

Convention on Nuclear Safety - 2008

Questions Posted To Belgium

Q.No	Article	Ref. in National Report
1	General	Chapter I.C.c. (page 17)
Question/	Signs of potential degradation of the safety culture can be witnessed in many countries. Sometimes performance levels can be restored in an early stage via intervention by the regulatory body or a re-organization by the operating organization on its own initiative.	
Comment	Sometimes signs of underperformance remain longer due to whatever reasons or stay hidden. Especially, when due to the liberalization of the electricity market the operating organization is slimmed down too much.	
	It is assumed that this liberalization of the e-market is the root cause of the observed backlog in filling in some functions in the organizational chart of the licensee (lack of available human resources) as well as the root cause of the backlog in responding to the AVN.	
	1. Is that assumption correct and can you elaborate on that issue?	
	2. The need to improve the relation between the management and the executive personnel at the Tihange site is probably due to other causes. Can you elaborate a bit more on the problem and its solutions? Is in that respect an increased presence of the management on the shop floor enough, or are other solutions foreseen as well?	
Answer	1. It is always difficult to clearly identify a cause-consequence scenario in those fields. Organisational changes may have different motivations, the objective being often to rationalize efforts and to improve efficiency. Originally, the lack of human resources was one of the root causes of the backlog. Electrabel/Suez established a program of recruitment and training in order to increase human resources. When facing the operator project to implement its so-called NUC21 re-organisation, the safety authorities carefully analysed the implications of it, in particular on safety. The main announced objective was to improve the efficiency by organising tasks by site in place of by unit. The implementation started after in-depth discussion between the regulator and the operator that ensured that safety functions would be maintained or improved. This implementation was carefully followed and raised in 2004 some concerned (described on page 17 of the report). As for any detected deficiency, a deeper analysis (an audit in this case) was launched, which resulted on an action plan that was implemented by the licensee. From the audit, it was not possible to conclude that the identified concerns had to be attributed to one of the possible e-market	

consequences, nor to fully exclude it.

2. Different actions are taken at the Tihange site, in particular as a follow-up of the OSART mission, to increase presence of the management on the shop floor. Visits to observe the activities are to be done by the management.

Q.No 2	Article General	Ref. in National Report Chapter I.C.d (page 19)
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Question/ Comment 1. What is the current status of the ideas/plans to implement the safety requirements in national regulations to make them available to the public?

2. Taking into account the Law on Phase-out of nuclear energy, does it make still sense to spend much effort with the task to publish these requirements in the near future?

Answer 1. The major initiative is actually the transposition of the WENRA reference levels in the national regulation, which should be finalized for 2010. At this time of writing, 2/3 of the texts are drafted.
2. The reference levels address mostly the existing reactors. It makes thus sense to transpose legally these levels, taking into account the phase-out law because the last 4 reactors have to close in 2025 according this law.

Q.No 3	Article General	Ref. in National Report Section I-C Part (g) , Page 21
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Question/ Comment It is stated that one of the issues that need to be rectified is that the activities performed by AVN are directly paid by the Licensee (Electrabel). In this case the requirement of the regulatory body being totally independent of organizations associated with the promotion of nuclear technologies appears to be compromised. Please clarify whether the situation regarding payment of AVN by Electrabel remains the same or has there been any change?

Answer In 2001, the GRR-2001 created the independent public safety authority, the Federal Agency for Nuclear Control (FANC), as an autonomous body. It is managed by an independent Board. The relation with the Government is ensured by a commissioner who, in the name of the Minister in charge (the Minister of Internal Affairs), checks the conformity of the decisions.
Another independent body, the scientific council of the FANC, is in Belgium the sole body that can refuse authorizations: A royal decree cannot be issued without the positive advice from the scientific council. The control staff of FANC has the status of judiciary officer, having the power to shutdown a plant.

As in other fields in Belgium, the permanent on-site inspections (and “back-office” technical safety evaluations) is delegated (The Agency keeping the final responsibility) to “Authorized Inspection Organizations”. The status of these AIOs is detailed in art 74 of the GRR-2001. These AIOs have to be non-profit companies, they must be accredited (for a maximum period of 5 year) and their inspectors have to be individually recognized by the FANC on their competence basis.

It should also be mentioned that the FANC performs a close surveillance on the activities of AVN : The FANC director is chairman of

the “Commission de Surveillance”, having in charge to evaluate the activities performed by AVN, namely in the frame of GRR-2001.

The list of duties that FANC can delegate to the AIOs is clearly defined in the GRR-2001, and the AIOs charge the utilities for their activities. Article 74.5 (see answer to question 28) for more details) of GRR-2001 avoids clearly conflicts of interests. Until now, this situation has not led to special difficulties in practice.

AVN has followed the commissioning of the Belgian reactors since the 70-ties , and keeps a unique knowledge and tracking of their design basis and operating history.

Although the present situation allowed good and efficient working, some specific aspects could be improved in order to reinforce the AVN role as a part of the “regulatory body”, namely because the FANC has, according to the Law, to call for public tenders for the missions defined in the GRR, which could induce a loss of the AVN (and others AIOs) knowledge.

The present duties of the AIOs will not be changed, but re-enforced. It should also be stressed that this solution will ensure a long-term perspective for AVN (at present, the accreditation is limited to 5 years).

Having considered different juridical solutions, the final solution retained was to change the status of the AIOs to a FANC subsidiary (No independent AIOs would subsist in the future).

This future status was subject to the consensus of the Belgian Parliament.

On 1 October 2007, a “foundation”, subsidiary of the FANC called “BELV” has been created for this purpose. It is now also clearly the willingness of both the AIOs and of the FANC to finalise as soon as possible the move to BELV. Nevertheless, due to the political situation in Belgium and the long period of an interim Government, this decision has not been taken yet.

For the practical arrangements, AVN consists of approximatively 40 high-level technical experts that would be transferred to the BELV foundation. A spin-off of the existing AVN (+/-10 people) will continue independently other consultancy activities mainly in the international field. The physical re-location of the AVN staff is not yet decided (The AIO and FANC offices are relatively close and located both in Brussels), but the main guidelines are :

- The AIO will keep a large independence (same structure as now, distinct management, ..)
- The people of the AIO will keep the same level of working conditions with long-term perspectives

It is intended that the FANC will finance totally the BELV activities, although the final mechanism is not yet finalized.

Q.No	Article	Ref. in National Report
4	General	Chapter I.C.c page 17

Question/ Comment The reorganization of the operating organization (Electrabel) has not been finalised due to lack of available resources for a few (at least four) years (from 2000- to 2004 (date of the audit). This situation could have some potential impact on plants safety.

Is this situation affecting critical areas of the NPPs such as engineering, maintenance ,operating departments of the plant?

Why did the Regulatory Authority react so late to this situation as we understand the audit was conducted in 2004?

What is the status of the reorganisation?

Answer There was no evident sign of degradation of the safety culture before 2004. The reorganisation NUC21 was being conducted, under the supervision of the AIO.

Mid 2004, the AIO made a global assessment, using OCDE indicators. It showed some trends of early signs of potential degradation of safety culture, although the situation didn't need immediate corrective measures. When the AIO informed the FANC and the operator of their findings, the FANC conducted an in-depth audit on both nuclear sites, and asked and action plan to the operator.

The initial reorganisation as proposed by the operator after the 2004-audit has been adapted as a result of further analysis and audits (such as a WANO Assist Mission). The new organisation puts more emphasis on nuclear safety by reinforcing the role of the Health Physics department and by creating a nuclear safety department at corporate level. Specific attention was given to redefine the responsibilities of the departments Operations and Maintenance and a specific department for Engineering Support has been created. These changes of the organisation have been discussed and agreed upon by the authorities, who also monitor how this is put into operation as well as the efficiency of this new organisation. The newly defined organisation is now in place and except for some functions in the Engineering Support and Maintenance departments most of the newly defined functions are occupied. This means that recruitment is still on-going.

Q.No	Article	Ref. in National Report
5	General	Chapter I.C.g Page 21

Question/ Comment As indicated in Section I.C of the Belgium report additional information/status of the amendments and other legal mechanisms to bring the inspection organisation (AVN) into a FANC subsidiary body would be welcome as an integral part of the presentation of the Belgium National Report at the 4th Review Meeting in April 2008.

It could be expected that due to FANC/AVN reorganizations experienced people may leave due to physical relocation, different working conditions, different structure, etc. This may contribute to the problem of finding suitable resources as already experienced by

Electrabel

Taken cognisance of the above comment and also of the previous question related to the reorganisation of Tractebel, how will the decision to reorganize the Authorized Inspection Organizations to make them subsidiary of FANC affect the role that AVN (or other AIOs) are playing to ensure the safe plants operation?

Answer Please see answer to question 3 .

Q.No	Article	Ref. in National Report
6	Article 6	p. 27, §IIB; p.143 §III.C.4.a.2); p. 172

Question/ Comment Concerning periodic safety reviews, the analysis commonly includes ageing aspects: could Belgium give examples of outcomes from ageing analysis?

Answer As a result from the periodic safety review, several outcomes from the ageing analysis are summarized in the answer to question 36, concerning eg. the monitoring of the vessel embrittlement, the inspection programme for the radial guidance of the internal components of the reactor vessel and for the guide tube pins , the corrosion phenomena of the classified pipings, etc."

Q.No	Article	Ref. in National Report
7	Article 6	

Question/ Comment Article 6, Section II-B, Page 28

1) It is stated that at Doel 1 & 2 , the Seismic assessment was found to be 0.056g . Has any re-assessment been carried out to ascertain that the measures taken (e.g. bunkerising of buildings etc) at Doel 1 & 2 improved the SSE value to 0.1g?

Section I.C. (a), Page 15

2) On page 15, it is mentioned that two holes were made in primary steel containment and secondary concrete containment. Please provide information on the actions taken to ensure structural integrity and leak tightness of the containment

Answer 1) In the design of Doel 1 and 2, earthquakes had not been considered as a factor influencing the design requirements, due to the weak seismic activity of the region (significantly lower than the seismic activity of the Tihange site). When designing Doel 3 and 4, applying the USNRC rules has imposed a minimum of 0.1 g for the Safe Shutdown Earthquake (SSE). For Doel 1 and 2, the same methodology for defining the SSE has been followed, except the requirement of a minimum value of 0.1 g. It has been verified that the needed equipments resist to at least 0.056 g, no further re-assessment has been made with 0.1g.

2) Regarding the primary containment (spherical form, made of steel, 25 mm thick) :

A finite element analysis confirmed that the containment, with the 5.5m diameter hole and with a temporary footbridge, complied with

the requirements of ASME III NE. The repair weld complied with ASME III NE and was tested 100% : visual, penetrant test, radiographic and ultrasonic examination.

Regarding the secondary containment (reinforced concrete dome, 800 mm thick):

A finite element analysis confirmed that the containment, with the 5.5m square hole and with a temporary platform, complied with the requirements of ACI349.

The main difficulty has been the way to repair the concrete in order to restore the previous strength. At the outer face, an over thickness 8 * 8 m was foreseen, allowing a good overlap of old and new reinforcement bars.

At the inner face, a new liner was foreseen. It was used as lost formwork during the pouring and as equivalent reinforcement during service and accidental conditions. A special studs and anchors system was used to transfer stresses from the new liner to the old concrete.

Injection dispositions between old and new concrete were ready for use in case of insufficient tightness of the cold joint. The room between outer and inner containment is depressurized in service condition.

Q.No *	Article Article 6	Ref. in National Report Section I.B, Page 10
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Question/ It is mentioned that dismantling of reprocessing plant in the Mol-Dessel region was to be completed by 2007. Kindly indicate if the Comment dismantling has been completed and what was duration of the dismantling operation?

Answer The dismantling started in 1986. Presently, almost all internal parts of the reprocessing building have been removed and one third of the building has been prepared in order to break it down by controlled demolition. This demolition of the eastern part of the building will start in June 2008. The complete demolition of the reprocessing building will be finished by 2012.

Q.No 8	Article Article 6	Ref. in National Report P. 27
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Question/ The obligation to perform periodic safety reviews has been in force since 1975 in the Belgian regulations...

Comment What is the frequency of the safety reviews, e.g. annually?

Answer The Operating licences require that a periodic safety review be performed every ten years. The synthesis report established for each unit needs to be submitted to the FANC before the end of each ten-year of operation. The implementation of the safety improvement measures needs to be carried out according to an agreed planning. At present, the FANC requests an implementation of all measures during the following 5 years of operation. It should be noted that the licensee performs a continuous safety management in which the preparation/implementation of studies and of safety improvements are common practice. It should also be mentioned that :
- FANC issued in July 2007 new directives related to the PSR, in order to comply fully with the IAEA recommendations (NS-G-2.10)

- Specific safety evaluations can be asked at any moment by the regulatory body.(This is explicitly stated in the license)

Q.No	Article	Ref. in National Report
9	Article 6	Table page 29/217

Question/ In the table of summary of the main projects and modifications to the installations several installations have undergone “power uprate”
Comment What is the regulatory approval process for installations “power uprate”? Does this require approval of a new licence, in the form of a new Royal Decree? Is a new Environmental Impact Assessment required?

