

BEL ✓

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Annual Report 2008



Bel V

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CHAPTER 1

INTRODUCTION

Bel V was created in September 2007 by the Federal Agency for Nuclear Control (FANC) as its subsidiary. This new organization, completely under FANC's control, is intended to group all Belgian nuclear experts who are performing regulatory control activities in the area of nuclear safety and radiation protection. This grouping fits with the recommendations of the parliament resolutions, published in April 2007, aiming at a more efficient organization of nuclear regulatory activities in Belgium.

However Bel V could not become immediately operational because decisions were blocked on the political level by the lack of government. It is only in April 2008 that AVN and Bel V were able to sign an agreement through which AVN's regulatory activities were transferred to Bel V, as of April 14th, 2008. At this date, 46 AVN staff members were transferred to Bel V and continued to carry out all the regulatory activities as before.

The stabilized relation with the FANC offers the opportunity to re-build a complementary relationship between Bel V, the Belgian TSO, and the FANC, the Belgian nuclear safety authority. The tandem FANC-Bel V is the Belgian Regulatory Body. The priority in 2008 was to establish an efficient and effective working environment mainly in the area of regulatory inspection and control. An integrated inspection and control strategy was established and communicated to the licensees. It is publicly available on the FANC website. Synergies are also being sought in other areas such as knowledge management, R&D, international activities and improvements to the regulatory context.

Recruitment remains a major challenge. The unstable situation in the last few years as well as the uncertainty concerning the future of the regulatory organizations in Belgium caused the loss of several experienced people. Moreover the nuclear sector is heavily recruiting in Belgium and in the neighbouring countries. Starting with 46 people in April, Bel V was nevertheless able to reach a staff of 51 on December 31st, despite losing 4 people in the meantime. The objective is to reach 58 people by the end of 2009.

The challenge is not only recruiting but also training and keeping the newly hired, who need to implement the acquired knowledge and experience during the years to come. This has to happen with the experienced staff already heavily busy with the regulatory activities. International networking offers some relief, but the language barrier and the difficulty to share specific technical knowledge about the national facilities remain important obstacles in sharing the burden across the borders.

Building on the expertise and dedication of its staff, Bel V succeeded to maintain a high level of control on the safety of the nuclear installations under its responsibility. The incidental release of iodine at IRE at the end of August, rated level 3 on the INES, caused an additional burden on the Bel V staff. The main lesson learned by the licensee is the need to keep all safety processes under control (here the chemical processes) as part of the safety culture. The quality and reliability of the monitoring systems were also identified as needing permanent attention. For Bel V this event illustrated the difficulty to concentrate on the nuclear and radiological safety in an environment of high attention by the media and the political world, and anxiety of the public. In that respect, the complementarity FANC-Bel V is an asset.

This report shows not only the attention Bel V has paid in 2008 to the safety of the Belgian nuclear installations under its control, but also to the activities needed to maintain and develop its high level of technical expertise as well as to fulfil its role as Belgian TSO.

CHAPTER 2

REGULATORY ACTIVITIES IN BELGIUM

2.1. GENERAL ASSESSMENT OF NUCLEAR INSTALLATIONS

Nuclear Power Plants

At the request of the Belgian Government, an OSART visited the site of Tihange Nuclear Power Plant in May 2007, focused on unit 1. The team identified a number of topics in operational safety that can be improved. The most significant ones include: the work authorization process and its coordination, event analyses, the application of human performance tools, procedures for temporary modifications, the resolution of minor deficiencies in the field (labelling, cleanliness, small leakages), prevention of contamination. Since May 2007 and during the whole year 2008, CNT implemented an action plan in order to improve these areas and to present solutions and results during the follow-up mission foreseen in January 2009. One of the most difficult challenges is to obtain evolution of human behaviour, in response to management expectations. Bel V took this plan into account in its inspection programme.

Doel Nuclear Power Plant is developing an action plan in order to prepare the OSART mission foreseen in 2010. Feedback from the Tihange OSART is taken into account.

An important recruitment programme is under way at Electrabel since 2007. This is the result of the need to increase the staff as well as to plan for many retirements in the coming years, but also the result of the will of Suez to develop nuclear activities. The challenge is now to train and to retain the newly hired staff members, and to maintain enough competences in Doel and Tihange. A positive impact of the increased number of personnel begins to be felt on the field.

Other nuclear facilities

An extensive internal audit has been conducted in 2007 at the SCK•CEN on the issue of safety culture. An action plan to implement the conclusions of the audit was developed and followed in 2008. Positive evolution can be established, in particular in the Health Physics Department.

At Belgoprocess, some efforts are to be done to improve the safety culture. The follow up of the periodic safety review is also to be improved.

As a result of the intensified inspection programme organised by AVN in 2007, and of the external audit conducted at the request of the FANC with the help of the French Safety Authorities, a large number of recommendations has been put forward in order to improve the safety at IRE. The importance for IRE of the periodic safety review was also underlined to improve safety. An action plan was defined in 2008.

On August 22nd, an important release of iodine 131 occurred. As a result, the IRE activities were suspended by the FANC. Restart authorisation was submitted to deep analysis and a new action plan. The challenge of the new IRE management remains the increase of safety culture. The efforts to hire high quality staff in order to strengthen the teams performing safety functions have to be continued.

Integrated strategy for control

Bel V is now a subsidiary of the FANC. An integrated strategy of inspection (by FANC) and control (by Bel V) is developed for 2009.

2.2. OVERVIEW OF INSPECTIONS IN NPPs

The regulations require permanent inspections during operation of the 7 Belgian nuclear units. The goal of the inspections is to verify compliance with the license, as well as to assess the licensee's safety management and safety culture. In 2008, more than 350 inspections have been performed in the seven Belgian nuclear units.

An overview of the main inspection activities by Bel V inspectors is given hereafter for each unit.

In 2008, 7 events have been rated on the INES as level 1.

Doel 1/2

A relatively large number of events occurred in 2008. Two events with loss of defence in depth were classified as level 1 on the INES. In one event limiting conditions for operation for the safety injection system were violated by wrong planning of maintenance on a safety injection pump. In a second event two steam generator isolation valves were misaligned by human error. Five unplanned stops for corrective maintenance were necessary. One of these was a lengthy cold shutdown to replace degraded pressure retaining bolts of primary pumps. Many of these events can be attributed to maintenance deficiencies in the remote past and/or plant aging.

The primary system of Doel 1 was polluted with resins because of a mechanical failure of an ion exchanger. An extensive cleaning program was applied on the primary system. Long term effects of the sulphate pollution are being examined and increased follow up for stress corrosion cracking might be necessary for certain components.

An event of uncontrolled level decrease in the primary circuit occurred during mid loop operation. Unreliable level measurements contributed to the human failure that caused the event.

Doel 3

The unit was at nominal power during the whole year, except for:

- the refueling outage from June 20th until July 22nd;
- a reactor trip following the manual shut down of a primary pump on August 7th, followed by a cold shutdown to repair the pump seals;
- the cold shutdown that was extended until September 14th, after having discovered weaknesses in the design of the seals of the shutdown-pumps. The design was modified.

Two events have been rated as level 1 on the INES:

- the above mentioned weak design of the shutdown-pumps, combined with insufficient maintenance of the pump coolers causing leaks of the pump seals;
- the unavailability of an emergency diesel generator due to a lack of cooling water.

