As an extra added value for the population, ONDRAF/NIRAS launches a health monitoring programme in Dessel and its greater region in cooperation with leading research centres.

This chapter
- addresses the safety of the repository and explains how safety management is substantiated by extensive studies;
- explains the monitoring programmes for the repository and the wider area around it;
- provides a status quo as regards the emergency planning for the site;
- explains how the health monitoring programme will contribute to public support for the repository.

10.1 / Safety of the repository

For a repository of radioactive waste, safety is of the essence. As applies to all nuclear facilities, safety of the disposal in the short term, during its operation and closure, is of primary importance. Characteristic of a repository, however, is that safety in the long term, hence after its closure, must be safeguarded as well.

10.1.1 Safety strategy as starting point for the design of the repository

The safety strategy for the repository describes the method in which safety is ensured. It is the starting point for development and safety evaluation of the entire repository (waste, monoliths, modules, site). The safety strategy comprises safety objectives, safety orientations, choices and processes.
Safety objectives. The following are the safety objectives for the surface repository in Dessel:

- The repository must protect humans and the environment against possible risks caused by the radioactive waste.
- The repository must offer passive protection, or rather, offer protection that does not require further action from future generations. No burden is thus carried over on future generations.


Safety orientations. The key safety orientations for the surface repository in Dessel are as follows:

1. Waste is isolated from the biosphere, thus protecting humans and the environment.
2. The radioactive substances in the waste are immobilised in order to delay and decrease their release.
3. The activity of the long-lived radioactive substances in the disposal and per waste unit is reduced, taking account of:
   - the half-life of the radioactive substances;
   - the 200 to 300 years' duration in relation with the closure and control of the repository;
   - the immobilisation characteristics of the waste and the repository at Dessel.
4. Protective measures are taken to isolate and immobilise the waste, ensuring that protection of humans and the environment does not require intervention from future generations.
5. The duration for closure and control will be limited to 200 to 300 years, so that protection becomes fully passive from the moment all parties involved – through monitoring and periodical safety adjustments – are sufficiently confident about the long-term safety.
6. Independent levels of protection are provided by several inter-complementary barriers and safety functions. This ‘in-depth safety’ is necessary to ensure that safety would not be too dependent on the function of one single barrier or safety function. Manifestation of this principle in the design depends on, inter alia:
   - the threat posed by the waste in function of time;
   - the robustness – i.e. insensitivity to disturbances – of the barrier and/or safety function;
   - the consequences of diminished barrier functionality or decreased efficiency of a safety function.

Choices and processes. The choices and processes involve the development of the repository, its management and safety evaluation. They describe, among other things:

- how the safety orientations are schematically incorporated in the design and realisation of the disposal system;
- how as a matter of caution, not all barriers and functions of the repository are included in the safety evaluation.
10.1.2 Safety studies

Together with leading national and international research centres and engineering and consultancy agencies, ONDRAF/NIRAS is conducting a wide range of safety studies. The studies aim to:

1. **Supply feedback for the development of the repository** by checking the contribution of the individual barriers and safety functions to safety.

2. **Check the safety of the proposed repository design** by:
   a. evaluating the capacity of the individual systems, structures and components to perform the safety functions during the facility’s lifecycle;
   b. to verify the safety via a radiological impact calculation.

3. **Determine the allowed quantities of long-lived radioactive substances.**

As regards 2. and 3., the aim is to include all barriers and safety functions. For 2. and 3., only the key barriers and safety functions are taken into consideration. A thus simplified model guarantees a solid review of the safety, independent of changes.

In the license application procedure, the general safety of the disposal system is argued on the basis of:

- the development of the repository’s design in accordance with the safety strategy;
- a safety check based on the safety evaluations;
- the evaluations that define the allowed quantities of long-lived radioactive substances and the measures taken to restrict the actual quantities thereof to the allowed limits.

**Feedback for the development of the repository.** The safety studies evaluate the safety of the design of the repository and the contribution of the individual barriers and functions to that safety. This evaluation is used as feedback for the development of the repository.

**Checking the safety of the developed repository.** Once the design of repository is complete, its safety will be systematically assessed according to the following method:

- First, the individual systems, structures and components are checked for effective performance of their safety functions during the required time lines.
- Next, the radiological impact is calculated on the basis of the most important barriers and safety functions. An inventory is made of key characteristics, events and processes that can influence the safety of the repository. It serves to determine the safety assessment scenarios for which models and input data will be defined that will form the basis of subsequent calculations for the safety assessments.
**Defining the allowed quantities of long-lived radioactive substances.** The radiological impact calculations are also used to determine the allowed quantities of long-lived radioactive substances in the waste and in the disposal. According to the safety strategy, these quantities must be restricted in the surface disposal. After all, they do not decrease significantly from radioactive decay during the 200 to 300 years’ period related to the closure and control of the repository. The allowed quantities of long-lived radioactive substances are defined: 1) for the total radioactivity that can be stored in the disposal; and 2) for the specific activity per waste unit.

### 10.1.3 Managing safety

Safety management comprises supervision of safety during the various life phases of the repository: its development, realisation, operation, closure and the nuclear regulatory supervision.

Managing safety responsibly implies
- a systematic consideration of the safety aspects during the development of the design of the disposal site to start with;
- subsequent monitoring, checking and where possible, improving safety during construction, operation, closure and nuclear regulatory supervision.

The license applicant manages safety during the development of the design. The licensee is responsible for safety from the start of the construction phase, and the disposal operator is accountable from the start of the operation phase.

Apart from internal supervision, safety management also includes external supervision by the nuclear safety authorities FANC. External supervision consists of granting licenses for the repository on the one hand, and supervision of compliance with those licenses on the other. The nuclear licensing procedure with respect to the repository is described in Chapter 13. Licensing procedure.