Answer Power uprate of the reactors is considered as a major modification (the authorized power being specified in the exploitation License). The authorisation process for power uprating is the same as issuing a new licence, including amongst other:

- Environmental Impact Assessment report, with public inquiries (including consultation of foreign countries in the surrounding area of the plant, if indicated, for Doel for exemple)
- Consultations of the Scientific Council
- New Royal Decree (as amendment to the existing license)

Q.No	Article	Ref. in National Report
10	Article 7.1	I.C.2

Question/ The Report states that the surveillance of nuclear activities is under the responsibility of the Federal Agency for Nuclear Control.
Comment FANC may call upon the assistance of authorized organization, e.g. Association Vincotte Nuclear, so AVN is a ‘second regulatory body’ for the nuclear power plants. Are there common strategies, policies (e.g. strategy for inspections), or jointly organized trainings for the two authorities?

Answer AVN is not a “second regulatory body” but a part of the regulatory system. The surveillance of NPP’s on a daily basis is indeed done by AVN, the “authorized inspection organization”, but under the responsibility and guidance of the FANC. All the inspection reports of AVN are sent to the operator and the FANC, who can – if necessary – use enforcement tools. The FANC and AVN are working together on a complementary manner. Therefore, directives have been written by the FANC and communicated to the authorized inspection organizations. In the framework of this collaboration, strategies and inspection policies are worked out. It is foreseen to have jointly organized trainings on some subjects (like INES). See also answer to question 3.

Q.No	Article	Ref. in National Report
11	Article 7.1	IIC.5

Question/ The Royal Decree of 17 October 2003 specifies the National Emergency Plan for nuclear and radiological situation, in particular the
Comment tasks of each parties involved. The law of 15 May 2007 defines the Civil safety and describes roles and missions of different entities involved.

Does this law of 2007 cover also the tasks of the parties involved in the national emergency plan for nuclear situations?

Answer The law of 15 May 2007 on Civil safety defines in general terms the role and missions of the Civil Protection and the fire departments. It includes namely:

- the rescue of and assistance to people exposed to dangerous situations and the protection of their goods;
- the protection against pollution, the release of dangerous substances including that of radioactive substances and ionizing radiations; and
- logistic support.

Missions and tasks to be carried out regarding rescue and logistic are described in specific (monodisciplinary) intervention plans as requested by the Royal Decree of 16 February 2006 related on emergency and intervention planning.

Q.No *	Article Article 7.1	Ref. in National Report Section II.M., Page 112
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Question/ Kindly provide the list of applicable national regulations, and requirements related to siting of nuclear installations.
Comment

Answer As the construction of new nuclear power plants is prohibited by the nuclear phase-out law, there is no particular detailed siting regulation in Belgium. However, article 29 of the GRR-2001 states that building of a nuclear installation should avoid environments with risks of fire, flooding or explosion. In addition, the environmental changes of the nuclear power plants are re-evaluated at least at each periodic safety review.

Q.No 12	Article Article 7.2.3	Ref. in National Report Page 42/217 Article 5 & 6
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Question/ It is our understanding that a licence (Royal Decree) is issued individually to each nuclear installation. In cases where there are several
Comment nuclear installations on one site is there an authorisation process for the site such as a site licence for regulating aspects that are common to all nuclear installations e.g emergency planning etc..

Also how is the strict liability regime enforced on such site where there are several nuclear installations (and perhaps different operators)?

Answer A separate licence is issued for each reactor, except for Doel 1 and 2 , which are twin reactors(having common systems). Only one operator is the owner for all nuclear installations in Belgium (Electrabel). Electrabel being the sole operator of both sites, his liability as license holder is enforced by art. 6.2.5 of GRR-2001 and international treaties (Brussels and Paris). More details are given in the report page 68.

Q.No	Article	Ref. in National Report
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13 Article 8.1

Question/ Comment Do you have currently in your regulatory staff, or in a technical support organization (TSO) working for the regulatory body, an adequate number of technical experts (e.g., in the areas of reactor physics, thermo-hydraulics, and materials engineering) who can conduct an in-depth safety assessment of nuclear power plant, as would be needed for evaluation of operating events, large power upgrade, lifetime extension, or new build? Do these experts have tools and ability to conduct independent safety analysis, including both deterministic analysis and PRA? What is the number of such experts in various technical areas within the regulatory body and within the TSO? What is the outlook concerning the number of experts in a few years ahead?

Answer The regulatory staff of the FANC and AVN together represents about 200 people. The technical experts for in-depth safety assessment of NPPs are mainly provided by AVN. These experts cover the deterministic as well as the probabilistic safety analysis. For some fields, AVN disposes of its own tools to perform evaluations (e.g. PSA, thermal-hydraulic analysis, ...). The present number of technical experts is adequate to cover all the technical fields needed for inspection and safety evaluations for existing facilities. New build is not foreseen. However, given that some people left AVN in the last one and a half year, and in order to prepare for the people who will retire in the next few years, AVN is engaged in an important recruitment program.

Q.No Article Ref. in National Report
14 Article 8.1

Question/ Comment What kind of systematic training and development programmes you have for your new regulatory staff members? How do you ensure that they are ready to conduct their duties as regulatory staff members in the tasks assigned to them?

Answer For what concerns FANC, the high requirements for new staff members and the close follow-up by experienced staff members and management of a relatively small team ensures that every staff member has the knowledge needed for the task assigned to him. There duties are categorized in formal “function descriptions” according their experience and knowledge. If the initial education does not fulfil the requested skills, FANC organize post-university trainings for the new staff members, presently on a case by case basis. In addition, in the near future, as a result of the reorganisation of the Agency and the preparation to the ISO-9001 certification, a formal systematic training and development programme, including assessments, for new and experienced staff members is being set up. For what concerns the AIOs, the inspectors have to be accredited individually (generally for a limited time: 6 years) . The conditions of accreditation and renewal of accreditation are set up in art. 73 of the GRR-2001. This article asks a strong high-level initial education (post-university) as well as a continuous training, proving that they maintain and improve they theoretical knowledge and practical experience. The technical expertise of the inspectors in view of their accreditation and renewal of accreditation is evaluated by the FANC Scientific Council.

The AVN training system has been developed using the Systematic Approach to Training (SAT); the various elements of this training system are implemented according to the good practices of a Quality Management System, using the process approach recommended

by ISO 9001-2000 standard.

Q.No	Article	Ref. in National Report
15	Article 8.1	p. 22, §I.C.g.; p. 67, §II.D.6.

Question/ Comment As regards the prospect of creation of subsidiary bodies of the FANC, could Belgium clarify whether AVN's resources (in terms of staff and budget) would be integrally transferred to FANC? In addition, could Belgium provide information on the latest developments of this process? Have necessary draft amendments been proposed to the Minister of Internal Affairs?

Answer Please see answer to question 3.

Q.No	Article	Ref. in National Report
16	Article 8.1	

Question/ Comment Is there any particular training programme provided to the new regulatory staff members intended to act as inspectors?

Answer Please see answer to question 14. The training needs of each staff member depend directly on his educational profile and on his position in the organisation. Actually, the competencies required are converted into training programmes for each individual. Of course most of the initial training courses or training materials for self-study are identical for all newcomers. In addition to other staff, a future NPP inspector has to follow a specific initial training on simulators (four times two weeks) and a practical training period of 3 to 4 months in a foreign nuclear power plant.

Q.No	Article	Ref. in National Report
17	Article 8.1	

Question/ Comment How does the staff of the regulatory body address the necessary technical background to perform full deterministic and probabilistic safety analysis?

Answer AVN has established a number of technical competence centres, each addressing different areas, which are important for safety. These centres address in their entirety all issues used in deterministic and probabilistic safety analyses. Processes and procedures are implemented to manage the definition of these domains of expertise and their structure, the development and maintenance of expertise, the definition of a safety assessment framework, the execution of technical activities, and the internal assessment of activities. A senior member coaches new staff in order to acquire the needed minimum knowledge and experience.

Q.No	Article	Ref. in National Report
18	Article 8.1	II.D.6, p.67

Question/ Comment The Report states that in the near future, AVN will get the status of a subsidiary body of the FANC. Will the status of authorized inspection agency remain?

Answer No, all existing AIOs will be part of the subsidiary BELV. Please see answer to question 3 for more details.

Q.No	Article	Ref. in National Report
19	Article 8.1	II.D.3, p. 59

Question/ Comment The Parliamentary Commission of Internal Affairs in charge of nuclear safety made several recommendations concerning working and effectiveness of the FANC (April 2007) :

Is there an action plan to implement these recommendations, or were these recommendations already used in the reorganization of the FANC that started since the beginning of 2007?

Answer An internal strategic plan has been set-up for the implementation of the recommendations of the parliamentary commission. For example :

- These recommendations have been taken into account for the 2007 FANC reorganisation
- The subsidiarisation of the AIOs, like AVN, is a direct consequence of these recommendations
- The staff of the FANC has been increased (from 110 to 140 people)
- New regulatory (writing new regulation) initiatives have started.
- The process in the frame of a near future ISO9001 certification, including internal audits mechanisms, has started.
- ..

Q.No	Article	Ref. in National Report
20	Article 8.1	II.D.6, p.66

Question/ Comment Relation- FANC and AVN (license applications under article 6 of GRR-2001):

The costs of AVN inspections and analyses are invoiced to the licensee. Will these costs also be paid to AVN in the future, when AVN will be a subsidiary body of FANC, or will these be paid to FANC?

Answer Please see answer to question 3.

Q.No	Article	Ref. in National Report
21	Article 8.1	II.D.1, p.54

Question/ Comment general regulation and overseeing:

The “Contact Committee” seems to be quite informal. Why is this Committee a platform where the safety authorities are “informally informed” as regards “general overseeing”. Is it a meeting with agenda and minutes that are distributed?

Answer During the Contact Committee, the operating organisation gives a general overview of the operation of his nuclear facility during the previous period and presents the progress on certain projects (preparation of periodic safety review, preparation/projects of future

license application,) and evaluations/analyses requested by the regulatory body.

Very often the subjects discussed in this Committee will lead to subsequent formal interactions between the operating organisation, safety authorities and authorized inspection organization (ex. license application, requests for additional information, ...)

The Contact Committee has a standard agenda. Minutes of these Contact Committees are made and distributed to all the participants.

Q.No	Article	Ref. in National Report
22	Article 8.1	II.D.1, p.55

Question/ European experts:
Comment

What is the difference in the (level of) judgment of safety between the European experts and AVN? Has it been a expert review of AVN's work, or an independent assessment? Is this independent advice required by Belgian law?

Answer AVN was not subject to a dedicated external verification mission. The Belgian regulatory framework does not require such an assessment. Due to international contacts and participation in IRRT/IRRS and OSARTs a number of AVN's staff could compare their knowledge and practices with their peers, with more than satisfactory results. Of course, the quality management system requires that all inspection and assessment work is independently reviewed by peers.
In addition, in the early nineties, AVN created its Scientific and Technical Committee, comprising international and national members. This Committee meets yearly and evaluates and discusses AVN's activities on the basis of AVN's Annual Report (See also the answer to question 25).

Q.No	Article	Ref. in National Report
23	Article 8.1	II.D.1, p.56

Question/ Major modifications:

Comment Major modifications are subject to a kind of licensing procedure. What are the criteria which determine a major modification and where are they written down in the Belgian regulatory system?

Answer Article 12 of the Royal Decree of 20 July 2001 stipulates that the Federal Agency for Nuclear Control decides whether a modification to an existing nuclear facility is considered to be a major modification (which is subject to a licensing procedure) or not, but does not contain detailed criteria for classification of modifications. Therefore the Agency has developed a guidance document, which clearly defines the different criteria to determine this.

According to this guidance document, a modification is considered a major modification if one of the following criteria are fulfilled:

- the modification has clearly an important character (ex. change of important safety related component such as a steam generator)
- the modification changes an explicit license limit (ex. maximum thermal power of reactor, change of cycle length,..)
- the modification increases or may increase the authorised impact (risk) to the workers, the population or the environment (ex.

increase of effects of design basis of beyond design basis accidents, increase of impacts during normal operation,...)

Q.No	Article	Ref. in National Report
24	Article 8.1	II.D.2., p.56

Question/ unsafe situation:

Comment What happens when an AVN site inspector is informed about an acute safety problem and direct action is necessary, but the plant refuses to implement the necessary corrective actions? Does AVN then have the possibility to order a shutdown ?