Doel 4

The unit was at nominal power during the whole year, except for:

- A reactor trip following a test of the differential protective system of the alternator, which caused de-energizing of the alternator on March 28th.
- After the above mentioned reactor trip (a few hours before the planned stop) the licensee has decided not to bring the reactor back in critical condition and to cool down till cold shutdown



Doel NPP site – general view

for refueling. The refueling outage was ended on April 30th, but due to several problems with the replacement of the alternator's rotor, it took till May 19th before the unit could be reconnected on the net.

No event has been rated on the INES.

Tihange 1

The unit was at nominal power during the whole year, except for:

- reactor trip on May 1st due to the spurious closure of main feedwater valves;
- reactor trip on June 25th due to interferences during stormy weather;
- reactor trip on October 30th due to a failure into non safety-related regulations processor;
- reactor trip on October 31st (at 10% of nominal power) by forgetting to reset all protections that appeared during the above mentioned reactor trip;
- the refueling outage, from September 6th till October 19th.

Two INES level 1 events took place:

- unavailability of a containment spray pump due to too high vibrations;
- unavailability of an exhaust fan of the annulus space, due to inappropriate maintenance.

Tihange 2

The unit was at nominal power during the whole year, except for:

- the refueling outage, from February 10th till April 18th.
- a reactor trip on April 16th (during start-up after outage) at low power (6,5 %) generated by the intermediate range nuclear excore chains, due to a wrong set point setting (the adequate value is 25 % of nominal power);
- two reactor trips occurred on July 18th due to:
 - at full power, drop of 4 control rods in the core during a repairing operation in the electric board of these rods, inducing a high flux variation detected by the power range nuclear excore chains;
 - at low power, during start-up after the first transient, due to a spurious signal generated by one of the two nuclear source chains (wrongly indicating 10 times the value of the other chain).

No event rated higher than level 0 on the INES scale took place in 2008.



Tihange NPP site – general view

Tihange 3

The unit was at nominal power during the whole year, except for:

- an outage in order to replace a damaged fuel assembly, from December 21st 2007 till January 18th.
- a power decrease to 50% nominal power at the beginning of March, due to the stop of one of both circulation water pumps caused by a problem at the corresponding main circulation water filter.

One other event should be mentioned:

- on January 24th, the activity of the reactor coolant increased with several orders of magnitude, indicating the occurrence of fuel cladding damage.

One event has been rated as level 1 on the INES:

- the switch of a safety air compressor has been found in the “off” position.

Tihange – Common activities

During the whole year CNT implemented its action plan in order to improve the areas where the IAEA Operational Safety Review Team (OSART) of international experts gave recommendations and suggestions during its mission in May 2007. Solutions and results are to be given during the follow-up mission foreseen in January 2009. An important effort is made for training, revision of procedures, organisation and quality of works, housekeeping, control of contamination, human performance, ... An exercise of global evacuation of the site has been done, as recommended.

The inspection program on the site was further implemented as follows:

- Follow-up of the action plan for the OSART follow-up mission;
- Meeting with the managers of different Departments (Maintenance, Operations, Care, Engineering Support, Process Performance Management) and services, in order to evaluate their organisation and the management of different processes related to nuclear safety or radiation protection;
- More attention is devoted to human factors and human performance, housekeeping, resolution of minor deficiencies, ..., having in mind the importance of permanence for the actions of improvement.

2.3. OVERVIEW OF INSPECTIONS IN OTHER NUCLEAR FACILITIES

In 2008, about 330 inspections have been performed in the nuclear facilities other than NPPs.

The significant activities and events in those facilities are summarised below. 4 events have been rated as level 1 on the INES and one event as level 3.

Nuclear Research Centre (SCK•CEN)

The working regime of BR2 during 2008 consisted of 3 cycles of 3 weeks and 2 cycles of 4 weeks.

Before cycle 04/2008, a crack was observed in the primary circuit, at the bend of a pipe at the entry of the pre-heater of the pressurizer. The crack has been temporarily repaired. A more thorough inspection of the primary circuit piping as well as an investigation of the part where the crack was observed have been planned.

In September 2008, the construction work required for the Guinevere experience at the VENUS reactor has started.

Concerning the audit on the safety culture that was initiated in 2007, the action plan resulting from the audit has been approved.

On May 15th, a transport of scrap iron took place from SCK•CEN to Studsvik. On arrival of the transport, it has been observed that the dose rate exceeded the value for excepted packages. The event was classified on level 1 of INES.

Belgoprocess

The decommissioning of the Eurochemic plant (former pilot reprocessing plant for spent nuclear fuel) has started in 1990, and it is scheduled that the complete plant will be demolished in 2012. The demolition of Eurochemic occurs in three phases. The plant has been subdivided since 2004 in an eastern, a western and a



Belgoprocess – Storage building

central part. On Friday 20th of June 2008 an official ceremony gave the starting shot and three days later - on June 23rd, the actual demolition has started. With the demolition of this part in September 2008, 35% of the total concrete inventory of the Eurochemic plant was demolished. During this demolition the decommissioning work of the central part is still continuing.

Belgoprocess continued in 2008 the visual inspection programme of the intermediate level waste drums in the Eurostorage building. The visual inspection programme of the low level waste drums in building 151 has been completed in 2008.

Among the operational incidents, three incidents INES 1 are to be mentioned in 2008: two of these incidents are due to non-conformities in the follow-up of the waste stream and the third one is a start of fire in a cutting-cell. The causes of these incidents have been thoroughly studied in order to take the necessary measures to avoid this kind of incidents in the future.

Belgonucleaire

In March 2008 was issued the Royal Decree granting the decommissioning license to Belgonucleaire. Before starting the decommissioning activities, BN still had to select subcontractors in compliance with well-established criteria, approved by Bel V and FANC and the initial Safety File for approval was still to be submitted to Bel V and FANC. Apart from the Safety report for application of the decommissioning license, this Safety File consists of Exploitation Permits (“*Uitbatingstoelatingen*”), describing the different safety systems and their working conditions for the dismantling operations. Those have to be approved subsequently by Bel V and FANC. The Initial Safety File was approved by FANC by September 2008.

At the end of 2008, the selection procedure for subcontractors is still on-going. In the mean time, Belgonucleaire carried out safety improvements to its facility, by e.g. removal of equipment and reduction of fire risk. Prior to clearance during dismantling, Belgonucleaire has to obtain approval for its proposed clearance methods from Bel V. This work is in progress.

Research reactor of the University of Ghent (Thetis)

The facility is in operational stand-by since the end of 2003 pending the final removal of the fuel assemblies and the decommissioning of the facility. Operational activities at the facility are limited to maintenance and testing of safety systems that need to be operational in accordance with the safety case.

A call for tenders was organised in 2008 for the defueling of the reactor and the final removal of the fissile material from the site. This operation is expected to be carried out in 2009 on the basis of a specific safety case that needs to be approved by Bel V. The application for decommissioning of the facility is still in preparation.

No significant events are to be mentioned for 2008.