### 10.2 Monitoring of safety

**10.2.1 Why monitor the safety of a repository?**

A nuclear site needs to be monitored in order to guarantee the safety of the people living in the vicinity at all times. Those monitoring activities occur structurally and on the basis of a programme. ONDRAF/NIRAS is developing a programme to monitor the safety of the repository and its surroundings in accordance with legislation.
10.2.2 The monitoring programme for the repository

**Purpose.** The repository and its surroundings are permanently monitored in order to:

- demonstrate that the situation of the repository is in accordance with legislation and the licensing conditions;
- support decisions, such as the transition to a next phase in the lifecycle of the repository (operation-closure), adapting the Safety Case or taking curative measures;
- get a better understanding of the repository and its surroundings.

The monitoring programme for the repository and its surroundings consists of the following building blocks:

- parameters, to be verified by measurements;
- reference levels for the initiation of research or certain actions;
- type and frequency of measurements;
- follow-up of measurements and trends;
- research and action levels of the measured parameters and measures to be taken in the event these levels are exceeded;
- guidelines for changing the monitoring programme's course.

**Where will monitoring take place?** In an around the repository the main focus will be on parameters that matter for:

- safety assessment during operation;
- long-term safety assessment;
- assessment of the environmental effects.

Several parameters are of importance during the various life phases of the repository. Before the facility becomes operational, the starting conditions matter most (the (hydro)geological, radiological, chemical and biological reference measurements). During the 200 to 300 years’ period related to closure and control, the main focus is on confirmation of the immobilisation properties of the waste and the repository.

The monitoring programme is therefore divided into several components:

- **Direct verification of the impact of the repository.** This component comprises parameters to define the radiological, physical, chemical and biological impact of the repository on its surroundings. First reference measurements have already been carried out in the preliminary project phase and this year, measurements of radon concentration and the environmental dose, among other things, will be implemented as well.

- **Verification of the performance of the repository and its surroundings.** This component includes, inter alia:
  - checks: 1) of the waste before disposal; 2) of the construction and production of caissons, monoliths and modules, and 3) of the construction of the final cover;
  - monitoring the structure of the repository and the drainage water;
- monitoring the drainage water and proper functioning of the drainage system in the inspection areas and galleries: follow-up on concrete cracks in the module floors; detection of leaks at the top of the inspection area; detection of water at the bottom of the inspection area...;
- groundwater level measurements as input for the models to predict migration of pollutants in the groundwater.

- Improvement of understanding of the repository and its surroundings. This component includes, inter alia, several prototypes, the research programme into the behaviour of concrete, seismic follow-up... The development of an inspection robot and testing it in the scope of the demonstration test is one of the short-term priorities (see Chapter 4. The disposal).

The results of all monitoring activities are stored in a central database.

10.2.3 Integration of the repository monitoring programme into general information distribution for the wider nuclear site.

Information as an element of participation. The local communities are closely involved in decisions on the development and realisation of the repository, its operation and closure. This principle if manifested by the provision of general information on both the repository monitoring activities and information of other nuclear companies and FANC.

The aim of providing this general information is to assess the impact of the nuclear sector in the region and to inform the population. No significant measures are expected under this monitoring activity. After all, the artificial radioactivity is much lower than the naturally present radioactivity. Recording the results year after year therefore basically serves to demonstrate that the safety in the region indeed does not pose any problems. Monitoring activities thus help to provide objective information and to consolidate confidence in the repository and other nuclear companies.

Open communication via the digital interactive network. The digital and interactive network (DIN) allows for adequate distribution of the results of the general information provision. The intention is to have the DIN draw from the information in the central database via an interface with the monitoring project.

The central databank is fed with information from the repository, and optionally with data from other nuclear companies and FANC’s monitoring activities. Alternatively, the interface could draw from several databanks, including the one containing data from FANC’s monitoring activities.
10.3 / Emergency plan

10.3.1 The importance of an emergency plan

What if...? An effective emergency plan for the repository. No matter how thorough and well thought-out the repository’s safety management may be, accidents can never be ruled out. For this reason, ONDRAF/NIRAS is preparing an emergency plan: a scenario including the most significant risks at the site plus the corresponding strategy, plans of action, procedures and instructions for organisation of assistance that aims at minimising the consequences of a possible accident for humans and the environment.

Synchronisation within the nuclear Dessel-Mol region. ONDRAF/NIRAS will initially work out an emergency plan for the repository and for waste transport to and within the site, and subsequently check it against the existing emergency plans in the Dessel-Mol region. First of all, ONDRAF/NIRAS wants to examine whether the general organisation of the nuclear emergency planning in the Dessel-Mol region leaves room for improvement. Secondly, concrete synchronisation with the safety plan of the Belgoprocess site, that contains low-level waste and high-level waste, seems appropriate.

Cooperation between several levels. With the emergency plan, ONDRAF/NIRAS also aims at facilitating cooperation between the federal government and the municipalities. Streamlined cooperation between the individual levels should lead to open and transparent communication on behalf of the federal government (crisis management department, FANC) and provide adequate means for local assistance services. These include:
- adequately trained personnel;
- adapted materials (such as personal protection equipment, gauging equipment, adapted fire extinguishers);
- a municipal disaster official who can provide administrative assistance on the subject to the mayor;
- proper coordination of the individual help services and optimised medical infrastructure;
- smooth communication and cooperation between local and federal levels of crisis management.

The right to information. The population in the area surrounding a disposal site is entitled to information. ONDRAF/NIRAS is therefore committed to inform the population about safety plans and emergency planning on the site on a regular basis.