Answer The licensee is responsible for safety and should be the first one to make that decision, in line with the management's declaration that priority should be given to safety.
If an AVN inspector discovers an acute problem needing a direct action he informs first the Licensee. It is not expected (and never happened) that the Licensee will not take the requested actions, but in the very theoretical case where the Licensee refuses to implement the corrective actions , AVN has the possibility to call (24h per day and 7day per week) a FANC Officer, who has the legal power to close the plant.

Q.No	Article	Ref. in National Report
25	Article 8.1	II.D.3.b., p.62

Question/ scientific and technical committee:

Comment

AVN has a Scientific Committee and FANC has a Scientific Council. And there are even more committees and councils.

Is there a certain overlap in these committees regarding the topics that are discussed or the members? Does the general public have access to information from these committees & councils ?

Answer As mentioned, the existence and the role of the Scientific Council of the Agency have been established by the law of 1994. This Scientific Council has to provide advices on rules, license applications and inspections (see § II.C.4.b). AVN's General Director is asked to provide the safety evaluation report related to licence requests coming from the main operators and to present it to the Scientific Council. The transcripts of the meetings of the Scientific Council are confidential and are not made public. However, the official advices that are given (regarding for example a license application) are made public.
AVN took itself the initiative to establish a "Scientific and Technical Committee" (see § II.D.3.b). It meets annually and discusses the main safety issues of Belgian installations as well as AVN's operation. The recommendations are addressed to AVN and are followed-up. The meeting reports, including the recommendations, are not made public.
They may be some fortuitous overlap for the members. Of course, information on important nuclear topics, especially with regards to NPPs, installations, may be discussed in both councils, but with different objectives, the FANC's council being more focused on licensing process, including broader aspects like environmental impact, radiological protection,...

In addition, the Scientific council of the FANC has the right to take advice from any (national or international) external scientific institution or expert when needed.

The reports of the FANC scientific councils are confidential. However, the final conclusion of the scientific council is annexed to the royal decree of authorization, which is public.

Q.No	Article	Ref. in National Report
26	Article 8.1	Page 54
Question/ Comment	The report states that “As regards the general overseeing of the operating organisation, the Safety Authorities are informally informed of the organisation’s operational issues and projects through the meetings of a “Contact Committee” ...[which] ... meets twice a year on average”. Could FANC say a little more about its communications process with AVN, the typical matters discussed at such meetings, and about its past and present relationship with AVN? Six monthly meetings seem remarkably infrequent, although at other points in the report, there are references to quarterly meetings with the Commission de Surveillance (page 62/217), monthly meetings between FANC and AVN (page 73/217), and to inspection reports for each inspection being systematically transmitted to the FANC (page 55/217). What is the current status of the recommendation “...to bring the inspection organisations into a FANC subsidiary body by the end of 2007” (page 22/217)?	
Answer	AVN is in charge of the permanent surveillance of the installations and of the functioning of the internal Health Physics Department. In this sense, the AVN counterparts are the site managers. The FANC receives all inspection reports, and organises monthly meetings with AVN for the follow-up of the different actions in regard to the licensee and for discussing issues raised in the inspection reports of AVN. This mechanism is formally set-up in the FANC guidance document “Directives aux organismes agréés” and “General Inspection and Control Policy ». Of course, other non-systematic meeting with AVN take regularly place to discuss and analyse specific issues (for example WENRA implementation plan, periodic safety review evaluations,...) The “Commission de Surveillance” is in charge of controlling the good working of AVN in the frame of their missions defined in the GRR-2001. This “Commission de Surveillance” is enforced in the GRR-2001 in article 74 The “contact committee” meeting is at the corporate level and involve the managing directors of the Licensee on one part and the directors of FANC and AVN on the other part. This committee is more focused on strategic issues. Please see answer to question 21 for more details about this committee and answer to question 3 for more details about the subsidiarization of the Authorized Inspection Organizations.	

Q.No 27	Article Article 8.1	Ref. in National Report Page 55
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Question/ Comment The report says that “All modifications are notified to AVN” and “AVN issues successive operating licences that allow [the operator] to proceed to the next steps: core loading, criticality, increasing steps in power up to nominal power.” Despite the vital role of AVN, one can infer from the wording of page 18/217, paragraphs 3 and 4, that prior to the audit in 2004, Electrabel had lost some respect for AVN. Has this position now been fully rectified? Is this one on the reasons underlying the recommendation to bring the inspection organisation into a FANC subsidiary body?

Answer Electrabel did not lose respect in AVN and it continues to expect that AVN continues its work as inspector and safety assessor. One of the reasons is that the AVN staff has a sound knowledge of the different nuclear installations and of the related safety requirements. The transfer to a body, which is subsidiary to the FANC, would not fundamentally change this. The concept of this transfer is rather based on the law on public market, which does not allow the FANC to subcontract some of its activities to private organisations without public tendering

Q.No 28	Article Article 8.2	Ref. in National Report
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Question/ Comment Is the principle of effective separation (as given in Art. 8 Para 2) laid down explicitly in any binding national law or is this principle met by a sum of state organisational measures?

Answer For what concerns FANC, FANC is a public regulatory body reporting to the Minister and to the Parliament. For what concerns the AIOs, the effective separation principle, avoiding any conflict of interest is laid down in article 74 and especially 74.5 of the GRR2001:
The AIO is a non-profit organization with its own juridical personality.
The Inspectors and the manager of the AIOs :
- Should be fully employed by the AIO
- Cannot have interest in manufacturing nuclear installations or parts for nuclear installations
- Cannot have interest in radioactive material business nor with radwaste business
- Cannot supervise installations they own, operate or they have designed or manufactured
- Cannot directly nor indirectly proceed to modifications , maintenance or repairs to the installations
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Q.No 29	Article Article 8.2	Ref. in National Report
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Question/ Comment Is there any difference to your point of view between “effective separation” and “independence” as referred to in your report?

Answer Considering the answer to the previous question (n° 28), the independence of AIO in the text should be understood as “effective separation”.

Q.No	Article	Ref. in National Report
30	Article 8.2	Section I-C Part (g) ,Page 21

Question/ Comment It is stated that one of the issues that need to be rectified is that the activities performed by AVN are directly paid by the Licensee (Electrabel). In this case the requirement of the regulatory body being totally independent of organizations associated with the promotion of nuclear technologies appears to be compromised. Please clarify whether the situation regarding payment of AVN by Electrabel remains the same or has there been any change?

Answer Please see answer to question 3.

Q.No	Article	Ref. in National Report
31	Article 8.2	Pages 55 and 56

Question/ Comment At the foot of page 57/217, the text refers to the Department “Authorisations and Regulations”. Is this the same as the Department “Regulatory and Licensing” whose four areas of responsibility are set out at the top of page 58/217? The next page, 59/217 refers to “the legal separation between ‘regulatory activities’ on the one hand and ‘licensing and control activities’ on the other hand...” This is confusing. Could FANC please clarify the names and areas of responsibility of each of its Departments under both the old organisation, and under the new organisation shown on page 60/217. Will most of the responsibility for the control of assessment and inspection activities for nuclear power reactors be situated in the new ‘Facilities and Waste’ Department?

Answer The name “authorisations and regulations” or “Regulatory and licensing” refers to the same department of the old structure. This department was in charge of preparing the regulation and issuing the licences (royal decrees for class I facilities). Another department “Control and surveillance” was in charge of controlling the facilities.
In the new structure (since September 2007), the regulation activities have been transferred to the department “Regulation, International Affairs and Development”. The department “facilities and wastes” has the responsibility for the control and inspections in the nuclear power reactors, but also for issuing exploitation licences, as stated pg. 59 of the report.

Q.No	Article	Ref. in National Report
32	Article 9	

Question/ Comment Is the principle, that prime responsibility for the safety of nuclear installations rests with the holder of the relevant license laid down explicitly in any binding national law or is this principle met by a sum of regulatory requirements?

Answer The Royal Decree of 20 July 2001 (GRR-2001) stipulates that the facility general manager (i.e. the person who applied for the licence) is responsible for complying with the conditions set in the licence (Article 5.2), see the report page 68.
In addition, this principle is stated in the FANC document “General Inspection and Control Policy”. (2003)

In the frame of the WENRA harmonisation initiative, such requirement will also be reinforced in the national public regulation.

Q.No 33	Article Article 9	Ref. in National Report II.E, p.68
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Question/ Comment To each NNP unit, an AVN inspector is assigned.

Are these assignments limited in time and if so what is the limit ?

Answer These assignments are not time limited. In practice an inspector can easily stay on for 5 years and more. They can change their job, but it is needed to train the new candidate inspector thoroughly, and this takes time.

Q.No 34	Article Article 10	Ref. in National Report pages 69 and 71
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Question/ Comment The licensee declares in his policy that the personnel is involved in the continuous improvement process. In the general inspection and control policy of the regulatory body, continuous improvement is not explicitly mentioned. How does the regulatory body monitor if the continuous improvement process is practised? Are formal indicators used?

Answer AVN inspects all departments and units which perform safety related activities. It also discusses the main findings with the site management and with corporate headquarters. The continuous improvement process is monitored through the inspections. Indicators have been used to assist in the evaluation of the re-organisation of the utility.

Q.No 35	Article Article 10	Ref. in National Report page 72 (II F 1 and II F 2)
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Question/ Comment To what extent can the Belgium regulator require measures to cope with severe accidents?

Answer The Belgian regulatory framework does not require formally and explicitly, measures to cope with severe accidents for existing plants. However, in the framework of both periodic safety reviews and PSA Level 2 studies, plant vulnerabilities with respect to severe accidents have been assessed both deterministically and probabilistically, and measures have been taken to cope with potential losses of containment integrity (e.g., installation of catalytic hydrogen recombiners, reactor cavity flooding). In addition, severe accident management guidelines have been implemented at all plants. These measures are implemented in the SAR, which is legally binding. As far as the regulatory framework is concerned, it is worth to recall that, according art. 13 of GRR-2001, the FANC has the possibility, on its own initiative, to complete the licence with additional exploitation conditions.

Q.No 36	Article Article 10	Ref. in National Report page 72 (II F 1 and II F 2)
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Question/ The 3rd review of the older Belgian NPPs should have taken place in 2005 (compare Appendix 1, page 132). What were the main findings and measures taken of the 3rd periodic safety review?

Answer Main findings and conclusions of the most recent PSRs:

Many safety related improvements were related to the ageing of equipment.

The new regulations and practices of the USNRC and the EU published over the last ten years have for their greater part already been taken into account or implemented during the last operation period. A thorough assessment of the conformity with the regulations applicable to SFP lifting devices showed that certain cranes did not meet requirements. Modifications of the Doel 1/2 and Tihange 1 polar cranes are being studied with the goal of resolving this.

The updating of data on the specific internal and external risks (floods, explosions, extreme atmospheric conditions, etc.) has shown that there are no new factors that call the current hypotheses into question with regard to the design of the units. Measures have been taken to increase the availability of safety equipment in the event of a heat wave. The effectiveness of the Tihange ultimate heat sink was strengthened by digging of a number of new groundwater wells.

The monitoring of the vessel embrittlement confirmed that this phenomenon is under control and does not constitute an obstacle for the continuation of unit operation over the next ten years. The evaluation of national and international experience confirmed the current inspection programme concerning the radial guidance of the internal components of the reactor vessel. The inspection programme for guide tube pins was adapted based on the analysis of national and international experience on corrosion.

The components of the cast stainless steel primary circuit showed no signs of premature ageing.

International feedback on ageing mechanisms not considered during design was gathered. It enabled identification of the risk zones which merit a more detailed analysis.

The various corrosion phenomena likely to affect classified piping were identified and described. The current inspection programme is in the process of being re-evaluated in order to verify that it does indeed cover all of these phenomena.

PSA models are updated in order to take into account the modifications made to systems and the “human reliability” based on current accident procedures. New stabilisation procedures for accidents during handling of fuel assemblies were drawn up.

The assessment of international feedback on severe accident management has ended. The evaluation, based on representative severe accident scenarios, of the SAMGs that are in force is under way.

The training programme was reviewed in order to meet the needs of all categories of staff with regard to nuclear safety. A continuous

process for updating this training programme was defined and implemented (introduction of SAT approach – see answer to question 53). The various documents and domains of expertise concerning safety system design basis were identified. An action plan is under way in order to improve the dissemination and anchoring of this knowledge and ensure its long-term maintenance and accessibility.

Actions intended to improve the dose limitation programme (ALARA) were defined and implemented. Performance indicators concerning radiation protection were defined and are being monitored. ALARA procedures were updated. A database recording dose rate levels in the controlled area was created in order to facilitate the evaluation of doses upon preparation of the work. A teledosimetry system was made available to staff members.

Q.No	Article	Ref. in National Report
37	Article 10	

Question/ 1. Is a safety management system (SMS) planned or implemented?