Institute of Radionuclides (IRE) and related facilities (Nordion, Sterigenics, IBA)

IRE

Many safety concerns have been raised by the nuclear safety control authorities (AVN/Bel V and FANC) since 2005 at IRE. Action plans were set up in order to correct the situation. These action plans were followed by IRE with a lot of difficulties and delays in 2007 and 2008. Only a few actions were effectively implemented by the IRE management.

On August 22nd, an unplanned release of iodine-131 started at IRE. An unexpected chemical reaction occurred in a tank (2700 litres) collecting the liquid wastes of the shielded isotope production cells. Because the liquid wastes were not correctly separated between these cells, a peroxide solution came into contact with a solution of iodide (I⁻). An oxydo redox reaction most probably started in the waste tank : $H_2O_2 + 2I^- + 2H^+ \rightarrow I_2 + 2H_2O$.

During 4 days, about 45 GBq of iodine-131 were released. Various corrective actions and urgent modifications to the installation (filtering) eventually allowed stopping the iodine release to the environment. This event was rated at level 3 on the international INES scale. This incident also clearly shows important gaps in the safety culture of IRE.

The plant operation was stopped by FANC on August 26th. The request for the restarting authorisation was submitted to a deep analysis of the event by IRE and the identification and implementation of short term corrective actions. Start-up of the isotope production was allowed by a FANC decree dated November 3rd (under conditions to be fulfilled within mid-term deadlines).

A new authorisation was presented to the Scientific Council of the FANC in December 2008. The new IRE management developed a mid term action plan in order to rapidly upgrade the safety culture within the company.

MDS Nordion

The responsible person for the health physics service left in October and his task was subcontracted to AVC. In 2008, a lot of incidents occurred in MDS Nordion which incited FANC to take actions. The production of one department was blocked by FANC during one week following an incident. On the other hand, the iodine-131 release of IRE also affected the production of MDS Nordion because the ventilation system is common to both companies. MDS Nordion also has to increase its safety culture.

IBA-ri

A Class II expert has been appointed by IBA. A new authorisation regulates the new IBA-ri activities.

Sterigenics

The safety culture in this company continues to improve slowly. A major problem has been solved in 2008: it consisted in the removal without incident of 48 old Co60 sources.

2.4. EMERGENCY PREPAREDNESS AND RESPONSE

Emergency response exercises

In 2008, three emergency preparedness and response exercises were organized under the supervision of the General Directorate Crisis Centre of the Ministry of the Interior:

- in May for the Belgonucleaire nuclear site: partial exercise limited to the interaction between the emergency crisis cell of the licensee (on-site) and the evaluation cell CELEVAL (off-site).
- in June for the Tihange NPP: partial exercise with participation of local authorities and rescue services in addition to federal cells and committees (coordination committee, evaluation/information/measurement cells). This exercise was directed by controllers and included a simulation of media pressure. Real meteorological conditions were used for this exercise.
- in September for the Doel NPP: partial exercise limited to the interaction between the emergency crisis cell of the licensee (on-site) and the evaluation cell CELEVAL (off-site).

A 4th exercise for the IRE site was initially planned in December 2008 but it was cancelled as a result of the real incident that took place at the end of August. This event led to the first real activation of the Belgian nuclear and radiological emergency plan between 28/08 and 12/09/2008. Bel V was deeply involved in the follow-up of this incident and participated in the work and actions of the evaluation cell.

All these exercises were prepared, conducted and evaluated according to a new Belgian methodology for preparation, execution and evaluation of emergency preparedness and response exercises. Bel V was largely involved in these exercises, as participating organization but also as 'controller' and 'evaluator', especially for the exercise for the Tihange NPP.

Bel V participated within the evaluation cell in the international exercise organised by the IAEA (ConvEx-3, Mexico) in July.

In addition, Bel V participated, as observer, in the French emergency response exercise for the Nogent NPP in May 2008. The main objective was to observe the implementation and working of the local coordination centre and the sorting & decontamination centre.



Emergency response exercise in France (May 2008)

Other related activities

Bel V continued to actively contribute to the working-group on Emergency Intervention Zones set up by the General Directorate Crisis Centre of the Ministry of Internal Affairs. This working group, composed of radiological experts, representatives of the federal and provincial authorities and representatives of the police and civil protection, aims to elaborate principles and guidelines for the setting up of intervention zones, such as key-hole approach, definition of sectors and operational slicing. The Bel V representative in this group was in charge to work out the working document to be discussed in the group.

Bel V together with the Federal Agency for Nuclear Control initiated a working-group aiming to completely review the information exchange forms used by the utilities in the case of a nuclear or radiological emergency. This WG started with representatives of Electrabel (Doel & Tihange NPPs, Corporate) but at a later stage it is expected to apply the results and outcomes of this WG to all concerned installations (SCK•CEN, BN, BP, IRE).

Bel V took part in a “reading committee” put in place by the Federal Agency for Nuclear Control in the frame of the development of a basic training course on radiological protection.

Improvement of Bel V’s role

In order to improve the Belgian emergency preparedness and response in case of a nuclear emergency and especially the role of Bel V herein:

- Bel V staff participated in the Belgian emergency preparedness and response exercises, which, besides the response activities, implied a lot of preparation, observation and evaluation of the response by the Bel V crisis team, by the licensee and by other involved parties (evaluation cell of the governmental crisis centre);
- unannounced emergency activation tests were organized. These tests allow to check the availability of the roles of duty of Bel V in different conditions;
- participation of Bel V representatives in a Workshop on radioactive measurements in the environment (FANC, 10/10/2008);
- participation of a Bel V representative in an international workshop on “Learning from the Chernobyl legacy” (Kiev, 22-23/09/2008) together with Belgian colleagues (from Ministry of Internal Affairs, FANC, local authorities...).

International collaboration

The close collaboration with the French counterparts (IRSN) in the Emergency Preparedness & Response area has been continued by regular contacts and exchanges between experts from the two organizations. In that context, an IRSN representative participated, as an observer, in a thematic inspection dedicated to the on-site emergency response plan in November at the Tihange NPP. It is expected that next year Bel V will participate in a similar inspection in France.

Bel V was also active in the discussion between French and Belgian competent authorities (nuclear safety authorities, ministry of the Interior, TSOs) aiming to elaborate a bilateral agreement on “preparation, alert, information exchange and assistance relative to radiological emergencies”.

CHAPTER 3

SAFETY ASSESSMENTS AND NATIONAL PROJECTS

3.1. POWER UPRATING & SG REPLACEMENT AT DOEL 1

A steam-generator replacement for the Doel 1 NPP is planned by the end of 2009, together with a power uprating of about 10% (i.e. up to a thermal power of about 1310 MW).

The same modifications were introduced for the Doel 2 NPP in 2004. They did not lead to any difficulty and took place as expected. After these modifications, the Doel 1 and Doel 2 NPP will be identical again (same kind of steam generators, same operating parameters).

Most safety studies were received in 2008. The review by Bel V concentrated on the differences with the sister project at Doel 2. These differences are mainly related to some mechanical aspects and to the impact of the power uprating on the capacity of the shared safety systems (Doel 1&2 are twin units). No major problems were identified up to now.

3.2. "18 MONTHS" EXTENDED CYCLES FOR DOEL 4

Since 1996 (Steam Generators Replacement), Doel 4 is authorized to operate with "16 months" equivalent full power cycles, as opposed to Tihange 3 which operates with "18 months" cycles.

