

BEL ✓

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Activity Report 2009



Bel V

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EDITORIAL



2009 was the first full calendar year for Bel V (which became operational in April 2008). It was therefore a year of consolidation, recruitment, training and coaching. We started the year with 51 people and we reached a staff of 59 on December 31st, despite losing 3 people in the meantime. Of these 59 people, 20 have been hired since April 2008 and 21 are less than 35 years old!

Training and coaching such a large number of newly hired constitutes a big challenge requiring important resources. The experienced staff, already very busy, must free sufficient time to make sure the new generation comes to speed as soon as possible. If we want not to lose this investment, we need to keep our experts as long as possible. This is also important for nuclear safety: the quality of our inspections and of the safety assessments we perform depends very much on the knowledge and expertise of our people, and this knowledge and expertise takes long to acquire and can be lost quickly.

To keep our experts, Bel V offers them an interesting job, but also a job that is an important component in the protection of the public and the workers against the danger of ionizing radiation. Another aspect is the friendly atmosphere at work: good relations and mutual respect are prized values within Bel V. An effective and efficient internal communication system is also an important component to have people happy at work: it allows to build a positive team spirit. In addition to frequent internal messages, sandwich debates are organised every 5 to 6 weeks to share information and debate topics of common interest in an informal atmosphere.

The complementarity between Bel V (the Belgian TSO) and the Federal Agency for Nuclear Control (FANC, the nuclear safety authority) was further developed in 2009. The tandem FANC-Bel V is the Belgian Regulatory Body. The integrated (FANC and Bel V) inspection and control strategy, established at the end of 2008, was implemented for the first time in 2009. Lessons learned will be used to further improve the process. Other areas of collaboration include the surveillance of the security of nuclear sites, the assessment of safety cases submitted by licensees, emergency planning & response, and cross-cutting issues such as knowledge management, R&D, international activities and improvements to the regulatory context.

2009 was characterized by the completion of the review of two important safety cases: the GUINEVERE critical facility at SCK•CEN, and the steam generators replacement and power up-rate at Doel 1. GUINEVERE is an experimental setup that will contribute to the validation of the sub-criticality monitoring for an ADS. Doel 1 was the last Belgian NPP which still had its original steam generators. Replacing them with an improved model allowed to increase the output by about 10%.

The 2009 edition of the EUROSAFE Forum took place in Brussels. The Bel V staff contributed heavily, together with colleagues from GRS and IRSN, to the organisation of this important event. It was a big success with about 350 people attending. Bel V experts made several presentations. The conference made an important contribution to the renown of Bel V.

Important challenges are still ahead of us. Let me mention two of them:

- the transfer of knowledge from the old to the young generation: 3 of our experts are more than 65 and still work part time for Bel V, and 4 more will reach 65 during the next 5 years, totalling about 300 man-years of expertise; it is important not to lose this asset;
- the safety assessment of the periodic safety reviews (PSR): the more aggressive planning required by the FANC implies that there will be an overlap between the end of the current projects and the start of the following ones, thereby straining our resources.

I am confident that we will successfully tackle those challenges with our dynamic team.

Benoît DE BOECK
General Manager

CHAPTER 1

REGULATORY ACTIVITIES IN BELGIUM

1.1. 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. During the whole year 2008, CNT developed an action plan in order to improve some areas identified by the OSART team. Solutions and results were presented by CNT during the follow-up inspection in January 2009. The team was impressed with the set of corrective actions taken to resolve the findings of the original mission. The final report has been published. The process of "continuous improvement" is ongoing.

Doel Nuclear Power Plant is developing its ENERGEIA action plan in order to prepare the OSART mission foreseen in 2010. Main actions are focused on the state of the installations (housekeeping, leak reduction program, ...), on the reduction of human errors, on the training, on the organisation, ... Bel V made some remarks, in order to contribute to increase the safety culture on the site.

Due to the foreseen development of nuclear activities of the Suez Group, skilled people leave or will shortly leave the Doel or Tihange site. The challenge is the knowledge transfer to the new hired people, and to maintain enough competences in Doel and Tihange.