Comment 2. What is the basis of the SMS (IAEA Requirements, other criteria)?

3. Is the implementation of a SMS voluntary or obligatory? (Does the regulator require the implementation of the SMS? If yes, how detailed are the requirements for the contents of the SMS?)

4. How is the SMS assessed and approved? (Does the regulatory body check whether the appropriate processes are implemented or available in the SMS? Does the regulatory body check whether and to which extent the applicable criteria for a safety management system are fulfilled? Is the authority entitled to inspect the results of the SMS assessment and if so, to which extent?)

5. How is an external review process performed?

6. What are the key elements of an SMS? (Indicators, Integrated or stand alone system, Continuous improvement and treatment of deviations (Are there regulations how to handle deviations from the specified process?); Participation on benchmarks exercises of licensees

Answer 1. A SMS is implemented

2. The SMS is taking into account the safety culture concept as stated in IAEA –INSAG-4 . It complies with the IAEA Safety Requirements GS-R-3. It has been developed in order to be compatible with the quality assurance requirements from the Belgian Regulations, US 10CFR50 appendix B and the ASME NQA/1.

3. Although originally implemented on a voluntary basis by the Belgian Licensee, the implementation of a SMS is now required by the Belgian Nuclear Safety Authorities as being an essential part of the nuclear power plants safe operation. The regulatory basis for this requirement will be introduced with the implementation of the WENRA RHWG reference levels into the Belgian regulations.

4. The SMS was approved by the AIO in the framework of changes made by the Licensee to its organisation. In accordance with the change management process, this organisation was discussed before implementation with AIO and is described in the Safety Analysis Report. The performances of the management activities are monitored both by internal audits and inspections performed by the

Licensee and by the AIO through its regular and specific inspections activities. On request of the AIO or the FANC, internal assessments of the SMS can be submitted and discussed.

5. In addition to the external review performed by the AIO, the licensee requests WANO peer reviews on a periodic basis. The Tihange Nuclear Power Plant hosted recently an OSART mission and a similar mission is foreseen for the Doel Nuclear Power Plant.

6. The key elements include the general policy of the management, the strong support by the upper management level, on site involvement and oversight of the management at all levels, the improvement plans to carry out and follow-up the continuous improvement process, efficient and effective monitoring systems (including benchmarking with peers), the responsibilities and commitment of personnel at all levels to implement the SMS. As mentioned under item 2, there are presently no Belgian Regulations in this area.

Q.No 38	Article Article 10	Ref. in National Report
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Question/ Comment Is the principle of priority to safety laid down explicitly in any binding national law or is this principle met by a sum of regulatory requirements?

Answer This principle is stated in the safety analysis report. The SAR is annexed to the royal decree of authorisation, and consequently is a legally binding requirement.
Nevertheless, the SAR is not a public document. In the frame of the WENRA harmonisation initiative, such requirement will be published (issue A : Safety Policy) in the regulation.

Q.No 39	Article Article 10	Ref. in National Report
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Question/ Comment How the regulatory body does perform its own evaluation? Are there any specific indicators used?

Answer In the near future, as a result of the reorganisation of the Agency and the preparation to the ISO-9001 certification, a permanent intern audit team will regularly and formally evaluate all key processes (including the evaluation process itself) , using performance indicators.
AVN performs their own evaluation using Performance Indicators derived from the MACRE indicators.

Q.No 40	Article Article 10	Ref. in National Report
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Question/ Comment Could you please provide information on the measures taken to increase the reporting of low level events, including near-misses, to allow for their trending and analysis? How many such events are reported within licensees' organisations on an average, per year?

Answer A specific OEF programme has been implemented that aims at identifying possible tendencies towards degraded safety performance.

Several root cause analysis methodologies are applied:

- the ASSET methodology,
- a predefined root cause tree,
- event and causal factor chart combined with change analysis and barrier analysis techniques,
- a specific human factors investigation tool.

At the moment, not all the methods are applied by both sites, but it is foreseen that both sites of the operating organisation will apply all available methods.

The reporting of low-level events is encouraged by the Human Performance policy and the will of transparency. Experience Forms (FE) are established for each event, and analysed depending on the importance of the event (up to accident report). The Experience Feedback Section performs statistics. About 750 FE were established in 2006 on the Tihange site.

Q.No 41	Article Article 10	Ref. in National Report P. 69
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Question/ Belgium constantly assess the level of safety of our activities.

Comment Which methods are used to assess level of safety of the activities?

Answer Please see answer to question 39.

Q.No 42	Article Article 10	Ref. in National Report
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Question/ Are contracted organizations trained on the safety policy principles discussed in II.F.1? (Discussion in II.H.2 could be interpreted as covering this, but the terminology is different.)

Answer The section II.F.1 deals with the selection of the Contracting organizations. It means that, for example that Electrabel audits the Quality assurance programme of the contractor. Training for workers of the contractors is described in section II.H.2)

Q.No 43	Article Article 11.1	Ref. in National Report II.G.1, p.74
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Question/ Both the operator (Electrabel) and the architect- engineer (Tractebel) are owned by the Suez group.

Comment

Are there any special organizational measures to guarantee the independence of the internal safety reviews, since both operator and engineering/analyses departments are in one company ?

Answer Although the operator and the architect-engineer are member of the same group, the internal safety review of modifications developed and engineered by the Engineer is performed by a committee of experts of which no employee of Tractebel Engineering is a member.

Furthermore, all modifications are subject to preliminary approval by the AIO, before they are implemented in the installations of the NPP.

Q.No	Article	Ref. in National Report
44	Article 11.1	II.G.2, p.74

Question/ Major safety improvements to NPPs implemented during the periodic safety reviews are financed through annual provisions.
 Comment Replacements aimed at availability and (non-nuclear) safety, are financed through investments and depreciation.

Phase-out as required by Law of 2003, may lead to future reduction of annual investments in equipment and human resources. Are the annual provisions of 1/10 each year sufficient and assured by some regulatory requirement, even incase unexpected replacements/upgradings are needed?

Answer When adopting the phase-out law, the Belgian Government stressed on the importance to keep an adequate safety level. In the Belgian regulation, the Safety Authority (namely via art. 13 of the GRR-2001) has the possibility to impose at any time new additional “Exploitation conditions”, including all appropriate safety improvement to the licensee. In addition, the licence (Royal Decree) of authorization specifies that any “special safety evaluations” should be conducted at any moment on request of the Authorities”. The annual provision is thus not a limiting envelope.

Q.No	Article	Ref. in National Report
45	Article 11.1	

Question/ The report indicates that great care is given to master the knowledge in the nuclear domain, specifically for the design basis of the Comment plants. How is the underlying technical basis of the plant designs documented and maintained?

Answer The technical basis of the plant design bases is maintained and updated as necessary through several processes:

- PSR: the safety related items considered during the periodic safety review process contribute to the maintenance of the technical design basis of the plant.
- Change process: this process provides at several phases for technical review and compatibility checks that allow to maintain and to updatedas necessary the technical basis of the plant design.
- Updating of the FSAR: As required by the Decree of Authorisation for each Nuclear Power Plant, and in addition to design specifications and other technical documents, the SAR has to be updated on a permanent basis, maintaining safety related information up to date.

Q.No	Article	Ref. in National Report
46	Article 11.1	

Question/ With regard to the required two weeks training on a full-scope simulator every two years (II.G.4):

Comment • Is proficiency determined by individual or shift or both?

- Is simulator training focused on normal operation or response to abnormal conditions or both?
- Have two weeks every two years been sufficient to maintain licensed operator proficiency?

Answer As stated in the FSAR, the proficiency is verified both on individual and on shift basis. The simulator training is mostly focused on incident and accident conditions and somewhat less on normal operating conditions. The programme of the training on a full scope simulator is thus organised that, on a two-year schedule, the most important scenarios are covered. In this way, it can be considered as being satisfactory.

Q.No	Article	Ref. in National Report
47	Article 11.2	p. 75

Question/ Could Belgium provide more details on measures taken to avoid a loss of competencies due to retirements?

Comment

Answer AVN has established a system for knowledge transfer, a hiring policy and a coaching practice. The documentation is now managed with the help of an electronic management system.
Electrabel has put in place a system to identify on a yearly basis critical competencies present with all personnel older than 55 years. This system enables management to set up development program in order to organise the retention of these competencies through the recruitment of new staff, specific training, documentation transfer and archiving of information.

Q.No	Article	Ref. in National Report
48	Article 11.2	p. 76, §II.G.4

Question/ The report states that “This qualification is reviewed every two years or, if a licensed person has ceased during four months or more performing the function for which he/she was qualified. It is renewed conditional to, among other, a favourable advice of the Assessment Committee on the basis of the individual’s training and activity file.” Could Belgium give more information about what is the meaning and content of the “activity file” used by the Assessment Committee for qualification renewal ? In particular, does it mean that the activity file describes which activities have been performed by the licensed person ? Could Belgium precise if competencies are assessed on the basis of observations systematically made on the field by the management ?

Answer The qualification of operating personnel is based on US practice. For each concerned staff member an activity file is requested. This file contains all activities performed by the operating personnel related to the plant operation (e.g. review of operations procedures, or operational documents, drafting or review of operational event analysis, participation to specific plant operation such as transients, ...). Competencies of operating personnel are followed-up and assessed by the operation managers. The result of the global assessment is available in the file submitted to the Assessment Committee.

Q.No 49	Article Article 11.2	Ref. in National Report p. 76, § II.G.4.
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Question/ Comment The report states that “For all the personnel of the plant, there are training and retraining plans which are adapted according to the missions of the personnel”. Regarding the licensed personnel, how are the competencies required for performing activities defined as regards safety? How are these competencies identified and assessed by managers in order to provide appropriate training and retraining programs ?

Answer The framework of minimal training and retraining activities is described in the SAR. The annual training program is established in compliance with those requirements and takes into account for specific training needs identified either during simulator training or during operation of the plant. Operation managers are trained and certified as Licensed Operators making them fully aware of the necessary skills and competences expected from the licensed operators.

Q.No 50	Article Article 11.2	Ref. in National Report p. 77
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Question/ Comment Could Belgium explain how the potential impact of a modification on operating or maintenance activities is identified and considered at the very beginning of the modification project ?

Answer The modification process includes verifications at several phases, managed by the Engineering Support department, the Modification Committee (CMOD) and the Plant Operations Review Committee (PORC), to evaluate the impact on operation and maintenance activities as well as to other aspects such as nuclear safety, radioprotection, releases to the environment, etc. The CMOD is managed by a representative from the Engineering Support department and includes members from the Operation department, Maintenance department, Care department and Nuclear Fuel. A given modification is examined by the CMOD at the different stages of the modification process, from the first initial modification proposal to its closure before archiving the corresponding documentation.

Q.No 51	Article Article 11.2	Ref. in National Report II.G.4, pp.75, 76
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Question/ Comment Training, qualification and certification of personnel are described in the SAR of the NPP. At the Tihange site there exists an intensive training programme for contractors' personnel. Successful completion of this training is mandatory to obtain a working permit for that site.

Are there no general (national) requirements for training, qualification and certification of nuclear personnel, independent to what is written in the NPP specific SARs? Since the situation is that Tihange has a training programme for contractors' personnel and Doel does not have such a programme?

Answer Such requirement will be legally implemented in the Belgian regulation and on the field in the frame of the WENRA harmonisation

initiative. At present both nuclear sites have training programmes for contractor personnel.

Q.No	Article	Ref. in National Report
52	Article 11.2	II.G.5

Question/ Comment NUC 21+ Organization: The organization of the Operator has established the Electrabel Corporate Nuclear Safety Department for independent control of the nuclear safety and full responsibility of the health physics departments at both NPP sites.

1. This reorganization would probably result in fewer personnel. Is there some guarantee that sufficient staff will be available in the future?

2. What are the requirements in Belgium for the demonstration of a sufficient/adequate number of qualified staff to fulfill all nuclear safety duties during the operational phase? Does the regulatory body require the licensee to report about this regularly?

Answer 1. The NUC 21+ organization provided for more personnel than the previous one. The departments on the sites were reinforced in personnel. In addition, extra people were foreseen in order to cope with the potential rotation and retirement of plant personnel. The additional ECNSD department was created without any suppression of positions on the sites.
2. For all safety related positions, AVN has agreed with the utility the minimum number of qualified staff (engineering level) and these values are indicated in the FSAR, chapter 13. The resource issue is regularly discussed with the different department heads during inspections activities.

Q.No	Article	Ref. in National Report
53	Article 11.2	P. 76

Question/ Comment Art.11.2 (II.G.4)/p.76

The training programs are defined in the Safety Analysis Report, which includes a "function – program" correlation chart.

When developing training programs were Systematical Approach to Training principles including Job and Task Analyzes considered?

Answer The training programs were originally not developed by use of the Systematic Approach to Training principles. Although not yet fully implemented, the training programs are now being improved by use of SAT.