10.3.2 Needs analysis: which concerns should be addressed by the emergency planning?

Set-up. For proper fulfilment of the needs regarding emergency planning and communication, ONDRAF/NIRAS carried out a needs analysis.
The aims of the examination were as follows:

- to analyse and update the current concerns of the local communities, based, inter alia, on the STORA and MONA files;
- to map the status of the nuclear emergency planning at a federal, provincial and municipal level on the basis of existing legislation;
- to make an inventory of the lessons and points for improvement learnt from past nuclear emergency plan exercises and incidents;
- to organise consultation with the Dessel and Mol partnerships and councils, the local help services in the region (fire brigade, civil protection, police), the federal institutes and the nuclear companies in Dessel and Mol.

**Results.** These are the key findings and recommendations of the needs analysis:

- Appointment of a disaster official has meanwhile been established as a legal requirement. The rule has been met in both Mol and Dessel and responsibilities have been identified, but practical implementation and administrative support are required. ONDRAF/NIRAS suggests putting a person from the communication centre in charge of supporting the disaster officials and mayors of the surrounding municipalities (Dessel, Mol, Retie and Geel) as regards the nuclear emergency planning. This option requires further investigation.

- A new communication initiative to inform the population about the nuclear emergency planning is required. This could be combined with new iodine tablet distribution. Further examination is required.

- The establishment of STORA and MONA (see Chapter 7. Participation) constitutes a permanent forum for discussion of local nuclear themes in both Dessel and Mol. The partnerships can also offer a platform for local participation and communication as regards emergency planning. The responsibility for communication about the emergency plan, however, remains with the competent safety authorities (at a federal, provincial and local level) at all times and can never be delegated to the partnerships.

- The fire brigades in the area (location Mol) now avail of adapted equipment, such as a powder fire-extinguishing vehicle. Methods for optimisation of the medical infrastructure so as to generate adequate response in the event of nuclear accidents must be investigated.

- A top-down approach applies to nuclear accidents: the operator informs the federal crisis centre that in turn steers the local help services. Communication between the federal and local level would benefit from a video conference system. This would allow local levels to join in discussions in the crisis centre and they would thus be kept informed about any decisions in real time. This option requires further study.

A smooth evacuation of the disposal site requires closure of the Ring around Geel. This aspect was also addressed during discussions about the emergency plan (see also Chapter 8. Spatial planning and mobility).
10.4 / Health monitoring: an additional benefit for the population

10.4.1 Why monitor the health of the people in and around Dessel?

Trust is essential for acceptance. Confidence about their health among the people living in the neighbouring area would fulfil a key condition for a long-lasting future of the repository for radioactive waste. In other words: Dessel and Mol citizens and their offspring must be able to trust that the repository does not affect their health.

Health monitoring in the region is an important added value for the population. The initial idea was to provide a free annual medical check, extending the healthy worker effect among employees in the nuclear industry to the local citizens around the nuclear site. This proved unfeasible for several (legal, organisational and financial) reasons. Therefore, ONDRAF/NIRAS is now investigating the feasibility and desirability of statistical health monitoring which examines the impact of various environmental effects and monitors several health data with a view to health prevention in the region.

Inventory of deaths and illnesses. Besides the health monitoring activities, regular inventories of deaths and illnesses that could relate to the consequences of radioactivity (such as cancer and congenital defects) are intended to be carried out. Follow-up of these data should counter persistent rumours about alleged increased cancer incidents as a result of the long presence of nuclear activity in the region. The partnerships STOLA-Dessel and MONA carried out a similar study in 2002 and 2003 and find it useful to continue it for adequate information the population.

10.4.2 The test project biomonitoring

ONDRAF/NIRAS is investigating whether biomonitoring is a suitable method for monitoring the health of the people living in the surrounding area and has started a pilot project in cooperation with research centres and universities.

Humane biomonitoring is a technique measuring exposure to and early effects of pollutant substances in the human body. By order of the Flemish government the Support Centre Environment and Health already tested this method in various Flemish regions. It showed that some environmental pollution is present in almost all humans throughout Flanders.

The test project aims at mapping the environmental health of the citizens of Dessel and the surrounding area by means of human biomonitoring. More in particular it will measure the presence of environmental pollutants in children born in and around Dessel with a possible longer term follow-up. In addition, other health data will be gathered with a view to health prevention in the region. If the test project gets a positive assessment from the partners involved, ONDRAF/NIRAS will ensure structural regional implementation of the project after 2012.
The feasibility study includes five components:

- **Documenting the local expectations in the field of environment and health.** In 2010, researchers will list the local expectations and concerns regarding environment and health on the basis of conversations with local participants and citizens.

- **Humane biomonitoring on a first group of newborns.** Examination of 200 newborn babies over a period of two years will commence from 2011. The presence of environmental pollutants will be defined on the basis of blood from the umbilical cord and a urine sample taken from mother and child. The results of the findings will then be compared to data available in Flanders and abroad.

- **Gathering data on illnesses and death.** Specific data on illnesses and death, such as the incidence of cancer, will be gathered and compared to Flemish data. This research is a continuation of a statistical study already carried out in the preliminary project phase.

- **Developing a strategy for long-term monitoring.** Long-term monitoring comprises: 1) further monitoring of the 200 babies from the first birth group until the age of 18 years (e.g. when they reach the age of 7 and 15, respectively), and 2) monitoring new birth groups every five years. The new groups will be compared to the previous birth groups.

- **Developing a phase plan for policy translation.** A phase plan will be developed to interpret the results of the humane biomonitoring studies and to translate them into their meaning for public health. This should help politicians in working out actions regarding health prevention.

All components of the feasibility study will pay considerable attention to local cooperation and consultation. In 2010 the research team will contact local participants to develop a protocol and to establish a consultation structure to work out and follow-up the study. The demarcation of the research area – the municipalities where the study will be set up – will also be discussed at the local consultation.