An extension to "18 months" cycles for Doel 4 has been decided by the Utilities in 2007 with the wish to start the first real "18 months" cycle in September 2009 (cycle 24). The programme of studies and the justifications for non-reanalyses, for assessment, as well as a planning for the studies to be provided were received. Bel V performed the safety assessment of the project, what did not lead to any difficulty. The formal licensing is expected early in 2009.

3.3. PROBABILISTIC SAFETY ASSESSMENT

Development and Review of PSA

In 2008, the Licensee (Electrabel) and its architect engineer (Tractebel Engineering) continued the update of the plant specific PSA analyses for the Belgian nuclear power plants. Consequently, also Bel V continued its review activities of these updated analyses. As in the past, Bel V performs an online review of these PSA updates. In 2008, the activities were mainly devoted to PSA level 1.

Bel V has also completed the review of the updated PSA of the BR2 research reactor.

Given that in the future the scope of the PSAs will be extended to include fire and flooding PSA, a first meeting has taken place with Electrabel and Tractebel Engineering to discuss the methodology that they intend to apply for the fire PSA.

Also in 2008, and as a part of the Belgian action plan to meet WENRA Reference Levels on PSA, Electrabel has presented the result of the action plan for some PSA-related issues, for instance on the use of insights gained from PSA for training of staff members. Bel V reviewed this work and concluded that it responds in a satisfactory way to the objectives of the WENRA Reference Level.

In 2008, Bel V did not perform PSA-based Event Analyses (PSAEA) for events in the Belgian nuclear power plants. For Bel V's participation in the eleventh international "Technical Meeting on Risk-based Precursor Analysis", see section 6.2.

For the R&D activities undertaken in view of (existing or future) PSA applications and for PSA activities undertaken in an international framework (OECD, IAEA), see section 6.2 and related annex of this report on Research and Development.

3.4. PERIODIC SAFETY REASSESSMENTS (PSR)

1st Common PSRs

The first three units (Doel 1/2 and Tihange 1) are currently submitted to their third periodic safety review while for the other Belgian units the second PSR is ongoing. More precisely, implementation studies and corrective actions are performed according to the PSR reports which were transmitted to the FANC in respectively 2002, 2003 and 2005.

The FANC has been kept informed of the progress of the current PSRs a.o. through the Contact Commission meetings and specific progress meetings.

All methodological documents were reviewed by Bel V. Some questions are still pending.

The studies of most of the subjects of these joint periodic safety reviews are underway.

The available conclusions of various subjects were summarized in a previous annual report. Some additional elements are drawn hereafter. Generally, these conclusions are still under review by Bel V.

The protection of the site against flooding is still under review. Measures to protect the site in case of flood are being studied.

2nd Common PSRs

A project group has prepared a scope and methodology document according to the guidelines of the FANC. Those guidelines rely on the application of IAEA Safety Guide NS-2.10 "Periodic Safety Review of Nuclear Power Plants".

3.5. GENERIC STUDIES (common to all nuclear power plants)

Sump Clogging during the Recirculation Phase (Follow-up of the Barsebäck event)

The objective is to evaluate the potential of sump clogging during the re-circulation phase of an accident, and if necessary to define adequate solutions to this issue.

Without waiting for complete sump evaluation guidance, TE/EBL have already started a campaign of strainers enlargements. All the Belgian units have already enlarged strainers.

In parallel, TE and EBL have defined improvements to the procedures after an accident (done for Tihange, in progress for Doel).

An approach to assess the re-circulation function is now chosen and is inspired by the solution adopted in Swedish PWRs. It combines analyses and tests in order to justify the performance of the existing passive strainers (possibly enlarged), together with to be installed self-cleaning strainers. A test program for the self-cleaning strainers was scheduled and performed in 2008 with Vattenfall.

In December 2008, Laborelec introduced to Bel V the chosen approach to assess the coatings and paintings located within the reactor building. Future developments are expected in 2009.

3.6. SAFETY-RELATED COMPUTER-BASED SYSTEMS FOR NPP

New emergency diesel generators are needed for the Doel 1 and 2 units. In view of their qualification, the suppliers of the software of the engine digital controllers (MTU and Vector) were audited by Bel V. The architecture of the computer system and the design of system and application software were some of the main points of discussion. The qualification process should be continued in 2009.

Besides, a replacement of the memory cards and an upgrade of the programming tools used to develop and implement the software of the Doel 1/2 protection system was felt appropriate by KCD and TE. The replacement and upgrade procedure was discussed with Bel V. The implementation of these changes will take place in the first half of 2009 and will be followed by Bel V.

Likewise, KCD decided to replace the old ISKAMATIC electronic technology by new digital processors and supervision screens for the hot and cold zones and for the radio monitoring of the gaseous, liquid and solid waste processing building of the Doel site. Bel V was kept informed and commented the Fabricom-Cegelec study related to this project.

TE and Bel V are also involved in discussions on future I&C safety related system architectures. This prospective study is expected to produce a synthesis of the main issues to be considered when new safety related I&C systems need to be installed. A meeting should be organized in 2009 to close the subject.

Two other important equipment renewal projects require a software qualification. The isolation and ventilation system of the Doel 1/2 control room for which the Siemens Teleperm logic is to be replaced. And the Nuclear Instrumentation system (SIN) on the four last units (CNT2/3 and KCD 3/4) for which classified and non-classified parts will be replaced. A first meeting was organised to prepare the software pre-audits regarding these projects that will take place before mid- 2009.

A generic project aiming at consolidating the licensing approach to be followed in Belgium for software-based systems is ongoing. There has been no real progress in 2008; this project will be continued in 2009 with TE.

Other I&C replacements by digital technology are already planned: the radiation monitoring system in Tihange 2, the 6kV high speed transfer devices and the 6kV relays in D1/2. The study of these replacements will be pursued in 2009.

CHAPTER 4

INTERNATIONAL ACTIVITIES AND PROJECTS

4.1. OECD ACTIVITIES

Bel V participated in the activities of the following Committees, Working Groups or meetings:

- the Committee on Nuclear Regulatory Activities (CNRA);
- the Committee on the Safety of Nuclear Installations (CSNI);
- the Nuclear Science Committee (NSC);
- the CNRA Working Group on Inspection Practices (WGIP);
- the CNRA Working Group on Operating Experience (WGOE);
- the CNRA Working Group on Public Communication (WGPC);
- the CSNI Working Group on Fuel Cycle Safety (WGFCS);
- the CSNI Working Group on Risk Assessment (WGRISK);
- the CSNI Working Group on the Analysis and Management of Accidents (WGAMA);
- the CSNI Working Group on the Integrity and Ageing of Components and Structures (IAGE), and its subgroups on the integrity of metal components and structures, and on the ageing of concrete structures;
- the CSNI Working Group on Human and Organisational Factors (WGHOE);
- the CSNI Working Group on Fuel Safety Margins (WGFSM);
- various OECD projects (see also section 6.2);
- the Incident Reporting System coordinators activities.

4.2. IAEA ACTIVITIES

Bel V participated in the Committee on nuclear safety standards (NUSSC).