Q.No	Article	Ref. in National Report
54	Article 11.2	General

Question/ Comment With the resurgence of nuclear power worldwide, which could result in competition for experienced human resources (both locally within your country and internationally) what strategies/steps are being taken in your country by both the regulatory body and the operators to ensure that sufficient numbers of qualified staff remain available for all safety-related activities in or for each nuclear installation, throughout its life.

Answer AVN tries to hire motivated engineers and physicists, it promotes the company through personal contacts, e.g. at universities, through its website where open positions are advertised.

Electrabel and Tractebel Engineering have within the framework of the SUEZ Group established a major campaign to attract new engineers for its current nuclear activities as well for the upcoming projects. This recruitment program is focused on junior staff that are consequently enrolled in a training program of up to 18 months, taking both theoretical as well as practical aspects into account. Senior engineers are recruited by the individual companies to fulfil specific technical and operational needs. Geographically, the recruiting efforts are limited to Belgium and France.

Q.No	Article	Ref. in National Report
55	Article 11.2	Page 74

Question/ Comment The report says that about 1600 Electrabel staff work in the 7 nuclear power units, meaning that each is operated on average by about 230 operating members of staff. Engineering support is provided in addition by Tractebel Engineering staff. Could Belgium please provide an estimate of the number of full-time-equivalent Tractebel Engineering staff are required to support the 7 operating nuclear power units?

Answer The support provided by Tractebel Engineering to Electrabel for the operation of the 7 nuclear units amounts to some 275 full-time-equivalent (250 of whom are “technical” support).

Q.No	Article	Ref. in National Report
56	Article 12	ii.H.1

Question/ Human factors:

Comment Please describe the dependency on computer systems for the execution of ERGs, ORGs, FRGs and Critical Function Status Trees? If digital systems are applied for these procedures, how is the availability of the systems assured? Please describe the required level of training in case of unavailability of those computer systems.

Does the safety design comply with the 30-minutes rule? For which postulated initiating events the operators cannot apply the 30-minutes rule? What makes the operator’s procedures applicable for executable human intervention in time frames shorter than 30 minutes?

Is there any system to prioritize in a sudden abundance of signals and alarms?

Please provide a view on the use of digital instrumentation and its relevance for safety related systems. (control of the plant, reactor protection or only process presentation and diagnostics, etc.)

Answer The use of computer systems for the execution of accident management procedure is not applied. The safety design complies in

principle with the 30' rule. An exception is a possible intervention on auxiliary feedwater flow, in order to control the steam generator level, especially in case of steam generator tube rupture accident. This type of scenario is regularly trained on the full scope simulator facilities in order to improve and maintain operators' capability.

As shown during full scope simulator training, the sudden abundance of signals does not create insurmountable problems for the plant operators. Digital applications in reactor protection system and reactor emergency core cooling are not very extensive. Examples are part of reactor protection of Doel 1/2 and Tihange 1, undercooling measurement (Tihange).

Q.No *	Article Article 12	Ref. in National Report Section II.H.2, Page 80
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Question/ Comment Kindly provide some information about the accidental operation procedures used on the full-scope simulator.

Answer The accidental procedures used on the full-scope simulators are those established, for example, in accordance with the Emergency Response Guidelines from the WOG.

Q.No 57	Article Article 12	Ref. in National Report P. 82
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Question/ Comment An internal Experience Feedback Programme - How is internal feedback encouraged?

Answer AVN performs a national and international experience feedback system. It is managed by the corresponding process owner. Results are communicated to the licensee. The inspectors regularly inspect the experience feedback system of the licensee. All operating staff of the NPP are encouraged to complete, at the occurrence of an interesting event, an event report indicating the nature, the causes and the consequences of the event. This event report is then analysed, in function of its relevance, on different levels of the organisation.

Q.No 58	Article Article 12	Ref. in National Report Section II.H.1 Page 80
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Question/ Comment Good Practice: Independent usage of ORG event-based procedures by operators and FRG symptom-based procedures by the Shift Technical Advisor

Answer

Q.No 59	Article Article 12	Ref. in National Report Section II.H.2 Page 80
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Question/ Comment What are the requirements for an operator licence and what is the periodicity of medical and psychological examinations of licensed operators?

Answer The requirements are similar to the ones used by the USNRC, except that an examination on simulator is not performed by the regulator: the instructors perform this evaluation. There is a six-monthly medical examination. The medical and psychological examinations are required in the FSAR. In the medical examination, the administered tests and examinations are adapted by qualified doctors taking into account the specific conditions and risks that the licensed operators are confronted with.

Q.No 60	Article Article 13	Ref. in National Report p. 84, § II.I
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Question/ Comment The report states that “The responsibility for applying the quality assurance programme is assumed by the operator who subcontracts the related tasks to his Architect-Engineer during the design and construction phases of the power stations, up to and including their start-up tests”. Could Belgium give more details on the role of the Architect-Engineer during the design and construction phases of the new power stations? How is the responsibility for applying the quality assurance programme assumed in manufacturing safety related equipment?

Answer Belgium has currently no plans for the design and construction of new power stations on the Belgian territory. As defined in the FSAR, the Operator has final responsibility of all Quality Assurance Aspects related to its installations. However, in the framework of the partnership between the Operator and the Architect Engineer, the Operator has delegated some aspects of the operational activities related to the QA programme to the Architect-Engineer. Nevertheless, the Operator has put in place a surveillance system by using audits, etc. to verify the correct implementation of its complete Quality Assurance Programme.

Q.No 61	Article Article 13	Ref. in National Report page 86 (II I 2 d)
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Question/ Comment The paragraph implies that the quality management supports the safety management. What are the regulatory requirements on the safety management systems? How is IAEA GS-R-3 taken into account (only INSAG 13 is mentioned)? How are QM processes integrated into the nuclear safety management?

Answer Please note that IAEA GS-R-3 is mentioned on page 84. As explained in the answers given to question 37, the safety management system of the licensee complies with the IAEA GS-R-3 and fully integrates the quality management. The feedback coming from the processes are used in the safety management activities: plant operations review committee, site operations review committee, feedback from audits to management, self assessments. In the frame of the WENRA harmonisation initiative (WENRA issue C : Management system), future regulatory requirements based on both IAEA GS-R-3 and INSAG 13 will be enforced in the regulation before end 2010.

Q.No 62	Article Article 13	Ref. in National Report page 87 (II I 2 d)
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Question/ In the figure on page 87 the interfaces between three different management systems are shown. How are potentially conflicting goals Comment of these management systems dealt with?

Answer As mentioned under II.F.1, nuclear safety is the overriding priority. To prevent conflicts, the general objectives set to the organization are integrated in global strategies taking into account for all aspects. The fulfillment of these objectives is followed up during monthly management reviews that allow identifying potential conflicts. Several committees such as the Plant Operational Review Committee and the Site Operational Review Committee can also solve potential conflicts between given objectives in matter of nuclear safety, environment and industrial safety. The Independent Nuclear Safety Committee (INSC) performs a periodical assessment of the nuclear safety effectiveness.

Q.No 63	Article Article 13	Ref. in National Report pages 87 (II I 2 d)
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Question/ The operator has different management systems in place. To what extent does the authority regulate these systems and how does it Comment supervise the adequate decision making process?

Answer The management system of the licensee has been established to cover all issues (nuclear, environmental, health and safety) for which the operator wants to be certified and for which he aims at continuous improvement. The nuclear safety management system is incorporated in this management system and is described in the SAR, which is legally binding. Any modification of this system is to be approved by the Health Physics Department and by the AIO/FANC and the SAR is to be adapted accordingly. The AIO evaluates the operation of this management system on a continuous basis and discusses his findings with the plant management. As mentioned in the answers given to question 37, the Belgian regulations are being updated according to the WENRA RHWG reference levels.

Q.No 64	Article Article 13	Ref. in National Report
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Question/ Quality management system, Monitoring and assessment of safety performance:

Comment Are the bottom up and top down approach part of the HPES method, which can be used to analyze errors?

Answer The HPES method is based to a large degree on the use of the bottom-up approach. In the frame of this methodology, the analysis of incidents includes the examination of technical as well as human factors. For the evaluation of human factors, internal procedures have been developed, which are inspired to a large degree on international reference guides of the IAEA and WANO.

Q.No 65	Article Article 13	Ref. in National Report page 88
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Question/ Please provide more information on the Key Performance Indicators used by independent safety inspectors in the framework of QC2 Comment Quality Control Level.

Answer In their activity, QC2 inspectors use a large number of indicators, among which are included the indicators based on the Tier 1 and

Tier 2 indicators that have been defined the World Association of Nuclear Operators (WANO). Indicators that are especially relevant for nuclear safety are those related to the scrams, availability of safety systems,

Q.No	Article	Ref. in National Report
66	Article 13	

Question/ Comment Is the operator responsible for the quality assurance program of vendors and suppliers of equipment? Does AVN periodically inspect the operator's quality assurance program? Does AVN inspect the quality assurance program of vendors and suppliers?

Answer The licensee is responsible for the qualification of his subcontractors. This includes, where appropriate, the acceptance of the quality assurance system of the subcontractor.. AVN does not inspect the quality assurance programmes of subcontractors, this is done by the licensee, architect engineer or by the B&PV inspectorate. AVN monitors the qualification process performed by the licensee during inspection activities.

Q.No	Article	Ref. in National Report
67	Article 14.1	

Question/ Comment Do you have access to the results of large nuclear safety related experimental test programmes to study physical phenomena and to validate analysis models used in safety analysis? Does this access adequately cover your needs for experimental data in different areas, taking into account the current state of your nuclear programme?

Answer As recalled in the report, the national research "Centre for Nuclear Energy" was created early in the 50th. This centre has a long history in the research in the field of nuclear safety; the first European PWR reactor (BR3) being commissioned in this centre. This research centre has a broad international reputation and has build large experimental databases, with original experiments related, for example to:

- The use of MOX fuel in PWR reactors,
- The thermomechanical and neutronic behaviour of the nuclear fuel (at high burn-up)
- The evaluation of vessel fluency
- Core instrumentation & dosimetry
- Criticality safety experiments in the field of burnup credit
- Geological disposal of high-level waste
- ...

Many large international programmes were conducted with international partners: Japan, UK, Korea, Germany, France, ...

For the moment, this centre acts as pioneer in the decommissioning techniques of PWR reactors (BR3).

The code packages used for performing safety analyses under the responsibility of the licensee are subject to acceptance by AVN. This process includes the accessibility of the needed experimental results.

Tractebel Engineering, as engineering support, participates since many years in a number of international R&D programs. TE is active in several OECD/NEA Working Groups such as GAMMA for example and has participated in many of the OECD/NEA organised ISP's for PWR applications. TE also participates in several experimental programs on large facilities such as for example LOBI, ROSA, PKL, PMK-2, PANDA for the thermal-hydraulic experiments, BIP, MCCI, Fuel-PAKS, MASCA/CORTRAN, ISTP for severe accident phenomena and the Halden Reactor Project for fuel rod behavior. The decision to participate in an international experimental programme is each time based on the need for experimental data in support of the safety analyses that TE performs for the utility. TE is also active in the users groups of the neutronic, thermal-hydraulic and severe accident codes that it is using for safety analysis and participates in code-to-code international benchmark exercises to compare its results to other codes and/or other users. This vast and continuing program provides TE with the experimental data and the code development that it needs to validate the safety analyses it performs.

Q.No 68	Article Article 14.1	Ref. in National Report
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Question/ Comment Is there a requirement in your country to apply PRA methods to support periodic safety review, licensing of plant life extension or power upgrade, or licensing of new build?

Answer It is actually not a legal requirement to apply PRA methods to support PSR. The PRA requirement is actually in force for new installations or major modifications, with the same licensing procedure as new builds (See article 7 page 43 of the report). Plant life extension and building new power plants are prohibited by the nuclear phase-out law. Such requirements will be implemented in the national regulation in the frame of the WENRA initiative. In practice, however, a first full cycle of analysis, modelling and review of PSA of all operating plants has been completed in the framework of the previous Periodic Safety Review (PSR), and an extensive PSA update is ongoing in the framework of the current PSR.

Q.No 69	Article Article 14.1	Ref. in National Report P. 95, §II.J.2
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Question/ Comment Could Belgium provide more details about the use of PSA during periodic safety reviews: in particular were Probabilistic Safety Objectives set? Was the impact of modifications assessed? How was the decision for a modification made and how were Deterministic and Probabilistic approaches combined? (For example were the two approaches used in parallel, was the probabilistic approach used to set priorities?....)

Answer A first full cycle of analysis, modelling and review of PSA has been completed in the framework of the previous Periodic Safety Review (PSR), and an extensive PSA update is ongoing in the framework of the current PSR. There are no Probabilistic Safety Objectives set.

In general, the impact of the modifications was not explicitly assessed.