At the end of the year, the Belgian Government decided to authorize the operation of Doel 1/2 and Tihange 1 for another 10 years, until 2025. Therefore a LTO (Long Term Operation) project has been launched (see section 2.3).

Other nuclear facilities

The action plan to implement the conclusions of the internal audit conducted in 2007 at the SCK•CEN on the issue of safety culture is still under implementation during 2009.

Dismantling activities started at Belgonucléaire, after formalisation of the authorization and signature of contracts with subcontractors.

In order to contribute to the improvement of safety culture within the company, Belgoprocess initiated in 2009 a large scale action plan involving all the workers and the employees.

The challenge of the new IRE management remains the increase of safety culture. All departments have brought improvements in order to decrease the releases and to increase safety; new people have been hired. The efforts have to be continued; different action plans are ongoing.

A strong effort has to be done to increase the safety culture in other installations of the Fleurus site, MDS-Nordion and Sterigenics.

Integrated strategy for control

The integrated strategy of inspection (by FANC) and control (by Bel V) has been applied in 2009.

The program of the controls has been sent to the installations in the beginning of the year. Performance indicators are under development in order to follow the execution of the program.

More attention is devoted to human factors and human performance, management of safety and development of safety culture.

1.2. 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 2009, more than 400 inspections have been performed in the 7 Belgian nuclear units.

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

In 2009, 14 events have been rated on the INES as level 1. This number is higher than in 2008, due in particular to a more systematic classification of the events and to the use of edition 2008 of the INES Manual.

Doel 1/2

Doel 1 had a long annual outage from October 30 until begin January 2010, during which the steam generators were replaced. The new steam generators allow a power up-rate of 10 %. The replacement work went well and radiation doses were kept low. There was some delay because of weather conditions (the steam generators are removed and brought in through the roof of the reactor building).



Doel NPP site – general view

Doel 2 had its annual outage from April 18 to May 5 and was brought to cold shutdown from December 6 to 22 during the Doel 1 outage to perform maintenance and tests for which both units have to be in cold shutdown.

Doel 2 had one automatic reactor shutdown caused by loss of power to the control rod steering logic.

During 2009 more than 100 modifications important to safety were designed and/or implemented. Most of them are replacement of obsolete equipment but also important design upgrades have been made or are being prepared.

Two events were classified as level 1 (anomaly) on the INES:

- during fuel manipulations a fuel assembly was accidentally dropped from a height of one meter.
- a compressor system that after a loss of coolant accident returns leakage to the reactor annulus building back to the primary containment was found unready for operation because its outflow opening was blocked with a flange.

Doel 3

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

- the refuelling outage from Mai 15 until June 17;

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

- the non-conformity with the design accident studies due to the functional leakage of pilot valves of the feedwater isolation valves. A modification of reactor trip thresholds solved this problem;
- the “illegal” modification of a flow transmitter that caused a leakage on the zero flow line of a safety injection pump;
- the observation of a non-conformity between the assembly procedure and the post accidental qualification requirements of instrumentation connectors inside the reactor building, causing possible water intrusion in these connectors after accident.

Doel 4

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

- a reactor trip in January, due to a spurious signal concerning the position of a feedwater valve;
- the refuelling outage, from September 18th to November 10th. The noticeable facts are:
 - a human accident occurred in the controlled zone: a person had his finger crushed
 - the low pressure bodies of the turbine have been replaced, increasing the output of the unit
 - at the end of the outage, the new turbine was damaged because rotor and stator collided. The turbine had to be repaired.
- during the first power increase after the outage, at 25% power, a bearing of the new turbine became abnormally hot and the unit has been stopped. The bearing showed to be damaged and has been repaired. November 20th, during the next start-up of the unit, the bearing became again abnormally hot and the unit has been stopped. The bearing again showed to be damaged and has been repaired. Finally, the unit started without problems and reached its full power on December 6th.

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

- discrepancies have been found between the polar crane in the reactor building and its descriptions in several documents;
- the observation of a non-conformity between the assembly procedure and the post accidental qualification requirements of instrumentation connectors inside the reactor building, causing possible water intrusion in these connectors after accident.

Doel Common

For WAB, GSG and SCG, Bel V's activities were concentrated on the reduction of the back-log in the follow-up of modification files and the update of the Safety Report.