**10.5 / Status quo and planned activities**

**10.5.1 Radiological safety and safety studies**

*Finalisation of safety studies by mid 2011.* All safety studies will be completed in the first half of 2011 so that the license applications for establishment and operation can be submitted to the FANC in the summer of 2011.

**10.5.2 Supervision**

*The first work version of the proposal for a programme of general information provision for the nuclear region is finished.* The local partnerships have uttered a few demands regarding monitoring activities in their final reports. To clarify and update these, ONDRAF/NIRAS has in 2008 organised workshops with the partnerships.
FANC imposes a number of requirements in the field of monitoring as a condition for obtaining a license for establishment and operation of the repository. For better cognisance of these conditions, ONDRAF/NIRAS has consulted with FANC about the objectives of the monitoring programme for the repository.

The workshop and consultation with FANC have resulted in a first work version of the proposal for a programme for information provision for the nuclear region Dessel-Mol. This work version was further detailed by a joint team of people from Belgoprocess and ONDRAF/NIRAS, supported by the SCK for specific aspects.

Towards a final monitoring programme for the repository and a proposal for a programme for information provision at the start of 2011.
The first work version of the proposal for a programme for information provision will act as an instrument for further talks with the partnerships, the SCK and Belgoprocess and with other nuclear companies in the area, such as IRMM and FBFC Int. The aim is to come to a final version of the information provision programme after this consultation, by the start of 2011.

Based on the elements of the monitoring programme for the repository included in the proposal for information provision for the nuclear region Dessel-Mol, discussions will also be held with FANC. The aim is to produce a final version of the monitoring programme for the repository after these discussions, by the start of 2011, in support of the nuclear license application for the repository.

Link to the central databank within the DIN. A general structure is being created for both the central databank and the interface. When finalised they will be implemented and connected to the DIN.

10.5.3 Emergency planning
Local needs, synchronisation with general emergency planning: finalised action plan by the end of 2010. ONDRAF/NIRAS and the local partnerships will discuss the results of the needs analysis with all other parties involved (FANC, public services within the Department of the Interior such as the crisis division, other authorities involved, help services, nuclear companies...). These discussions aim to materialise the proposed actions and to draw up an action plan together. The actual needs analysis has been carried out; the final report is currently being completed and will be submitted to the partnerships for information. The aim is to formulate an action plan by the end of 2010.

The emergency plan as a component of the license application: final version end 2010. The emergency plan for the repository must also be part of the license file that has to be submitted to the FANC in order to obtain a nuclear construction and operating license. In view of preparation of the license application, a final version of the emergency plan for the repository is planned by the end of 2010.
10.5.4 Health monitoring

Feasibility study has been started. The feasibility study humane monitoring will be carried out in the period 2010-2012. In 2010, focus will be on documenting the local perspectives and expectations around the environment and health; preparations for biomonitoring activities will be carried out as well. In 2011, samples will be taken from the first group of newborns. Specific data about health and death will be gathered and analysed, and the phase plan will be developed. In 2012, samples will be taken from the second part of the first group of newborns. Concrete recommendations for health prevention campaigns will be formulated as well as a proposal for long-term implementation of the biomonitoring programme.

10.6 / Planning

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peripheral conditions for the cAt project

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Balanced funding via two ONDRAF/NIRAS funds
**Balanced funding via two ONDRAF/NIRAS funds**

Funding is a key element in the realisation of long-term projects such as the cAt project. For all parties involved – ONDRAF/NIRAS, producers, local communities and society – guaranteed funding of disposal of the Belgian category A waste is essential; today, but also in the faraway future. The means necessary for the cAt project will be generated via two separate funds: the Long Term Fund (LTF) and the Medium Term Fund (MTF).

This chapter

→ describes the principles and the mechanisms of the cAt project funding;

→ provides an overview of the funding of the different project components.

### 11.1 / Funding principles

The cAt project is financed by two funds: the Long Term Fund (LTF) and the Medium Term Fund (MTF). The LTF already has legal basis through the Royal Decree of 30 March 1981. The legal framework of the MTF is currently being developed; the "Act of 8 August on the budgetary proposals 1979-1980" establishing ONDRAF/NIRAS will be adapted for the purpose.

The LTF covers long-term funding of the ONDRAF/NIRAS mission, i.e. the effective disposal of radioactive waste. The LTF was established during the period that radioactive waste disposal was mainly considered from a technological viewpoint. As a result, certain project components required for maintenance of the societal support for the repository are hardly covered by this fund, or not at all. An MTF is established for funding of these project components.

**LTF versus MTF.** Which cAt project building blocks will be financed by the LTF and which by the MTF depends on the capacity of the beneficiaries of the services provided by ONDRAF/NIRAS:

- The LTF finances all project components that constitute a direct service for the waste producers.
The MTF finances the project components that benefit the local communities with whom ONDRAF/NIRAS, through a participative process, has built up societal support for the repository. In other words, the MTF finances certain project components that aim at safeguarding public support for the disposal now and in the future and which do not constitute a direct service for the waste producers.

11.2 / Funding mechanisms

Both LTF and MTF are fuelled by the waste producers, including the Belgian State as the party with financial responsibility for nuclear liabilities. There is however, a fundamental difference between the fuelling methods of the two funds.

- Financing via LTF occurs via fees paid by the waste producers as a compensation for ONDRAF/NIRAS’ services, and in proportion with the waste accepted by ONDRAF/NIRAS.
- Financing via MTF occurs on the basis of taxes/retributions, which makes sense in view of the fact that the local communities are its beneficiaries.

11.2.1 LTF mechanism

The polluter pays. After the example of the pension funds, ONDRAF/NIRAS opted to capitalise the LTF by means of a system that is fed by the waste producers and the Belgian State. After all, the waste producers are responsible for disposal of the radioactive waste produced by them; that is the application of the “polluter pays principle”. The Belgian State has financial responsibility for the disposal of the nuclear historical liability.