Bel V experts also participated in the following meetings:

- Technical Meeting on Lessons Learned in Large Modernization Projects in Nuclear Power Plant (NPP) Instrumentation and Control (I&C) Systems, from 6 to 9 May 2008, Vienna, Austria;
- Technical Meeting of the FaSa project (International Project on Use of Safety Assessment Results in the Planning and Implementation of Decommissioning), from 17 to 21 November 2008, Vienna, Austria;
- Technical Meeting on Training for Regulatory Bodies in countries with Nuclear Power Plants, from 2 to 4 December 2008, Vienna, Austria.

4.3. COOPERATION WITH WESTERN SAFETY AUTHORITIES

Franco-Belgian Working Group on nuclear safety

This working group, originally created in the frame of the construction of the Chooz B NPP, is composed of the regulatory organizations (ASN, IRSN, FANC, Bel V). Two meetings are organized each year, one in Paris and the other in Brussels (Bel V Office).

The working group covers a large range of subjects on nuclear safety, such as cross-inspections, inspection practices and information exchange related to the NPP operation. The working group can also initiate specific studies like PSA-studies comparison.

The following main topics were discussed during the two 2008 meetings: status of the Chooz NPP, cross-inspections, feedback on emergency response exercises, exchange on the integration process of the WENRA Reference Levels in the legal framework, exchange on the containment sump filters clogging, experience feedback of events (irradiation accident in ONERA/Toulouse, ...), review of the Terms of Reference of the group.



Technical visit of Chooz NPP (March '08)

Cooperation with IRSN

Since 2003, a cooperation agreement existed between IRSN and AVN in order to promote the cooperation on nuclear safety and radiation protection between the two organizations. An equivalent cooperation agreement has been signed in 2008 between IRSN and Bel V. This agreement covers e.g. the exchange of information on a voluntary basis with no payment between the parties, each of them making available its own expertise to the other. In this framework, different areas of cooperation have been defined in separate documents called "specific theme of cooperation". In 2009, it is foreseen to evaluate the status of the different collaboration themes and to re-launch some of them, where appropriate.

Western European Nuclear Regulators Association (WENRA)

The Federal Agency for Nuclear Control (FANC) and Bel V represent Belgium in WENRA.

WENRA meetings

Bel V representatives participated, in support to the FANC representatives, in the spring and autumn meetings of WENRA. At these meetings, the work progress of the two subgroups (see hereafter) was discussed. Also interfaces with other international fora were discussed at these WENRA meetings.

RHWG (Reactor Harmonization Working Group)

In 2008, several meetings were organized involving FANC, Bel V, Electrabel and Tractebel Engineering with the aim to ensure the follow-up of the Belgian Action Plan. Some actions concerning the implementation of the WENRA Reference Levels in the nuclear power plants could be declared closed.

A Bel V representative participated in the three RHWG meetings organised in 2008.

WGWG (Working Group on Waste and Decommissioning)

During the first half of 2008, Bel V performed a self-assessment concerning the "Implementation side" on the Safety Reference Levels (SRL) related to the storage facilities for radioactive waste and spent nuclear fuel. Bel V carried out this self-assessment for a selection of representative storage facilities in Belgium (7 different facilities on the Belgoprocess site and on the NPP sites of Doel and Tihange).

Bel V participated in the WGWD-meeting, held in June. The achievements of this meeting were mainly the accomplishment (in several sub-groups of WENRA countries) of benchmarking concerning the "Implementation Side" of the SRL for the storage of radioactive waste and spent nuclear fuel. During these benchmarking exercises Bel V and FANC presented the results of the Belgian self-assessments.

In September 2008, Bel V participated in a coordination meeting with NIRAS/ONDRAF organized by the FANC to discuss the future developments regarding the Belgian regulation as a consequence of the self-assessment concerning the "Legal side" on the SRL related to decommissioning and the self-assessments concerning the "Legal side" and the "Implementation side" on the SRL related to the storage facilities.

Task Force on Safety Critical Software

The Task force has pursued its activities with experts from the Belgian (Bel V), Finnish, German, Spanish and British regulators.

Their report on the harmonization of licensing practices for nuclear safety critical software – made publicly available in 2007 over internet on behalf of the author/participating countries – received favourable comments and has been reviewed and maintained at the light of the experience and comments received.

The task force met twice in 2008 and decided to complement the report with additional common positions on specific issues for which some urgency is felt: digital systems inspection methods, software common mode failures and SMART/COTS equipment are among those. Bel V contributed with a first proposal to deal with the latter issue.

An invitation to participate in the task force activities was sent to the US NRC and accepted. After almost 15 years of Belgian (AVN) chairmanship, the chair was handed over to NII (UK).

European TSO Network (ETSON)

The ETSON Assembly met in Brussels (February), Garching (August) and Paris (November). After the transfer of regulatory activities from AVN to Bel V, Bel V became the Belgian member organisation in ETSON. At the November meeting, ETSON was extended with 2 new members: UJV (Czech Republic) and VTT (Finland).

The network substantially contributes to all activities within the framework of the EUROS SAFE approach, which are the Forum, Tribune and the public website, as well as to the work to strengthen the scientific and technical partnership. This work area applies to general or specific issues directly linked to the convergence of scientific and technical safety practices in Europe.

In August, ETSON organised (with high involvement of the ETSON Junior Staff Programme) its first Summer School. The event was organised at the GRS site in Garching. The main focus was on reactor safety and 3 representatives of Bel V lectured at this Summer School. Several young staff members of Bel V participated in the Summer School.

Some young staff members of Bel V continued their involvement in the ETSON Junior Staff Programme.

EUROS SAFE Forum

After the transfer of regulatory activities from AVN to Bel V, Bel V became the Belgian member organisation in EUROS SAFE. The Programme Committee met in Paris (February), Cologne (June) and Paris (November), amongst others to prepare the EUROS SAFE Forum which took place in Paris in November.

Bel V presented several papers in the technical sessions of the Forum.



ETSON members' representatives

For the activities performed in the framework of the EUROSAFE Co-operation Programme (containing 3 work packages on Nuclear Safety Assessment Guide, Identification of Research Needs and Knowledge Management), we refer to Chapter 6.2 “Research and development”, under the item “Nuclear Safety Assessment”.

4.4. ASSISTANCE PROJECT TO THE NUCLEAR REGULATORS IN CENTRAL AND EASTERN EUROPE

Practically all these projects are financed by the TACIS programme of the European Commission.

Armenia

Bel V is co-operating with the Armenian Nuclear Regulatory Agency (ANRA) through TACIS-financed projects:

- support in regulatory matters, such as emergency plan, pyramid of regulatory documents, inspection practices, training, quality system, radioactive sources and review of the SAR; project AR/RA/03 ended in April 2008 while project AR/RA/04 started in December 2008.
- enhancement of the safety assessment capabilities of the ANRA for licensing of Medzamor 2 safety improvements and of decommissioning activities, in particular assessment of design and operational safety aspects of the ANPP; project AR/TS/06 started in August 2007 and was extended by one year with an end date in August 2010.

One senior expert of Bel V is the technical project leader for all these EC-funded projects.

Further, Bel V is the country coordinator for Armenia and maintains regular contacts with other donors like USNRC, IAEA, SÚJB and the UK in order to have a coherent and non-overlapping approach.