The use of PSA in the PSR consists of the systematic design re-evaluation of the nuclear installations. The main objective is to confirm the robustness of the deterministic design, to identify design or operational weaknesses (if any), and to address these weaknesses (if necessary).

The decision for a number of modifications was mostly taken as an early feedback during the development of the PSA.

The probabilistic approach was not used to set priorities within the current PSR.

Q.No	Article	Ref. in National Report
70	Article 14.1	II.J.2

Question/ Assessment and verification of safety:

Comment Were all proposals from periodic safety monitoring implemented? If not, which criteria were applied to make the selection ?

Answer All the agreed safety improvements are implemented. Their choice depends on the feasibility of the proposals compared to compensating measures, the operator's interest to develop further those systems (like training), which are beneficial for the operation and operational safety. There exist no explicit (quantitative) criteria, decisions are based on good engineering judgement. At present, the future periodic safety reviews are in the phase of preparation and Belgium will apply the IAEA NS-G-2-10, which includes an overall evaluation of safety. This systematic approach should provide for more objective evidence of the added value of each improvement.

For the ongoing PSR, so far all identified improvement measures following the safety monitoring have been implemented or are in the process of being implemented. There have been no restrictive selection criteria.

In the upcoming PSR cost-benefit criteria will be applied in order to select the appropriate measures for safety improvement.

Q.No	Article	Ref. in National Report
71	Article 14.1	

Question/ The report states that modifications that do not have an impact on safety are approved only by the Health Physics Department of the operator, without formal involvement of AVN. Is the regulator periodically made aware of these modifications? Does the regulatory verify (perhaps on a sampling basis) that the operators conclusions regarding these modifications are appropriate?

Answer Each proposal for modification to the installations is examined by the Health Physics Department of the operator, which makes a judgement whether the modification has a possible impact on safety. When the Health Physics Department proposes to classify the proposal as a "modification without impact on safety", this classification is announced to the authorized inspection organisation (AVN) which can verify the classification of the modification. If needed, the AIO can ask to reconsider the classification of the modification if it feels that a possible impact of safety has been overlooked.

In principle, this process ensures that the AIO is aware of all the ongoing modifications and can verify that every possible impact on

safety has been examined.

Q.No	Article	Ref. in National Report
72	Article 15	p. 101, §II.K.3.d

Question/ Comment Could Belgium specify what are the nuclide measured in the gaseous and liquid releases ? In particular, is the measure of tritium and carbon 14 performed? Is it a regulatory requirement?

Answer Requirements for measurements in the gaseous and liquid releases are defined in the Safety Report joined to the license, and not in the regulation itself.

Some radionuclides are to be accounted separately in the liquid releases, by measurements, like (for Tihange) : tritium, Na24, Cr51, Mn54, Co57, Co58, Fe59, Co60, Zn65, Zr95, Nb95, Mo99, Tc99m, Ru103, Ru106, Ag110m, Sb122, Te123m, Sb124, Sb125, I131, Cs134, Cs136, Cs137, Ba140, La140, Ce141, Ce144. For the gaseous releases, noble gases, iodine and aerosols are accounted separately, by measurement. Release of tritium is estimated, based on a model of evaporation of waters.

Tritium is reported for both gaseous and liquid release. Carbon 14 is not measured, although it is taken into account in the determination of radiological impacts of the release limits.

Q.No	Article	Ref. in National Report
73	Article 15	II.K.3.c , p.100

Question/ Comment The table of the Steam Generator Replacements represents convincingly the great importance of the experience feedback (accumulated in the period of 1993-2004). The duration and the collective doses decreased significantly. But the last column shows that the only injury occurred in Doel 2, during the last replacement activities (2004). Please detail the type of this injury (e.g. concerning conventional activities or radiological incident).

Answer The indicated injury was caused by a conventional activity performed by a contractor. There was no link to any radiological incident.

Q.No	Article	Ref. in National Report
74	Article 15	II.K.3.d , p.101

Question/ Comment Reading the two tables on page 101 and the explanatory text it is rather difficult to understand the concept of the determination/establishment of the release limits. The first table shows exposures being lower than $50+30=80 \text{ fY Sv/a}$ (in general), whereas the second table shows 210 fY Sv/a and 370 fY Sv/a (for critical groups of sites Tihange and Doel, respectively). What is the dose constraint for the nuclear power plant releases? Are there authorized limits for the different radionuclides?

Answer The first table refers to design values used for determining the release limits. These limits were determined on the basis of US guides 10 CFR 50 appendix I and 40CFR190. The first table refers to values per nuclear unit. The GRR-2001 introduced a) new limits of exposure for the public, b) a new definition of effective dosis and c) new conversion factor dosis/exposure factors, coming from the European directive 96/29. The GRR-2001 asked a radiological evaluation of existing limits in order to verify that old plant release

limits complied with the new dispositions. This is the evaluation presented in the second table, per nuclear site.

For summarizing: The doses constraints for the nuclear sites are the values given in the second table. The values are different for Tihange and Doel sites because exposure pathways differ significantly for the two sites.

In addition, the authorized discharge limits are categorized in different classes of radionuclides : rare gas, Iodine, beta-gamma aerosols, alpha emitters and Tritium, for both gaseous and liquid releases.

Q.No 75	Article Article 15	Ref. in National Report Chapter II.K.3.a Page 98/217
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Question/ Comment What operational interface exists between the Work force, ALARA Teams/Coordinators and Management at the power plants?

Answer During the preparation of an activity in the controlled area, a preliminary assessment of the collective dose is made by the workpreparator, under the supervision of his hierarchy. If the predicted collective dose is superior then 0.5 man.mSv, a comprehensive analysis is made by the ALARA coordinator (who is a member of the RP service) and the workpreparator. The coordinator will indicate certain measures to reduce exposure. If, however, the comprehensive analysis indicates that the collective dose would be superior to 25 man.mSv, a special request is to be granted by the management after submittal of a complete file on the dose reduction measures.

Q.No 76	Article Article 15	Ref. in National Report Chapter II.K.3.b Page 98/217
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Question/ Comment How does the mentioned procedure in the Report relate to Primary Oxygenation objective/procedure of PWR Plants?

Answer The procedure mentioned in this chapter is not only related to the oxygenation of the primary system but also includes a general strategy to dissolve corrosion products associated with a high flow rate filtration and demineralisation of primary water.

Q.No 77	Article Article 15	Ref. in National Report Chapter II.K.3.c Page 100/217
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Question/ Comment The Table at the bottom of the page provides data as far as Steam Generator replacements are concerned. Although valuable data in terms of collective doses are specified, a “spectrum” (roughly) of individual doses is not clear. Please provide data in this regard (could be valuable for South Africa).

Answer The spectrum of the individual doses is given in the following table :

Dose (mSv) Number of individuals

0 <= dose <= 0,01 : 474
 0,01 < dose <= 0,2 : 554
 0,2 < dose <= 0,4 : 172
 0,4 < dose <= 0,6 : 82
 0,6 < dose <= 0,8 : 54
 0,8 < dose <= 1 : 43
 1 < dose <= 2 : 85
 2 < dose <= 3 : 33
 3 < dose <= 4 : 2

Q.No	Article	Ref. in National Report
78	Article 15	General

Question/ Comment It would appear that solid radwaste generation and management at the plants are not addressed in detail. Please provide condensed detail in this regard, especially regulatory requirements both in design and operation including waste minimization/optimization and what strategies are included in this programme?

Answer Please see answer to question 106.

Q.No	Article	Ref. in National Report
79	Article 15	Page 98

Question/ Comment The report says that "...a set of additional protective actions [are taken] as soon as one of the following criteria is met: estimated collective dose higher than 0.5man.mSv..." Is this dose the estimated collective dose for a specified task, or for some unit of time, for example a day, week, month or year? Could Belgium please clarify the definition of collective dose which is referred to at this point in the report?

Answer Collective dose is to be understood as the cumulative dose for all personnel involved in a specified task and this for the complete duration of the work. No distinction is made between personnel of the operator and personnel of external contractors. When as a result of a preliminary dose analysis it is shown that the collective dose is superior than 0.5 man.mSv, a set of protective actions are taken including the detailed analysis and the use of radiation protection equipment.

Q.No	Article	Ref. in National Report
80	Article 15	Page 100

Question/ Could Belgium please clarify what is meant by the units "H.mSv" on the vertical axis of the graph at the top of the page? Is this

Comment intended to mean “person.mSv” or “man.mSv”, which are referred to at several points in the text? Do the figures shown in the graph for the yearly collective dose include doses to Tractebel Engineering staff and any other contractors working at the nuclear power plants?

Answer In the graph under reference, the term “H.mSv” should be read as man.mSv. These figures typically include all doses both by the staff of the NPP as by any third parties, like Tractebel Engineering and other contractors.

Q.No	Article	Ref. in National Report
81	Article 16.1	p. 104, §II.L.2.a.

Question/ Comment A Royal Decree defines three levels for the notification of emergencies. In addition, a fourth notification level (‘reflex’ level or NR) has been considered to cope with events with fast kinetics. Could Belgium give further information on the reasons why this complementary level was introduced?

Answer Taking into account the design of the installations and all built-in safety features, most accident scenarios that can be considered for Belgian nuclear installations foreseen evolutionary processes, providing enough time to gather the experts and decision makers at the Crisis centre, evaluate the situation and decide upon and implement the protective measures. However as events with fast kinetic can not be totally excluded; a new concept, the “reflex-phase” (NR/UR-levels) was introduced. The objective of the Reflex-phase is, for such events, which might lead within a short delay to a radiation exposure of the population above to an intervention guidance level, to implement conservative protective measures off-site waiting for the activation of the emergency cells and committees. The reflex-phase is therefore a transient phase that ends when the emergency response organisation (cells, committees...) becomes operational. The conservative protection measures implemented in this reflex-phase is limited to the warning and the sheltering of the population within a pre-defined (limited) zone

Q.No	Article	Ref. in National Report
82	Article 16.1	II.L.2.b

Question/ Comment The Royal decree of 17 October 2003 has defined emergency planning zones of 10 km (evacuation and sheltering) and 20 km (pre-distribution zone for iodine tablets). The FANC has also defined (Decision of 24 November 2003) intervention levels for sheltering, evacuation and administrating iodine prophylaxis.

Are these planning zones based on these intervention levels and if so what kind of reference accident scenario has been used to establish this relation?

Answer The emergency planning zones (EPZ) were initially based on US regulation and practices but adapted to the Belgian situation (double containment...). At that time, all EPZ for NPP sized 10 km (sheltering, evacuation and iodine prophylaxis). In 2000 in the frame of the stable iodine pre-distribution and information campaign, the EPZ associated with iodine prophylaxis was extended to 20 km taking into account feedback of the impact of Chernobyl accident. This feedback was later reflected in the revised guidance intervention

levels published in 2003. The RD of 17/10/2003 took into account the revised EPZ.

Q.No	Article	Ref. in National Report
83	Article 16.1	Chapter II.L.2.a, Page 105

Question/ Can you please define the protective action Keep listening?
Comment

Answer While people are sheltered, they are urged to listen to the radio or watch the TV broadcast for obtaining information about the evolution of the situation and official recommendations to be followed.

Q.No	Article	Ref. in National Report
84	Article 16.1	Chapter II.L.2.b, Page 105

Question/ What arrangements/criteria/ restrictions are in place for large scale evacuation of the 10 km zone especially for NPP close to densely populated regions?
Comment

Answer The evacuation of the population constitutes an exceptional measure and can be ordered only by the federal coordination committee. The province Governor coordinates the implementation of the necessary means for the evacuation and gathering, in accordance with the provincial emergency and intervention plan. Concrete implementation of the evacuation will be carried out in coordination with the concerned mayor(s). Actions to care about specific population groups (schools, prisons, hospitals ...) will be defined in the preparation of the evacuation plans. The arrangements and procedures for evacuation are defined in provincial emergency and intervention plans, considering that evacuation will have to be organized towards a gathering centre located outside of the planning zone. These plans cover the different phases of evacuation: preparation, transfer, gathering, contamination control, decontamination and medical and psychological care. Return back and follow-up however are not part of nuclear emergency plans.

The provincial emergency and intervention plan includes an inventory of the available transport means in the event of evacuation, and contains the following elements:

- the location of the gathering centres for the population in each sector of 30° within the emergency planning zone for evacuation (this must be communicated to the population in advance);
- a clear recognition sign for indicating already evacuated buildings to the first-aid workers and the persons in charge for the monitoring of the evacuation;
- traffic control plans worked out by the police forces, which will define the evacuation routes as well as the routes dedicated to rescue services;
- plans for controlling access to the evacuated zone and monitoring procedures for entries into the evacuation zone;

- plans organizing permanent and provisional gathering centres;
- plans to organize the supply and the medical care;
- procedures for urgent medical aid for first responders.