Funding proportional to waste quantity accepted. The activities funded by the LTF (radioactive waste disposal) take place in the future. Funding through the LTF occurs in accordance with ONDRAF/NIRAS accepting the waste and in proportion with the amount of waste accepted.

The feeding mechanism of the LTF starts to work any time a waste producer or the Belgian State delivers radioactive waste to ONDRAF/NIRAS and the latter accepts responsibility for it. Prior to this transfer of responsibility, the waste is checked for compliance with the applicable acceptance criteria.

This mechanism guarantees that the fixed costs for ONDRAF/NIRAS are covered under all circumstances, and that its variable costs are covered as they occur. The mechanism is based on the following principles:

- the contractual waste quantities. Each large producer notifies ONDRAF/NIRAS of his planned waste production in the form of contractual quantities. These allow ONDRAF/NIRAS to plan the dimension of its facilities and to evenly and fairly distribute the fixed costs of the investments and the operation activities over the producers.
- **tariff payment.** Each producer makes a contribution to the LTF proportional to the total cost price of the long-term management of the waste that he transfers to ONDRAF/NIRAS and for which the latter accepts responsibility. These contributions cover both the fixed and the variable costs.

- **the contractual guarantee.** The books of the large waste producers and the accounts of the nuclear liabilities with include a provision for the difference between the fixed costs that can be attributed to the waste quantity announced by the producer or that are related to the liability on the one hand, and the fixed costs that already have been paid via the applied fees on the other. This contractual guarantee warrants coverage of all costs of the disposal, even if the disposable quantity turns out to be smaller than the contractual quantity.

**Collection contracts.** The work method for the LTF has been established in agreements between ONDRAF/NIRAS and the waste producers (including the Belgian State). These agreements are referred to as “collection contracts”. In principle, the contractual quantities announced by the producers are adjustable every five or ten years, or earlier in the case of force majeure. This allows for regular adaptation of the financial conditions to the evolution of the project and the economic context.

**A changed context.** The LTF mechanism basically ensures coverage of all costs for the disposal of category A waste. Time differences can however occur between expenditure and income, leading to a temporarily negative LTF balance. Furthermore, the government decided at the end of 2009 to continue three nuclear facilities for ten more years than was initially expected. ONDRAF/NIRAS is now examining the consequences of this changed context on the LTF.

**11.2.2 MTF mechanism**

Balanced funding must apply to the entire cAt project. Since some project components are not financed by the LTF, an additional fund is being created: the MTF. This fund has its own specific feeding mechanism.

The MTF finances all project parts not directly servicing the waste producers, but benefiting the local communities.

**MTF fuelled by taxes/retributions.** Contrary to LTF funding of activities that take place in the future, funding of a few project components such as the Local Fund must occur when the facility becomes operational. In other words: MTF funding must be separated from the pace at which ONDRAF/NIRAS accepts the waste.
Again contrary to the LTF, the MTF is fuelled by taxes and retributions. After all, the local communities are the users of the ONDRAF/NIRAS services in this case, not the waste producers. The local communities will be the beneficiaries of the services mentioned. By detailing and establishing a participative process, the local communities have enabled the creation and perpetuation of societal support. Feeding the MTF occurs on the basis of the total licensable capacity of the repository and the total waste quantities, and according to a formula allowing distribution of the burden of fuelling the fund over the producers.

**Beginning and end.** The waste producers start fuelling the MTF no later than three months after the construction license for the repository has been granted. No more than three months later, the MTF amount must correspond to the amount determined by law. The licenses are a suspending condition for fuelling the MTF.

**Allocation of the MTF in accordance with the law.** ONDRAF/NIRAS wishes to allocate the financial means of the MTF to all addressed parties involved in all openness. This requires establishment of a set of rules. It is therefore important that the final mechanism indeed allows allocation of the funds in accordance with the law. The possibility of judicial obstacles jeopardizing the funding must in any case be avoided. To that effect, the tie with the repository project must be examined for each project component. Whether the destination of the financial means is in accordance with the competence distribution within the Belgian State must also be checked.

### 11.3 / Overview of funding per component

The following overview of funding per project component may clarify the funding of the entire cAt project. Table 5 contains a summary.

**11.3.1 The repository**

The construction and operation of the quay, the caisson plant, the MPF, the disposal modules and the peripheral provisions are all services to the waste producers and are therefore financed by the LTF.

**11.3.2 Communication centre**

The part of the communication centre that forms a service to the waste producers will be financed by the LTF. Certain project components that mainly benefit the local communities, such as the multipurpose hall and the event meadow, will be financed by the MTF.

Yet other parts of the communication centre will be funded from ONDRAF/NIRAS’ general communication budget and third party funding.
11.3.3 **The Local Fund**

The Local Fund will be fuelled completely by the MTF. After all, this fund will finance projects and activities that benefit the local communities in the short, medium and long term.

11.3.4 **Maintenance of participation**

The part of participation that is clearly linked with the repository and therefore forms a service to the waste producers, will be financed by the LTF. Wider participation, e.g. with respect to the nuclear activity in the region, will be financed by the MTF.

11.3.5 **Employment and retention of nuclear know-how**

The direct and indirect employment generated by the cAt project is a direct consequence thereof and does not require additional funding. Retention of nuclear know-how in the region is a process of cooperation with the nuclear companies and it is therefore likely that the costs of these initiatives will be distributed over these companies. Detailed financing will be defined together with the nuclear companies upon development of the action plan.

11.3.6 **Safety, environment & health**

Project components that form a clear service to the waste producers, such as safety monitoring activities and emergency planning, will be financed by the LTF. Project components that mainly benefit the local communities, such as emergency planning for the wider region and health monitoring, will be covered by the MTF.