Tihange 1

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

- hot shutdown on August 15th, for an oil top up to a primary pump;
- 3 reactor trips on August 15th, 16th and 17th, at about 10 % of nominal power, due to spurious closure of feedwater valve.

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

- lack of NPSH on low head safety injection pumps (temporary measures have been taken – the replacement of the existing pumps is under examination);
- hole in a fire resistant wall;
- unavailability of a ventilation system related to spent fuel pool.



Tihange NPP site – general view

Tihange 2

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

- The refuelling outage, from June 26th to August 11th.
The main noticeable event is the discovery a foreign object (about 15 cm long) on the lower plate of the reactor vessel. This led to the withdrawal of the internal core structure in order to recover it. The safety analysis performed by the utility concluded that there was no potential risk of damage for the fuel assemblies.
- A reactor trip on August 12th, at nominal power, during a test of the reactor protection system, due to a spurious and simultaneous protection signal in another safety train.
- On September 7th, the unit was put in hot shutdown conditions in application of the requirements of the Technical Specifications (in case of total unavailability of the ventilation system of the spent fuel nuclear auxiliary building). The problem was solved the day after, which allowed to reach the nominal power.

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

- On June 12th, it appeared that the time of unavailability allowed by the Technical Specifications for an emergency air compressor (7 days) was exceeded by 45 hours.
- On August 1st, at the end of the refuelling outage, one of the 3 auxiliary feedwater pump of the steam generators was made unduly unavailable during a few hours, due to several human errors.

Tihange 3

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

- a reactor trip in January, due to the frost of a flow meter;
- the refuelling outage, from March 14th to May 6th. The noticeable facts are:
 - two fuel assemblies have been confirmed to present fuel cladding damage. They have not been reused for the following cycle;
 - the low pressure bodies of the turbine have been replaced, increasing the output of the unit.

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

- during the refuelling outage, only 1 diesel generator was available during a few hours, while the availability of 2 diesel generators is required;
- three very small holes have been detected in fire resistant walls.

Tihange – Common activities

The follow-up inspection of the IAEA Operational Safety Review Team (OSART) mission took place in January 2009. Key messages from the team leader were related to the very good results obtained by the Tihange site and the need for continuous improvement.

A WANO Peer Review took place in October.

The Bel V control program on the site was further implemented as follows:

- Meetings with the managers of different Departments (Maintenance, Operations, Care, Engineering Support) 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 perennality for the actions of improvement.

1.3. OVERVIEW OF INSPECTIONS IN OTHER NUCLEAR FACILITIES

In 2009, about 300 inspections have been performed in the nuclear facilities other than NPPs.

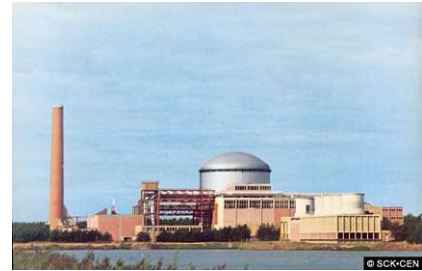
The significant activities and events in those facilities are summarised below. 8 events have been rated as level 1 on the INES and one event as level 2.

Nuclear Research Centre (SCK•CEN)

The working regime of BR2 during 2009 consisted of 3 cycles of 3 weeks and 2 cycles of 4 weeks.

For the JULES HOROWITZ REACTOR (RJH) which construction is planned at Cadarache, CEA and Technicatome designed a fuel element which has some similarities with the design of BR2 fuel, but nevertheless needs to be qualified full-size. As BR2 appeared to be the only reactor able to provide adequate irradiation conditions, the EVITA experiment was taken into service at the start of cycle 04/2009 in July 2009.

The construction work required for the Guinevere experiment at the VENUS reactor that started in September 2008 is still ongoing. The necessary licensing safety analyses were finalised in 2009, and the Scientific Council of the FANC gave its final approval at the end of the year upon the positive advice of Bel V.



BR2 reactor (SCK•CEN)

Concerning the audit on the safety culture that was initiated in 2007, the action plan resulting from the audit is still being implemented.