Ukraine

Bel V continued its support to the SNRCU within the TACIS project UK/TS/35 (licensing related safety evaluations of the decommissioning facilities of the Chernobyl NPP). Bel V was the task leader for the safety evaluation of the engineered near surface disposal facility.

Bel V assisted the SNRCU to develop further its own quality management system, to manage the international assistance projects and to develop its improvement plan in the framework of a longer development programme (UK/RA/06).

Bel V is also participating in projects to support the licensing of plant improvements in Zaparozhye NPP (I&C modernisation) and in the development of commissioning procedures and related inspections (UK/TS/32).

Russian Federation

Bel V cooperated with other western colleagues in the analysis of the emergency centre of the nuclear authority in view of proposing improvements in hardware and software (RF/RA/07).

Bel V participated in a project related to waste storage in FGUP “Murmansk Specialized Combines “RADON” (RF/TS/51) as well as in a project to provide support to Rostekhnadzor in licensing of decommissioning activities (RF/TS/50) of the heavy water research reactor at the Institute of Theoretical and Experimental Physics (ITEF).

Lithuania

Bel V participated in the two projects to support VATESI and the RPC in the framework of decommissioning of the Ignalina NPP, in cooperation with IRSN, GRS, SKI, STUK, CEPN, SSI, ITER-Consult, SERCO Assurance and some Lithuanian organizations.

Belarus

Bel V was involved in support to the Nuclear Authorities of Belarus in the area of radwaste management and emergency planning and preparedness (BE/RA/03).

Georgia

Bel V supported the Nuclear Authorities of Georgia in the area of legislation, radwaste management and inspection activities (GE/RA/01).

Regulatory Assistance Management

For the majority of its EC-funded projects, Bel V is participating in projects managed by Riskaudit.

Bel V continued its participation in the Regulatory Assistance Management Group and in the INSC (International Nuclear Safety Cooperation) and IPA (Instrument for Pre-Accession Assistance) Committee of the European Commission. In relation with the new financing instrument of the EC (INSC) Bel V underlined the need for optimization of the impact on licensing and institutional areas of the regulatory authorities.

4.5. COOPERATION WITH OTHER FOREIGN ORGANIZATIONS

FRAREG

In 2008, no FRAREG meetings were organised. There were some separate contacts with other FRAREG member organisations.

Japanese organisations

In April, a delegation of JNES, the Japanese Nuclear Energy Safety Organisation, visited Bel V. JNES has a role in Japan which is similar to Bel V's role in Belgium, both organisations being the TSO of the Safety Authorities. JNES was especially interested in Bel V's activities in ETSON (the European TSO Network), the way Bel V performs safety review work, the involvement of Bel V in European activities, and the prospect of new plants to be built by the Belgian Licensee.

In September, a delegation of about 20 engineers and scientists of the JSME (Japanese Society of Mechanical Engineers) visited Bel V. The delegation was especially interested in Bel V's organisation and functioning, the way Bel V performs its inspections of operating nuclear power plants, the competence and training of regulatory inspectors, and the periodic safety reviews and ageing management projects for the Belgian nuclear power plants.



Visit of JSME (September '08)

NERS

A Bel V representative participated in the Eleventh NERS meeting (Prague, April 2008), hosted by the State Office for Nuclear Safety (SONS) of the Czech Republic. The main points on the agenda were: developments in regulatory issues in the NERS member countries, the issue of power uprates of nuclear power plants, and operating experience feedback. Bel V accepted to host the twelfth meeting of NERS in 2009.

USNRC

In June, several Bel V representatives participated, in support to the FANC, in a bilateral meeting between the Belgian regulatory organisations (FANC and Bel V) and the United States Nuclear Regulatory Commission (USNRC). The main topics on the agenda were related to long term operation of nuclear power plants, safety culture, lessons learned from the Forsmark incident, the sump clogging issue, safety analysis of digital I&C, and some safety issues in installations other than nuclear power plants.

In December, at the occasion of the OECD/NEA/CNRA International Workshop on "Taking Account of Feedback on Sump Clogging" a Bel V representative, together with a representative of the FANC,

participated in a bilateral meeting with USNRC prior to the workshop. This meeting gave to the representatives the opportunity to share approaches and knowledge on the topic. The USNRC highlighted some recent observed issues and the status of the GSI in the US. Bel V discussed for the Belgian units the current activities in this field.

CHAPTER 5

OTHER TECHNICAL SUPPORT ACTIVITIES

5.1. ADVISORY ROLE

A PSA expert of Bel V contributed to a scientific evaluation of the PSA activities at IRSN. This consisted in an evaluation made by external auditors about the question whether a balanced and efficient approach is followed for development of PSA studies, review of the PSA studies made by utilities and other organisations (e.g., as part of Periodic Safety Reviews), use of PSA models and results, and other PSA related activities (training, research and development).

5.2. DOMESTIC EXPERIENCE FEEDBACK

Each year, Bel V performs a systematic screening of events in the Belgian NPPs and other nuclear installations, as well as an in-depth analysis of a selected number of events with emphasis on lessons learned and corrective actions.

For the year 2008, 28 event-reporting forms have been established (15 forms for the 7 NPPs (Doel and Tihange) and 13 forms for other nuclear installations).

Corrective actions related to these events and the licensee's operating experience feedback process have been evaluated during the inspections of NPPs and other nuclear installations. More detailed event analyses and identification of lessons learned, for a selection of events, have not been performed in this period.

5.3. FOREIGN EXPERIENCE FEEDBACK

PWRs Operating Experience in perspective

At the end of 2008, the 7 Belgian power reactors have reached 201,8 reactor-years since their first criticality. Their average age is thus 28,8 years (min 23,6 - max 34,5 years).

The two-loop Beznau 1 is currently the oldest operating PWR (39,5 years). 13 PWRs have reached criticality more than 35 years ago, and are still operating. We estimate the operating experience of the 297 PWRs/VVERs (power reactors greater than 50 MWe, including an estimate for 33 shutdown units) at the level of 7069 reactor-years. No new reactor was connected to the grid. Bohunice 2 (408 MWe, VVER in Slovakia) was closed on 31 December, 2008.

The ARIANE program

The number of records in the ARIANE database till end of December 2008 has reached 1708 (11 new entries). A more significant indicator is the number of Screening Cards - one screening card is written for each incoming, original document considered to have merit for an in-depth analysis - written in the same period: 25. For the perspective, 117 documents have been considered worth registration in the database (6118 since its inception).

NRC BULLETINS and GENERIC LETTERS

The USNRC issues Bulletins (or Generic Letters) for serious events or concerns requiring a licensee response. It may also directly impose a License Modification by an Order. No Bulletin has been issued in 2008.

One Generic Letter has been issued in 2008: Managing gas accumulation in ECCS, Decay Heat Removal, and Containment Spray systems. This GL requests reactor licensees to submit information to demonstrate that the subject systems are in compliance with the current licensing and design bases and applicable regulatory requirements, and that suitable design, operational, and testing control measures are in place for maintaining this compliance.

CHAPTER 6

EXPERTISE MANAGEMENT

6.1. KNOWLEDGE MANAGEMENT

For several reasons (one of them being that in the next 5 to 10 years several experienced Bel V staff members will retire) Bel V is attaching high importance to knowledge management.