### Table 5. Funding mechanism per project component

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<th>Project component</th>
<th>Funding mechanism</th>
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<td>Project management</td>
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<td>Construction and operation of the quay</td>
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<td>Construction and operation of the caisson plant</td>
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<td>Construction and operation of the MPF</td>
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<td>Construction and operation of the disposal modules</td>
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<td>Construction and operation of the peripheral provisions</td>
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<td>Prototypes</td>
<td>Specific contract for the project phase and LTF</td>
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<td>Communication centre</td>
<td>LTF, MTF, communication budget ONDRAF/NIRAS and third party funding</td>
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<td>Local Fund</td>
<td>MTF</td>
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<td>Participation</td>
<td>LTF, MTF, ONDRAF/NIRAS budget, third party funding (to be examined)</td>
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<tr>
<td>Retention of nuclear know-how</td>
<td>Third party funding</td>
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<tr>
<td>Safety, environment and health</td>
<td>LTF and MTF</td>
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</table>
11.4 / The order of magnitude of the ONDRAF/NIRAS funds

11.4.1 LTF

In 2005, ONDRAF/NIRAS carried out a first, preliminary estimate of the costs of the project, which resulted in an indicative amount of 350 to 500 million euros (euro 2003).

Recalculated for the 2010 situation – without changing the original cost estimate and planning of the cAt project and only taking account of inflation – the order of magnitude would be around 460 to 650 million euros (euro March 2010).

An actual estimate of the current project as described in this Master plan amounts to approximately 734 to 878 million euros (euro March 2010). This estimate is based on disposal of 30,000 monoliths at a rate of 1,000 monoliths per annum.

11.4.2 MTF

Preliminary estimate. In 2005, ONDRAF/NIRAS made a first, preliminary estimate of the MTF which resulted in an amount of approximately 70 million euros (euro 2003). This amount was merely an indication.

Recalculated for the 2010 situation – without changing the original cost estimate and planning of the cAt project and taking account of the evolution of economic parameters such as inflation and return on investments in the long term – the order of magnitude would be around 106 million euros (euro March 2010).

Scientific definition. In its decision of 23 June 2006, the federal Council of Ministers has requested ONDRAF/NIRAS to produce a more accurate estimate for the MTF. Together with the local partnerships, ONDRAF/NIRAS has developed a scientifically substantiated calculation method to determine the value of the Local Fund (LF) (see Chapter 6). Based on this method, the value of the LF is estimated at 90 to 110 million euros. ONDRAF/NIRAS estimates the realisation of the other project components to be financed by the MTF at 20 million euros.

Consequently, ONDRAF/NIRAS believes an amount of 110 to 130 million euros (euro March 2010) for the MTF to be well-founded and reasonable.
11.5 / Status quo and planned activities

**MTF Bill.** After due advice, e.g. from the Finance Inspector, the bill is submitted to the Council of Ministers. The bill is sent to the Council of State for advice. After investigation and adoption by Parliament, the bill receives royal assent and is promulgated. It can then be published in the Belgian Official Journal, probably by the end of 2011.

**Fuelling the MTF.** Fuelling the MTF starts no later than three months after the establishment license for the repository has been granted. In the current planning this has been projected for the end of 2013.

11.6 / Planning

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**Balanced funding (Chapter 11)**

- Bill (MTF)
- Fuelling the MTF
Licensing

The realisation and exploitation of the cAt project and all its components requires many licenses. The nuclear license will impose conditions regarding establishment and operation of the repository. The FANC has prepared an adapted licensing procedure for this purpose. ONDRAF/NIRAS is currently preparing the license applications based on a number of safety studies. In addition, a conventional (urban development and/or environmental) license is required for several components of the cAt project.

This chapter
- discusses the nuclear licensing procedure;
- lists the conventional licenses for the individual project components and summarises each procedure.

12.1 / Nuclear licensing procedure

12.1.1 Repository

The full licensing procedure with respect to the repository comprises a few steps. For each step, the license applicant must prepare a Safety Case for the FANC (see Chapter 10. Safety, environment and health).

- Establishment and operating license. With this license, the FANC ensures itself of the general safety of the repository. The Crown subsequently grants the license and imposes licensing conditions.
- Delivery decision. This decision ensures the FANC that the facility was built in accordance with the licensing conditions and that the operator avails of adequate assessments and procedures to start operation. The Crown subsequently attests the positive delivery.
- Decision on periodical safety revisions. For this decision, FANC checks that the facility still functions safely and examines possible improvements for its safety.
- Decision on closure of individual modules. This decision ensures the FANC that the waste disposed in the module meets all licensing conditions.
- **License for application of the cover of all modules after closure and for simultaneous start of the monitoring programme, and for allowing placement of the final cover on the disposal modules and starting the monitoring programme after placement of the final cover.** This decision ensures the FANC that the waste in the individual modules meets all licensing conditions. The Crown subsequently grants the license and imposes the licensing conditions for placement of the final cover and the monitoring programme after placement of the final cover.

- **Delivery of the final cover on the disposal modules.** This decision ensures the FANC that the final cover was built in accordance with the licensing conditions.

- **License to confirm the termination of the operating period and to allow the start of the closure phase and the monitoring programme after closure.** This license ensures the FANC that sufficient confidence in passive continuation of the facility exists to guarantee its long-term safety. The Crown subsequently grants the license and imposes the licensing conditions for the monitoring programme after closure and for complete shut-off of the drainage system, the inspection areas and the inspection galleries.

- **License for cancellation of the regulatory nuclear control.** This license ensures the FANC sufficient radioactive decay of the waste to allow cancellation of the regulatory nuclear control. The Crown subsequently grants the license for cancellation of the regulatory nuclear control.