Evacuation will be decided based on the actual (delayed evacuation) or projected effective dose integrated over 7 days. The guideline set up by the FANC ranges from 50 mSv to 150 mSv.

People having a private vehicle will take care of their own transport. Those who have no private transport means and specific groups of the population (elderly people, school children, physically or mentally handicapped persons, patients in hospitals, or at home, prisoners...) will be moved using public and private vehicles requisitioned by the authorities.

In the case of a delayed evacuation, evacuees will be submitted to a contamination control, and possibly decontamination (including the decontamination of vehicles and belonging), in the gathering centres, before they could be moved to more permanent destinations. When needed, evacuees will benefit from a medical and psychological follow-up.

The warning of the population as for the implementation of the evacuation countermeasure will be ruled as for other remedial actions.

In case of delayed evacuation mainly, radioactivity control and decontamination will be organised. The results of measurements will decide the need for decontamination. Generally controls decontamination will be organised in the gathering centres but could also be envisaged at checkpoints. The people, likely to be contaminated but not going to a gathering centre will receive the necessary instructions at checkpoints when leaving the evacuation zone. This will enable them to apply themselves a series of decontamination measures.

Q.No	Article	Ref. in National Report
85	Article 16.1	Page 49 Chapter II.C.5, and II.L.2.c
Question/	What post accident arrangements are in place for NPPs in Belgium?	
Comment		
Answer	Each site has an on-site emergency plan established in close coordination with the off-site response plans. The post-accidental operation is based on both event-based and symptom-based procedures, following the Westinghouse approach (ERG) for all units except Tihange 1, which applies the Framatome approach. The on-site and off-site emergency plans focussed mainly on urgent phase (direct protective measures for the population, preventive actions on the food chain ...). However, the organisation set up in that urgent phase is also valid for post-accident management. In the phase, the actions and protective measures will be defined mainly based on radioactive measurements in the environment collected by the so-called measurement cell.	
Q.No	Article	Ref. in National Report

86	Article 16.1	Section II.L.2.a, page 104
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Question/ Is it planned to replace the existing classification of accidents N1 – N3 + NR with classification recommended by the IAEA in GS-R-Comment 2?

Answer No, it isn't. Globally speaking, the Belgian classification scheme could be (roughly) compared with the GS-R-2 scheme as follows: N1 / Alert/site area emergency, N2-N3-NR / General emergency.

Q.No	Article	Ref. in National Report
87	Article 16.2	P. 104

Question/ 16.L.2.a/104

Comment In case that an emergency situation is quickly developing (fast kinetics) and might lead within 4 hours to a radiation exposure of the population above to an intervention guidance level, immediate protective measures for the off-site population – without any assessment – are taken by the local authorities.

Are there any measurable values or criteria (guidelines) to determine this type of events (fast kinetics)?

Answer Fast kinetic scenarios that could lead within 4 hours to a radiation exposure of the population above to an intervention guidance level have been evaluated in advance in order to:

- select among the whole set of possible accident scenarios the relevant ones;
- define straightforward criteria allowing to quickly identify such situations; and
- estimate the size of the reflex zone.

For these beforehand defined scenarios immediate protective measures for the off-site population will be taken enforcing the implementation of the 'reflex' phase.

For NPP's the criteria are:

- (1) LB-LOCA in conjunction with total loss (failure) of ECCS
- (2) Total loss of the heat sink
- (3) Confirmation of real or potential impact of the integrity of a nuclear building (reactor building, ...) (plane crash,, ...)
- (4) Enveloping criterion expressed as stack release values

Q.No	Article	Ref. in National Report
88	Article 16.2	P. 109

Question/ 16.L.2.b/109

Comment For off-site radiological calculations, focusing on the urgent protective actions, the licensee has to implement a radiological evaluation model....In addition, in its emergency room, AVN uses simple user-friendly prediction tools elaborated on the basis of standard scenarios and/or pre-calculated standard releases.

What is the relation between the results calculated by the licensee and those obtained by the AVN? Are both treated equally or one

prevails over the other?

Answer There is no direct relation between obtained results as the objectives of the evaluations are different. The calculations of the radiological consequences of potential or actual radioactive releases are made by the licensee and, as a legal requirement, are part of the information needed by the evaluation cell. These results are used in the decision process for implementation of potential countermeasures. The evaluations made by AVN fulfil two main objectives: firstly, making simple and quick cross-checks to confirm the order of magnitude of the values obtained from the licensee; and secondly making rough estimations using other assumptions (if ...then ... else ... approach). It should also be noted that the evaluation cell could also, if needed, perform some calculations with other tools.

Experience with emergency exercises shows that, if significant differences between the two estimations occur that they are due to discrepancies in the assumptions taken into account to determine the source term.

Q.No	Article	Ref. in National Report
89	Article 16.2	Page 108

Question/ Comment The penultimate paragraph says that "...the stable iodine pre-distribution zones extend to 20 km around the nuclear plants." Are tablets pre-distributed to all households, schools, old peoples' homes and other institutions within the 20 km radius, or are they held at local centres in readiness for distribution in the event of an emergency involving the release of radioactive iodine?

Answer The first pre-distribution campaign was organised in 1999 in a zone of 10 km radius. An information sheet and voucher(s) for getting the stable iodine boxes from a local pharmacy were sent to all households and all communities (schools, enterprises, old peoples' homes...) based on the zip codes and thus exceeding the nominal radius. A second campaign based on the same mode was organised in 2001 in a zone extended up to 20 km around the nuclear sites. Stockpiles are available in the Mobile Units of the Civil Protection for rapid distribution to schools and day nurseries (children communities) in the zone between 20 and 30 km and a national stockpile (about 2 000 000 adult equivalent doses) is kept in Brussels.

By law, each pharmacy (about 1 per 1700 inhabitants) must have 500 g KI powder and/or other products containing stable iodine (3800 adult equivalent doses). Moreover each pharmacy within the 0 20 km zones has a stockpile 960 boxes of KI tablets (or 4800 adult equivalent doses).

Q.No	Article	Ref. in National Report
90	Article 17.1	p. 114, §II.M.2.

Question/ Comment In Japan, the Niigata earthquake showed accelerations 2.5 higher than those taken into account in the design of the Kashiwazaki-Kariwa NPP. What is the position of Belgium regarding a seismic review of the Belgian NPPs further to the earthquake occurred in Liège on 8th November 1983?

Answer The earthquake in Liège in 1983 was already taken into account to upgrade the seismic loading for the Tihange 2 and 3 plants. Tihange

1 was upgraded during the first PSR (see national report on page 154). At that time, the peak ground acceleration (SSE) was increased from 0.1 g to 0.17 g. No seismic upgrade was deemed necessary for the Doel site.

The seismic loading of the Belgian nuclear sites will be further investigated in the future periodic safety reviews. At this moment, there is no direct concern, as all these sites are situated in a low to moderate seismically active region, as indicated in the Eurocode 8.

Q.No	Article	Ref. in National Report
91	Article 17.1	P. 113

Question/ Art. 17/II.M.1/p. 113

Comment These ultimate emergency systems are called “bunkerised systems” as they are installed in specifically reinforced buildings. Are spent nuclear fuel storage facilities (e.g. pool) also part of “bunkerised system”?

Answer These spent fuel storage facilities are installed in specifically reinforced buildings.

Q.No	Article	Ref. in National Report
92	Article 18.1	

Question/ What is your national policy concerning need for Severe Accident Management (SAM) procedures or back-fitting measures at operating facilities, aiming to protect the reactor containment integrity after a possible severe core damage? Are SAM procedures in place at the operating nuclear power plants? Has back-fitting been completed that addresses all physical phenomena, which might endanger containment integrity?

Answer Severe Accident Management Guidelines (SAMG) have been implemented in all Belgian Nuclear Power Plants. Before the development and implementation of SAMG’s, PSA level 2 results and specific severe accident analysis have been performed to develop severe accident strategies. Moreover hardware modifications have also been introduced to cope with the management of accidents: Passive Autocatalytic Recombiners (PAR’s) to reduce the risk of hydrogen explosion that may endanger the containment integrity; reactor cavity flooding feasibility study to enhance the cooling of corium outside the vessel (if vessel failure had to occur), preventing both basemat melt-through and continued containment pressurization.

Q.No	Article	Ref. in National Report
93	Article 18.1	P. 115, §II.N.1

Question/ As stated at p.26 of the report, Belgium did not develop national nuclear safety regulations, but instead adopted the American regulations. Accordingly, the whole design and safety analysis of Belgian NPPs have been done applying the US rules and all the associated documentation (regulatory guides, standard review plans, ASME Code, IEEE standards, ANSI, ANS, etc.) in order to ensure a consistent approach. Could Belgium provide comments on this experience, positive and negative aspects recognized in adopting the nuclear safety regulation of the “designer” country?

Answer The Belgian experience is rather positive. Belgium has recognised very early that it was better to use a well-developed regulatory

system than develop one of its own. The implementation of the American rules has required some modifications, like defining equivalence between American and European materials, without any major problem.

Q.No	Article	Ref. in National Report
94	Article 18.1	p. 115, §II.N.1

Question/ Comment Based on the Belgian experience of constructing and operating units from different designers at the same site, could Belgium provide comments on the positive/ negative impact on safety? Especially, were positive diversity effects evidenced?

Answer Although the Belgian units were based on Westinghouse and Framatome design, many design activities for systems outside the primary system were performed by Belgian architect engineers.
From the licensee's point of view, the following advantages and disadvantages can be discerned:

- disadvantages:
 - o although close in design (PWR of W origin), the training of staff (operators, maintenance staff members, etc.) must be adapted to the unit, taking into account the various differences, not only in the properties of the NSSS, but also in auxiliary systems and equipment,
 - o standardisation is less extensive; maintenance must be adapted to the particular unit,
- advantages:
 - o the philosophy of the various manufacturers is accessible (for example through the FROG and the PWROG) and encourages contemplation (e.g.: different approach concerning accidental procedures),
 - o this produces greater independence vis-à-vis reactor designers and makes it possible to capitalise better on technological and financial opportunities alike.

However, the fact that American regulations form the foundation of the regulations applicable to all units must be taken into account: this also makes it possible to compare the approaches of the reactor designers with the conformity to the regulations.

Q.No	Article	Ref. in National Report
95	Article 18.1	II.N.1, II.N.4

Question/ Design & Construction:

Comment 1. Is an area fire from aircraft fuel also considered for the postulated aircraft crash ?

2. ASME III defines a set of 5 load cases / load combinations. Later on added postulated (external) events may have led to new ASME analyses. Was there an integral check against the prevailing ASME Codes and if so did this result into design modifications?

Answer 1. Yes. This is one of the required external events that had to be taken into account for the design of the Doel3/4 – Tihange 2/3 plants.
2. The taking into account of the external accidents does not result in design modifications of ASME components, essentially due to the fact that those components are already qualified to the safe shutdown earthquake which has a frequency content nearer to that of

the ASME components than the external accidents.

Q.No	Article	Ref. in National Report
96	Article 18.1	Page 115-116 Section II.N.1.

Question/ Comment South Africa is faced with a similar situation with the licensing of the PBMR. A copy of the transposition of the ASME code (or where to access it) would be appreciated.

The Belgium Pressure Vessel Regulations have been replaced by the US rules (ASME III, etc.). The administrative rules of ASME might not be directly applicable in Belgium.

- How were these aspects compensated for in the Belgium legal environment?
- What is the role of FANC/AVN in this process?
- What additional requirements are in place to fill the gaps identified?

Answer A copy of the Transposition needs to be asked to the Operator. The application of the ASME III code needed to be approved and a derogation from the Belgian legislation has been obtained. The derogation was discussed between the Boiler and Pressure Vessel inspectorate Vinçotte but AVN was fully informed about the content. FANC (at that time the 2 Ministries of Labour and Health) were fully involved.

Q.No	Article	Ref. in National Report
97	Article 18.1	Page 119 Section II.N.5

Question/ Comment What is the role and involvement of the Regulator (FANC) and AVN during the manufacturing of components and parts of important safety components?

Answer The FANC and AVN do not intervene in the construction of pressure retaining systems and supports, as this is done by the B&PV (Boiler and Pressure Vessel) inspectorate. For I&C and electrical systems, AVN intervenes in the qualification process, like witnessing of seismic tests.

Q.No	Article	Ref. in National Report
98	Article 18.2	

Question/ Comment Have you met specific problems to find spare parts or replacement components properly qualified to a high safety class, as needed for plant lifetime management? If yes, how have you addressed the problem?

Answer One of the main issues is I&C, where replacements have been made or will be made, by using programmable logic.

The utility addresses the problem in several manners:

- To first try to be informed of that problem by periodically auditing the suppliers in technical and quality system areas.