The TRCs (Technical Responsibility Centres) continue playing a key role for knowledge management within Bel V. There are about 20 TRCs, acting as “Centres of competence” for all important fields of expertise of Bel V. The TRC management and operation is fully embedded in Bel V’s Quality System.

In 2008, several new engineers were recruited. This requires an important effort of the more experienced engineers to ensure an adequate transfer of knowledge. It also requires important efforts in training (see section 6.3).

For engineers retiring in 2009, an inventory was made of the activities they are performing and actions were undertaken to identify successors, so that an adequate transfer of knowledge could be organised.

The Electronic Documentation Management software (KOLIBRI, based on Hummingbird DM) is an important tool for an efficient retrieval of information, good sharing of knowledge and a more easy integration of newcomers. Although many reports are automatically recorded (the inspection and expertise formal reports), the real value of KOLIBRI lies in the added metadata selected by interested users, and in an optimized structure for the virtual links in public folders.

The DOCumentation USers team (DOCUS) discussed the optimum strategy to use KOLIBRI for further improving documentation and knowledge management within Bel V. The result of this work was approved by the Bel V Management and communicated to the staff in the form of a “Documentation policy” and a second document describing the practical application of this “Documentation policy”.

6.2. RESEARCH & DEVELOPMENT

Management activities

2008 was characterized by important changes in the legal context of our organization. Indeed, mid-April 2008, all regulatory activities were transferred from AVN to Bel V, a subsidiary of the FANC. This strongly impacted the calendar of some activities. For example, the R&D Programme for 2008 was established in May-June and approved by the Management on June 25th.

The total effort for 2008 amounted to 3195 hours, which represents about 4.9 % of the total available time for the technical staff. Of this work effort, 1006 h (about 1.5 % of the total available time for the technical staff) are related to projects performed under contract for the 6th Framework Programme of the EC.

In 2008, Bel V decided to join the following new projects, to be managed under contractual agreement:

- PKL-2 on « Thermal-hydraulic Safety Issues for Current PWRs and PWR Design Concepts through Experiments in the Integral Test facility PKL », under agreement with OECD/NEA

The involvement in R&D activities remains an important pillar for the continuous development and sustainability of Bel V’s expertise.

R&D on reactor safety

Thermal-hydraulic phenomena

During the year 2008, Bel V continued its participation in the ROSA project and started its participation in the PKL-2 project, both managed by OECD/NEA. The participation of Bel V in these projects has an impact on the understanding of relevant safety issues for current PWR plants as well as for new design concepts. In particular by participating to the PKL-2 project, Bel V will acquire expertise in carrying out calculations using advanced computational tools as well as techniques in modelling thermal-hydraulic phenomena performed in test facilities.

Bel V signed an updated license contract with IRSN for the use of the CATHARE code.

The NCI phenomenon (NCI = Natural Circulation Interruption) was revisited using new approaches and enhanced nodalization. The NCI modelling allowed the familiarization with both the use of Cathare code and also the modelling of Belgian nuclear power plants. Drawing conclusions of these investigations is underway.

Fission Products and Aerosols Behaviour

For the BIP Project (coordinated by OECD/NEA; BIP standing for "Project to investigate the behaviour of Iodine in support of nuclear reactor containment and fission product assessment) Bel V attended the PRG-2 meeting on 26-27 May 2008 and the PRG-3 meeting on 24-25 November 2008.

At the PRG meetings, the presentations and discussions on the BIP test results and future tests, as well as the more general presentations by BIP participants, give useful insights in issues and phenomena related to iodine behaviour.

Several documents on the experimental programme and on the first year test results have been provided by AECL, including reports and test data for selected RTF (Radioiodine Test Facility) experiments, as well as the First Year Reports for the BIP experiments on Adsorption of Iodine on Containment Surfaces and on Organic iodine formation from (painted) surfaces.

The BIP project offers a good opportunity to Bel V to increase its knowledge in iodine behaviour in the containment after a severe accident.

PSA and its applications

For the PSAEA analyses (PSAEA = PSA based Event Analysis), Bel V performed in spring 2008 a screening of operational events of the Belgian NPPs to identify cases that could be candidates for a PSAEA analysis. The results of this screening were presented to Electrabel and TE at a meeting in which Electrabel also explained their own screening activities. Unfortunately, for internal reasons Bel V has finally not performed these PSAEA analyses in 2008.

For the same internal reasons, Bel V could not organize the 11th international "Technical Meeting on Risk-based Precursor Analysis" in 2008. Electrabel decided to take over the organization of this annual Technical Meeting, and established an interesting programme with the participation of the major PSAEA practitioners. Bel V participated in this 11th Technical Meeting.

A Bel V representative participated in the 9th OECD/NEA/CSNI/WGRISK meeting (March 2008).

Bel V has contributed to the ASAMPSA2 project (7th Framework Programme) by answering the questionnaire sent to a large group of PSA Level 2 End Users.

A Bel V representative has participated, as external auditor, in a scientific evaluation of the PSA activities at IRSN (France) (see § 5.1 for more information).

The active participation in international activities (PSAEA, WGRISK, ASAMPSA2, workshops, ...) keeps the PSA experts of Bel V aware of new developments in methodology and applications.

Through its participation in ASAMPSA2, as external "End User", Bel V obtains valuable information that can be useful for the review of the Belgian PSA level 2 analyses.

Fire protection

In 2008 Bel V recovered his active participation in the PRISME project by participating in the PRISME meeting held in October and by performing calculations with CFAST in order to take part to the writing of a paper with the first results of the PRISME project.

Since Bel V will have to perform important review work in the area of Fire Hazard Analysis (FHA) and Fire PSA in the upcoming years, Bel V started to develop its competences in these areas, for instance by attending a course on Fire PSA co-organised by EPRI and USNRC.

EUROSAFE Co-operation Project

The objective of this EUROSAFE cooperation is to establish common understanding amongst the EUROSAFE partners about present and future nuclear safety assessment methodologies.

The effort consists of 3 work packages

- WG1: Nuclear Safety Assessment Guide (Coordinated by Bel V)
- WG2: Identification of Research Needs
- WG3: Knowledge Management

For WG1 on the development of Safety Assessment Guides (SAG), Bel V (responsible for the coordination of this WG) organized 3 meetings, allowing to manage the ongoing work, to discuss draft SAGs and to define further actions. In 2008, the work focused mainly on the development of technical SAGs for specific technical areas. At the end of 2008, 9 technical SAGs are under development (Mechanical Systems; Electrical Systems; Human factors; Organisational factors; Environmental Qualification; Severe accidents; Safety systems (fluid and auxiliary systems); Incidents and precursor analysis; Transient and accident analysis).

At EUROSAFE 2008 (Paris, 3-4/112008) a paper entitled "Anchoring TSO expertise by developing a common Safety Assessment Guide", was presented.

For WG2 on "Identification of Research Needs", a Bel V representative participated to a meeting of this WG and Bel V commented some documents related to the TSO viewpoint on needs for R&D.

For WG3, Bel V hosted a coordination meeting in early 2008. After this meeting, the EUROSAFE Portal (managed by GRS) was launched to facilitate the exchange of documents and information within the EUROSAFE Cooperation.

The work already performed within this EUROSAFE Cooperation Programme is a first step in the sharing of practices on safety assessment guidance amongst EUROSAFE partners, with the objective of improving our own practices through learning from other expertise organisations.