From the moment an establishment and operating license is granted, the FANC supervises compliance with the licenses.

### 12.1.2 The MPF

The nuclear license is also required for establishment and operation of the MPF. Belgoprocess will apply for the license for the MPF. A further license will be required in the future for dismantlement of the MPF.

The complete licensing path with respect to the MPF comprises a few steps. The license applicant must submit a safety dossier to the FANC for each step.

- **Establishment and operating license.** With this license, the FANC ensures itself of the general safety of the MPF. The Crown subsequently imposes the licensing conditions.

- **Delivery decision.** This decision ensures the FANC that the facility was built in accordance with the licensing conditions and that the operator of the MPF avails of adequate assessments and procedures to start its operation. The Crown subsequently attests the positive delivery.

- **Decision on periodical safety revisions.** For this decision, the FANC checks the facility’s continued safe operation and examines possible improvements for its safety.

- ** Decommissioning license.** With this decision the FANC ensures itself that the MPF can be dismantled safely and that the operator of the MPF avails of adequate assessments and procedures to start dismantlement.
12.1.3 Status quo and planning

Status quo
All necessary information is currently being prepared to enable application for the establishment and operating license for the repository at the FANC by mid 2011. The safety studies that are presently being carried out to substantiate the licensing application were discussed in Chapter 10. Safety, environment and health. All necessary information is currently being prepared to enable application for the establishment and operating license for the MPF at the FANC by mid 2011.

Planning disposal
All safety studies will be finalised in the first half of 2011 so that the establishment and operating license can be applied for by mid 2011. Based on the information from the FANC and subject to smooth procedural progress, the establishment and operating license could be granted by mid 2013.

The construction of the repository and testing the operations with non-nuclear test monoliths will take place between 2013 and 2015.

In 2015 and 2016, ONDRAF/NIRAS will prepare a file to ensure a positive delivery decision from the FANC, so that disposal operations for category A waste can start at the end of 2016.

Planning MPF
Application for the establishment and operating license will be submitted as from 2011 by Belgoprocess.

Based on Belgoprocess' experience with the licenses for existing storage buildings and processing and conditioning facilities and subject to smooth procedural progress, the establishment and operating license could be granted by the start of 2012.

The construction of the MPF and testing the operations with non-nuclear test packages, test caissons and test monoliths will take place between 2012 and 2014.

In 2014 and 2015, Belgoprocess will prepare a file to ensure a positive delivery decision from the FANC in 2015, so that the post-conditioning operations for category A waste can start in the course of 2015.
12.2 / Conventional licensing path

12.2.1 Overview of the licenses
For construction, and in some case also for operation of certain project components, ONDRAF/NIRAS must apply for many licenses. Below is a description of the conventional licenses required for each project component and an indication of the length of the procedures required to obtain these licenses. Possible requirement of an EIR project, a SIP and/or EIR plan procedure for the application of the license is also indicated. For projects that require an EIR, the application for the urban development license and for the environmental license must be accompanied by an approved EIR. The EIR project procedure is roughly identical to the EIR plan procedure.

Disposal modules
- EIR project
- urban development license (special procedure)
- environment license
- duration of the license path:
  - EIR project: approx. 1 year
  - urban development license: approx. 8 months
  - environment license: approx. 7 months
  - the application to obtain the urban development license and the construction license can only be submitted after approval of the MER project.
  - the procedures for obtaining the urban development license and the environment license can run simultaneously
  - the urban development license and the environment license are connected; this means that both licenses must be awarded before construction can start
- total duration (not accounting for appeal procedures): approx. 20 months
- appeal procedures can cause a delay of approx. 6 months to 2 years (higher appeal environment license)

MPF
- EIR project
- urban development license (special procedure)
- environment license
- duration of the license path:
  - EIR project: approx. 9 months
  - urban development license: approx. 8 months
  - environment license: approx. 7 months
  - the application to obtain the urban development license and the construction license can only be submitted after approval of the MER project
  - the procedures for obtaining the urban development license and the environment license can run simultaneously
  - the urban development license and the environment license are connected; this means that both licenses must be awarded before construction can start
- total duration (not accounting for appeal procedures): approx. 17 months
- appeal procedures can cause a delay of approx. 6 months to 2 years (higher appeal environment license)

**Caisson plant**
The caisson plant does not require a SIP if the main activity (more than 50%) constitutes manufacture of caissons for the repository and the secondary activity (less than 50%) consists of private manufacture.
The description below assumes no SIP is required for operation of the caisson plant.
- urban development license (regular procedure)
- environment license
- duration of the license path:
  - urban development license: approx. 7 months
  - environment license: approx. 7 months
  - the procedures for obtaining the urban development license and the environment license can run simultaneously
  - the urban development license and the environment license are connected; this means that both licenses must be awarded before construction can start
  - total duration (not accounting for appeal procedures): approx. 7 months
  - appeal procedures can cause a delay of approx. 4 months to 2 years (higher appeal environment license)

**The quay**
- urban development license
- duration of the license path:
  - urban development license: approx. 7 months
  - total duration (not accounting for appeal procedures): approx. 7 months
  - appeal procedures can cause a delay of approx. 6 months

**Prototypes**
- urban development license
- duration of the license path:
  - urban development license: approx. 7 months
  - total duration (not accounting for appeal procedures): approx. 7 months
  - appeal procedures can cause a delay of approx. 6 months