In the event of obsolescence or refusal of the supplier to continue to manufacture the qualified product, on a case-by-case basis, the

utility chooses one of the following possibilities:

- Use of a replacement equipment qualified for another NPP, after transposition on the Belgian level of the qualification. This is only possible if the qualification file is available.
- Extension of the qualified life of equipment, which is close to the end of its life, by means of analyses, calculations or additional tests.

Qualification under the utility's supervision of substitute equipment which is considered to be qualifiable.

Q.No	Article	Ref. in National Report
99	Article 18.3	Chapter II.N.6, page 119

Question/ Comment In Chapter II.N.6 (page 119) it is mentioned that “The instrumentation used for post-accidental operation was identified more clearly, and the notion of SPDS (Safety Parameter Display System) was implemented in the control room (or in a room adjacent to it).”

According to NUREG 0737 “Critical safety function displays should be readable from the workstations of users needing access to these displays” and “The displays should be accessible to the following personnel, although not necessarily at the same time: shift supervisor, senior reactor operator, reactor operator, and shift technical advisor”.

1. Could you please comment on the cases where the SPDS was implemented in a room adjacent to the control room regarding the accessibility of the information by the plant personnel mentioned above?
2. How is the view on the future use of the SPDS? Will it be supported by an IPSO screen which only specifically and by prioritization shows the safety systems from which operation is required ?

Answer 1. As mentioned in the NUREG-0737, "Each operating reactor shall be provided with a Safety Parameter Display System that is located convenient to the control room operators." As explained in the report, the control room and its ergonomics were reassessed. Each unit has a different control room layout. Depending on the specific control room, the SPDS information was either located in the control room itself or in a room directly adjacent to it. This location was accepted by the Belgian safety authorities as being an appropriate response to the requirements of NUREG-0737, taking into consideration the improved ergonomics and available information in the main control room.

2. As the SPDS is concerned, there are presently no modifications foreseen for this system.

Q.No	Article	Ref. in National Report
*	Article 19.4	Section II.0.4, Page 121

Question/ Comment The Emergency Operating Procedures (EOPs), Probabilistic Safety Assessment (PSA) Severe Accident Management Guidelines (SAMGs) have not been subjected to any review mission like RAMP IPSART etc. Kindly indicate how Belgian utilities ensure compliance of these documents with international standards?

Answer All accident management procedures are based on generic EOP packages developed by international working groups such as the FROG or the WOG, ensuring compliance with the international standards in this area. The plant specific procedures are developed by the utility and they are verified on the training simulators for further checking and improvement where necessary. AVN verifies particular EOPs as well and verifies if they correspond to international practices.

The utility has implemented a procedure for establishment and updating of EOPs. The EOPs are regularly reviewed on the basis of simulator experience, plant modifications, suggestions for improvement by the FROG or WOG.

The PSAs are performed by use of internationally recognized software programs such as "RiskSpectrum". The development of the PSAs was closely followed up by AVN, which is an active member of the OECD WGRISK. Extensive benchmarking was performed with other PSAs such as those made in France, Korea and in South Africa for similar nuclear power plants.

The review of the needed SAMG package was performed also by AVN. A validation exercise, covering all needed scenarios was and implemented, using a validated code and tabletop exercises, focusing on completeness, correctness and proper use by the operational teams.

Q.No	Article	Ref. in National Report
100	Article 19.7	

Question/ Chapter II.O.6, "Notification of significant Incident" does not give any details on events that have taken place or it does not state that anything significant has not taken place. It only provides administrative description. Could you kindly provide some information by using some performance indicators describing some trends.

Answer A rather extensive report has been produced by AVN in the framework of the OECD. Unplanned scrams, collective dose, gaseous effluents show very clear decreases over the years. Liquid releases are less subject to trend but are at the same time very much below discharge limits.

Q.No	Article	Ref. in National Report
101	Article 19.7	

Question/ Please explain the principles or criteria applied by the regulator and operator for screening other experience than incidents (e.g., management issues, unexpected degradation, design weaknesses, external hazards not considered earlier), for the purpose of ensuring adequate sharing of important experience with international interested parties (regulatory bodies, operators, designers, international bodies). Identify the relevant guide documents, if any, used for the screening.

Answer AVN does a screening by good engineering judgement, basically by evaluating which experiences could be beneficial to the international community. This is discussed during meetings in OCDE or IAEA.

Electrabel does a screening of the important events at its plants. When an event is deemed to be sufficiently important and relevant for other operators, information is transmitted to WANO (World Association of Nuclear Operators), which is in charge of further dissemination throughout the nuclear community. Low level events such as near misses are also collected and lessons learned from

these events are derived by use of the so-called "yellow-sticky" approach.

Q.No	Article	Ref. in National Report
102	Article 19.7	

Question/ Comment Please explain how the regulatory body ensures or verifies that the operators are informed and properly analyse the operating experiences reported through the well established international channels (e.g., WANO, IRS), and that they address the lessons learned by taking proper actions.

Answer The AIO analyses the international operational experience feedback data, which are officially available and sends a quarterly report to the utility for information. In case of events that present lessons learned which can be important for the Belgian units, the AIO sends a letter to the utility with the request to investigate these events and report on the possible safety improvement measures. The AIO proposes to establish IRS reports for national events, which are important to be known by the international nuclear community. The AIO inspects regularly the experience feedback system of the licensee and compares the results with its own evaluations where possible.

Q.No	Article	Ref. in National Report
103	Article 19.7	

Question/ Comment Please explain your national policy and practice of sending feedback reports to the international interested parties on actions that have been taken in your country as response to significant events reported through international channels (e.g., WANO, IRS).

Answer The national operating experience collected by AVN is screened by the IRS coordinator in order to select events which could be of interest for other countries. The corresponding IRS reports are established by AVN experts and/or plant inspectors and submitted to the licensee for potential comments. After final check by the IRS coordinator, the reports are sent to the IAEA. The licensee is reporting to WANO in accordance with the WANO reporting guidance. No specific national policy requires for sending feedback reports on corrective actions taken in response to significant events to international organizations. In some specific cases, such as for the Barsebäck or the Forsmark event, this information is shared with the international community by presentations made during ad-hoc conferences or during WGOE and IRS coordinators meetings.

Q.No	Article	Ref. in National Report
104	Article 19.7	p. 123, §II.O.7 - II.O.8

Question/ Comment Could Belgium give examples of improvements resulting from the international OEF analysis?

Answer Some USNRC GLs have triggered serious investigations, e.g. thermal binding, overpressurisation of isolated piping parts, selective protection signals for the battery chargers and inverters.

Q.No	Article	Ref. in National Report
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105 Article 19.7

Question/ Comment 1. Which are the screening criteria for the internal and external experiences to be considered? (Are audits and reviews performed by external experts for controlling the effectiveness of OEF? Which procedures, committees etc. are established for the review and exchange of operating experience at the plant operator level and the supervisory level?)
2. How is the implementation of lessons learned from operational experience monitored?
3. How are operating experiences handled that are below the statutory reporting threshold?

Answer An AVN procedure is available to guide the examination of foreign events. These do not contain detailed criteria, the decisions are made by senior staff with a thorough knowledge of the Belgian units. The reports resulting from that evaluation are sent to the licensees for information and possible use. In case that AVN would require a formal follow-up, a letter is addressed to the nuclear sites with the request to take action and to report the results. Separate files and a summary template are filled by nominated experts (not the unit inspector) in charge, up to the satisfactory closure of the issue. This closure can be acted only after approval by an independent AVN committee. An example is the lessons from the Forsmark station blackout precursor in July 2005. In addition, site inspectors have access to the reporting of domestic events below the statutory reporting threshold and discuss them with the concerned departments.

Q.No Article Ref. in National Report
106 Article 19.8 p. 123, §II.0.7 - II.0.8

Question/ Comment According to the purpose of this article this chapter should give some detailed information on radwaste generation and storage, even if these information can be found in the detailed annexes related to the sites of Doel and Tihange.

Answer Please note that the text below was excerpted from the Belgian National Report to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (May 2006). A few changes were made to the original text to adapt it to the specific case of NPPs.

Radioactive waste management :

The release of radioactively contaminated waste into the environment, be it in the form of gaseous or liquid effluents or in the form of solid material to be treated in future as non-radioactive waste (incineration, dumping) or to be re-used, is subject to very strict conditions and limitations (GRR-2001). Waste that cannot be discharged as such, has to be collected and treated as radioactive waste and is subject to the management of ONDRAF/NIRAS.

The radioactive material thus discharged into the environment, has to be kept as low as reasonably achievable (see GRR-2001, art. 34.5 with regard to liquid discharges, art. 36.3 for gaseous effluents and art. 18.3 for solid waste).

The concentration of radionuclides present in the discharges of gaseous effluents into the atmosphere and of liquid waste into the surface waters and the sewerage, is limited in a generic manner:

- up to one thousandth of the limit (calculated according to the method prescribed in the GRR- 2001) of the annual intake through ingestion by an adult belonging to the public in liquid radioactive discharge;
- up to the derived limit (calculated according to the method prescribed in the GRR-2001) of the concentration in the air for persons belonging to the public, in gaseous radioactive waste. For most radionuclides, the corresponding limit values are published in the GRR-2001 (in Bq/l for liquid waste and in Bq/m³ for gaseous effluents).

Belgian NPPs can deviate from these generically determined values. In those cases the release limits for the facilities are determined by means of exposure scenarios, taking into account a dose constraint (a fraction of 1 mSv/year, the dose limit for members of the public).

The evacuation of solid radioactive waste originating from Belgian NPPs with the aim to its recycling or re-use or its management as non-radioactive waste (incineration, landfill disposal) is permitted if it complies with the generically determined clearance levels and conditions stipulated in the GRR-2001. These clearance levels are expressed in kBq/kg. Deviations from these generic clearance levels may be granted by the FANC, provided the operator demonstrates that the radiological protection criteria are met, namely an individual dose of 10 µSv/year and either a collective dose of 1 man.Sv per year or optimised protection. These specific clearance levels shall not exceed the exemption levels. The operator of a nuclear facility has to establish and keep an updated inventory of the gaseous and liquid radioactive discharges and of the solid radioactive waste stored on the site and of the cleared materials. This inventory is at the disposition of the Safety Authority and of ONDRAF/NIRAS.

The Tihange and Doel nuclear power plants have their own processing and conditioning facilities qualified by ONDRAF/NIRAS. The waste processed and conditioned on the production site is composed of the waste (ion-exchange resin, filters and other diverse waste) with a dose rate higher than 2 mSv/h and the evaporator concentrates. Non-conditioned waste with a dose rate lower than this limit is sent to Belgoprocess where it is conditioned. The storage on the nuclear power plants sites is only temporary until ONDRAF/NIRAS removes the waste and transfers it to Belgoprocess.

Spent fuel management :

Until the mid-nineties the Belgian strategy for the management of the back end of the fuel cycle was the reprocessing of spent fuel from all NPPs. This policy led to the reprocessing of 670 tHM of the spent uranium-oxide fuel type by COGEMA at La Hague: the

very last Belgian fuel elements sent to La Hague have been reprocessed in late 2001. Due to the changing international context, and especially the collapse of the uranium prices from the mid-eighties onwards, a parliamentary debate was launched in 1993, focussing on spent fuel management and plutonium recycling. This led to a parliamentary resolution on 22 December 1993 urging the government to take action in order to temporarily prevent the implementation of new reprocessing contracts for a five-year period and to take profit of that time to make a thorough comparison of the back-end strategies, namely direct disposal and reprocessing of spent fuel. The Council of Ministers implemented this resolution by its decision of 24 December 1993. To give effect to this decision, an overview report was produced in 1998 by the Administration for Energy, in which the two management options were compared. In 1998 the Council of Ministers specified in its session of 4 December 1998 that the data available at that time and presented in the above-mentioned report were not sufficient to make a global evaluation of the benefits of both options. Therefore they decided that the moratorium on the conclusion of any new reprocessing contract should be confirmed until new data were available and reported to them, allowing them to make this global evaluation. They also urged Synatom to cancel a reprocessing contract concluded in 1991. The global evaluation has not been finalised up to now.

Two different solutions have been selected for the nuclear sites in operation: dry storage in metallic dual-purpose casks on the Doel site and a centralised fuel storage pool on the Tihange site. On the Doel site construction of the modular storage buildings started in May 1994 and the first cask was loaded in June 1995. The buildings in their present layout are able to house 165 storage casks. Additional modules can be added, if necessary. Metallic casks are periodically ordered by Synatom and loaded by the operators of the power plant in order to allow the transfer of spent fuel elements from the three deactivation pools of the site to the centralised dry casks storage facility. Such casks are designed both for storage and transport purposes. On the Tihange site the centralised fuel storage pool received its operating licence in May 1997 and the very first fuel elements have been transferred in July 1997. The total capacity of the pool is approximately 3700 spent fuel assemblies divided in eight sections.