Participation in the Halden Reactor Project (HRP)

Bel V participated in the Enlarged Halden Programme Group Meeting, held in Loen (Norway, May 2008).

The updated information collected through the meetings of the Halden Reactor Project is important for the assessment of the quality statements of the fuel and software providers.

R&D on waste and decommissioning

Waste disposal

Bel V continued its participation in several R&D projects (EUROSAFE JSP pilot project, EC 6th Framework Programme projects MICADO and PAMINA) concerning the study of radionuclide migration in porous media, the degradation behaviour of spent fuel matrices and the study of parameter uncertainties in the context of the safety assessment of deep geological disposal facilities.

Bel V has also increased its knowledge about the use of the MELODIE code (developed by IRSN; MELODIE standing for “Modèle d’Evaluation à Long terme des Déchets Irradiants Enterrés”).

These activities allowed Bel V to develop and consolidate its expertise for the impact assessment of waste disposal facilities.

Decommissioning

Bel V invested in the development of its expertise in this domain, by the participation to conferences, meetings, and working groups on decommissioning, as for instance

- the conference organized by the “Société Française de Radioprotection” on “Démantèlement des installations nucléaires et réhabilitation des sites” (Paris, February 2008),
- a meeting of the FaSA project on “Use of Safety Assessment Results in Planning and Implementation of Decommissioning of Facilities Using Radioactive Material” (IAEA, November 2008),
- the SFEN-Conference on “Decommissioning challenges : an industrial reality?” (Avignon, 29/09 - 2/10/2008)
- and the IAEA Workshop on “Decommissioning of Nuclear Facilities : A Visual and “Hands-on” Experience” (SCK-CEN, Mol, October 2008).

The EUROSAFE Forum (Paris, 03-04/11/2008) gave also Bel V the opportunity to present its experience in this field.

In addition of the safety aspects, Bel V focused its attention to two issues: the decommissioning and decontamination techniques and the decommissioning planning.

These activities have allowed Bel V to build up progressively an expertise in this domain.

R&D on other issues

Bel V participated to the testing of a revised version of the IAEA’s InterRAS-software (beta-version) for the evaluation of off-site radiological consequences. The testing performed allowed evaluating the functionalities and potentialities of this InterRAS software, in view of possible implementation in the Bel V emergency centre. The findings were reported end of September to the IAEA Incident & Emergency Centre.

These activities allowed getting an idea of the scope and functionalities of the revised IAEA InterRAS software. As soon as this tool will be released officially by the IAEA, Bel V will investigate its implementation in the Bel V emergency centre and its use during emergency situations (real or during exercises).

6.3. TRAINING

In 2008, the number of hours dedicated to training amounted to 10800 hours, i.e. 13.8% of the total number of technical man-hours, compared to 10% in 2007 and 8% in 2006.

The reasons for such an increase are the following:

- recruitment of new technical staff members, which required some significant coaching activities by senior people.
- development and implementation of an extensive programme of initial training for all newcomers recruited; this programme is made of self-study, on-the-job training and some external training courses.

Examples of external training courses with participation of Bel V newcomers in 2008 are:

- Design and Operation of PWR reactors at Areva (4 people during 3 weeks)
- Introduction to Pressurised Water Reactors at Westinghouse (3 people during 1 week)
- ETSON summer school on nuclear reactor safety assessment organised in Garching (4 people during 1 week).
- Basic one week course on radiation protection organised by SCK•CEN (3 people during one week)

Also to be mentioned is the organization of three internal training sessions at the intention of all the technical staff: one on the principles of ventilation, one on the treatment of modifications in NPPs and one common training session for newcomers in November, focussed on the regulatory framework in Belgium.

APPENDIX 1

LIST OF ABBREVIATIONS

| | |
|--------|--|
| ALARA | As Low As Reasonably Achievable |
| ANRA | Nuclear Safety Authority of Armenia |
| ARIANE | Automatic Retrieval of Information on Abnormal Nuclear Events |
| ASME | American Society of Mechanical Engineers |
| AVN | Association Vinçotte Nuclear |
| ASN | Autorité de Sûreté Nucléaire (France) |
| BN | Belgonucléaire |
| BNRA | Bulgarian Nuclear Regulatory Agency |
| BP | Belgoprocess |
| CCDP | Conditional Core Damage Probability |
| CEPN | Centre d'étude sur l'Évaluation de la Protection dans le domaine Nucléaire |
| CNRA | Committee on Nuclear Regulatory Activities (OECD) |
| CNT | Centrale Nucléaire de Tihange |
| CSN | Consejo de Seguridad Nuclear (Spain) |
| CSNI | Committee on the Safety of Nuclear Installations (OECD) |
| EBL | Electrabel |
| EC | European Commission |
| ECCS | Emergency Core Cooling System |
| EDF | Electricité de France |
| ETSON | European TSO Network |
| FANC | Federal Agency for Nuclear Control |
| FRAREG | FRAmatome REGulators |
| GRS | Gesellschaft für Anlagen und Reaktor Sicherheit (Germany) |
| HELB | High Energy Line Break |
| IAEA | International Atomic Energy Agency |
| I&C | Instrumentation & Control |
| INES | International Nuclear Event Scale |
| IRE | Institut des Radio-Elements (Institute of Radionuclides) |
| IRSN | Institut de Radioprotection et de Sûreté Nucléaire (France) |
| JSP | Junior Staff Programme (EUROSAFE) |
| KCD | Kerncentrale Doel |
| KFD | Kern Fysische Dienst (The Netherlands) |
| LOCA | Loss of Coolant Accident |

| | |
|--------------|---|
| MOX | Mixed Oxide Fuel |
| NEA | Nuclear Energy Agency (OECD) |
| NPP | Nuclear Power Plant |
| NRC | Nuclear Regulatory Commission |
| NUSSC | Nuclear Safety Standards Committee (IAEA) |
| OECD | Organization for Economic Cooperation and Development |
| ONDRAF/NIRAS | Belgian Radioactive Waste Agency |
| OSART | Operational Safety Review Team (IAEA) |
| PI | Performance Indicators |
| PRG | Programme Review Group |
| PSA | Probabilistic Safety Analysis |
| PSAEA | PSA-based Event Analysis |
| PSR | Periodic Safety Reassessment |
| PWR | Pressurised Water Reactor |
| PWSCC | Primary Water Stress Corrosion Cracking |
| R&D | Research & Development |
| SCK•CEN | Studie Centrum voor Kernenergie – Centre d'études d'Énergie Nucléaire (Mol) |
| SG | Steam Generator |
| SNRCU | State Nuclear Regulatory Committee of Ukraine |
| SSM | Swedish Nuclear Power Inspectorate |
| STUK | Radiation and Nuclear Safety Authority (Finland) |
| SUJB | Czech Republic State Office for Nuclear Safety |
| TE | Tractebel Engineering |
| TRC | Technical Responsibility Centre (Bel V) |
| TSO | Technical Safety Organization |
| USNRC | United States Nuclear Regulatory Commission |
| VATESI | Lithuanian State Nuclear Safety Inspectorate |
| VVER | Russian Pressurised Water Reactor |
| WENRA | Western European Nuclear Regulators Association |