**The communication centre**
- EIR plan
- SIP
- EIR project or request for relief of EIR duty
- urban development license
- environment license
- duration of the license path
  - EIR plan: approx. 1 year
  - SIP: approx. 18 months (6 for preliminary SIP and 12 for the procedure)
  - EIR project: approx. 6 months (request for relief of EIR duty)
  - urban development license: approx. 8 months
  - environment license: approx. 7 months
  - write-up of the preliminary SIP may overlap write-up of EIR plan
  - the application to obtain the urban development license and the construction license
    can only be submitted after approval of the MER project and after definitive adoption of the SIP
  - the MER project or relief may be drawn up during the SIP procedure
  - the procedures for obtaining the urban development license and the environment license
    can run simultaneously
  - the urban development license and the environment license are connected; this means
    that both licenses must be awarded before construction can start
  - total duration (not accounting for appeal procedures): approx. 32 months
  - appeal procedures can cause a delay of approx. 6 months to 2 years (higher appeal environment license)

**Expansion of the SME zone Stenehei**

- EIR plan
- SIP

- duration of the license path:
  - EIR plan: approx. 1 year
  - SIP: approx. 1.5 years – write-up of the preliminary SIP can overlap write-up of EIR plan
  - total duration: approx. 2 years
### The licensing process

**Chapter 12**

#### Test cover
Quay

**Licensing procedures**

**Caisson plant**
- Urban development permit procedure caisson plant
- Environmental permit procedure caisson plant

**Licensing procedures IPM**
- EIA project licence procedure
- Urban development permit procedure
- Environmental permit procedure
- Building and operating licence procedure (FANC)
- Delivery decision by FANC

**Licensing procedures Disposal**
- EIA project licence procedures
- Urban development permit procedure
- Environmental permit procedure
- Building and operating licence procedure (FANC)
- Delivery decision by FANC

**Licensing procedures**

**Communication centre**
- EIA plan procedure
- Environmental implementation plan procedure
- EIA project procedure (release)
- Urban development permit procedure
- Environmental permit procedure
General planning: milestones and activities

The general realisation of the cAt project comprises three fundamental steps: 1) design and public procurement, 2) construction and 3) operation. These subsequent steps are repeated in all projects. This chapter gives a schematic overview of the general project planning and the key milestones. The licenses and the planning related with the repository are critical factors beyond ONDRAF/NIRAS’ control.

13.1 / Logic of the planning

The various components of the cAt project are interconnected and the realisation of the project therefore follows a certain logic. For example: the quay, the caisson plant and the MPF must be fully operational before operation of the repository can start. Furthermore, it is important that the MPF becomes operational as from 2015 since according to the current prognoses, the available storage capacity at Belgoprocess will be exhausted by then. The new category A waste that is generated from that moment on can then be stored in the MPF, awaiting completion of the disposal modules.

13.2 / Licenses and planning: critical conditions

ONDRAF/NIRAS expects to possess the required conventional licenses for construction and operation of the different components of the repository by 2013. Halfway through 2013, ONDRAF/NIRAS should also avail of the nuclear license for establishment and operation of the repository.

Prior to the start of the construction of the communication centre, the planning procedure (SIP) must have been completed to create the necessary zoning change. The SIP procedure is expected to be finalised by mid 2012.

Both the licenses and planning procedures are critical factors in the planning. It is hard to make a correct estimate of actual terms and any delays in these complex routes in advance.
**Schematic overview of the general planning** (numbering per quarter)

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| Balanced funding (Chapter 11)          |      |      |      |      |      |      |      |      |      |
| Bill (MTF)                             |      |      |      |      |      |      |      |      |      |
| Fuelling the MTF                       |      |      |      |      |      |      |      |      |      |

| The licensing process (Chapter 12)     |      |      |      |      |      |      |      |      |      |
| Test cover                             |      |      |      |      |      |      |      |      |      |
| Quay                                   |      |      |      |      |      |      |      |      |      |

| Licensing procedures                   |      |      |      |      |      |      |      |      |      |
| Caisson plant                          |      |      |      |      |      |      |      |      |      |
| Urban development permit procedure     |      |      |      |      |      |      |      |      |      |
| Environmental permit procedure         |      |      |      |      |      |      |      |      |      |

| Licensing procedures IPM               |      |      |      |      |      |      |      |      |      |
| EIA project                            |      |      |      |      |      |      |      |      |      |
| licence procedure                      |      |      |      |      |      |      |      |      |      |
| Urban development                     |      |      |      |      |      |      |      |      |      |
| permit procedure                       |      |      |      |      |      |      |      |      |      |
| Environmental permit procedure         |      |      |      |      |      |      |      |      |      |
| Building and operating licence procedure (FANC) |      |      |      |      |      |      |      |      |      |
| Delivery decision by FANC              |      |      |      |      |      |      |      |      |      |

| Licensing procedures Disposal          |      |      |      |      |      |      |      |      |      |
| EIA project                            |      |      |      |      |      |      |      |      |      |
| licence procedures                     |      |      |      |      |      |      |      |      |      |
| Urban development                     |      |      |      |      |      |      |      |      |      |
| permit procedure                       |      |      |      |      |      |      |      |      |      |
| Environmental                         |      |      |      |      |      |      |      |      |      |
| permit procedure                       |      |      |      |      |      |      |      |      |      |
| Building and operating licence procedure (FANC) |      |      |      |      |      |      |      |      |      |
| Delivery decision by FANC              |      |      |      |      |      |      |      |      |      |

| Licensing procedures                   |      |      |      |      |      |      |      |      |      |
| Communication centre                   |      |      |      |      |      |      |      |      |      |
| EIA plan procedure                     |      |      |      |      |      |      |      |      |      |
| Environmental implementation plan procedure |      |      |      |      |      |      |      |      |      |
| EIA project procedure (release)        |      |      |      |      |      |      |      |      |      |
| Urban development                     |      |      |      |      |      |      |      |      |      |
| permit procedure                       |      |      |      |      |      |      |      |      |      |
| Environmental permit procedure         |      |      |      |      |      |      |      |      |      |
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A long-term solution for Belgian category A waste
NIROND 2010-02 E March 2010