In June 2009 two events occurred that have been classified on level 1 of the INES scale. Both events were due to the non-respect of written procedures. Neither event caused an increased dose for the personnel or any contamination.

Belgoprocess

The following activities/events are to be mentioned for Belgoprocess:

- The modification activities at the building 136X for the reception of canisters coming from the reprocessing of spent nuclear fuel from the Belgian nuclear power plants have been a major task during the year 2009. The global tests of the building 136X after modifications started mid 2009 and will be pursued in 2010.
- Belgoprocess continued in 2009 the visual inspection programme of the intermediate level waste drums in the Eurostorage building.
- In order to contribute to the improvement of safety culture within the company, Belgoprocess initiated in 2009 a large scale action plan involving all the workers and the employees. This action plan - called SAVE ("Samen Actief voor Veiligheid en Efficiëntie") – is divided in four phases and will extend over several years.
- Among the operational incidents, one incident INES 1 is to be mentioned in 2009. This incident is due to non conformities in the follow-up of the waste stream. It did not cause an increased dose for the personnel or any contamination.

Belgonucleaire

In March 2009, the contracts with the subcontractors were signed and the new BN organisation for dismantling was formalised in an Exploitation Permit (Uitbatingstoelating).

All contractors were submitted to a strict training programme for their dismantling activities, covering most of 2009.

The dismantling activities started and frequent debriefings and 'lessons learned'-sessions were organised in view of a continuous optimization of increased efficiency versus safe work methods. Special care was

taken to reduce the source term in the glove boxes as much as possible, to limit the exposure of workers during dismantling.

A detailed radiological survey was carried out through the installation.

The clearance procedures to be applied during dismantling were finalized and approved by the Health Physics Department and Bel V.

A thematic control concerning Fire Safety was carried out by Bel V and didn't reveal any serious problems.

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 remain operational.

A contract has been made in 2009 with a service provider for the reactor defueling and transport of the fuel elements to Belgoprocess. This operation has been postponed due to delays in the tendering process and is now expected to be carried out in 2010. The safety cases for these activities at University of Ghent and Belgoprocess have still to be submitted to Bel V for approval. The application for decommissioning of the facility is still in preparation.

No significant events are to be mentioned for 2009.

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

IRE

The new management took the opportunity, following the iodine release in August 2008, to initiate changes in the safety culture of the company. Despite the difficulties to respect a planning, additional barriers have been set up onto the ventilation system. All the departments have brought improvements in order to decrease the releases and raise the safety. IRE also hired new experienced people and reinforced strongly the safety department.

Two events have been rated as level 1 on the INES: a leak of a chemical system used during iodine-131 distillation, and a mass excess of 1 to 3 % U in two storages boxes.

MDS Nordion

The health physics service of MDS Nordion has been subcontracted in 2009 to Controlatom (AVC). The number of incidents, leading sometimes to an INES evaluation, continued to be high and demonstrated a lack of safety culture that has to be strongly improved.

Three events have been rated as level 1 on the INES: a xenon-133 release, a contamination of two employees with iodine-131, and a contamination of four employees with iridium-192.

Sterigenics

Several small incidents have shown that safety improvements are still very much needed.

One event has been rated as level 2 on the INES: one employee was present in the vault when the door was closed before the start of an irradiation.

1.4. EMERGENCY PREPAREDNESS AND RESPONSE

Emergency response exercises

In 2009, four emergency preparedness and response exercises were organized under the supervision of the General Directorate Crisis Centre of the Ministry of Internal Affairs:

- In March for the Belgoprocess 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), completed 2 days later by a workshop-seminar at local level to discuss the local response.
- In May for the Tihange NPP: partial exercise limited to the interaction between the emergency crisis cell of the licensee (on-site) and the evaluation cell CELEVAL (off-site), completed later in the year by a local exercise organised by the services of the Governor of the Province of Liège using the scenario developed for the exercise.
- In October for the Doel NPP: large scale exercise of a 36 hours duration with participation of most response organisations (at federal, provincial and local levels), deployment of field intervention teams and interaction with IAEA-IEC and Dutch local and national authorities. This large scale exercise was directed by controllers and included a large scale simulation of media and population pressure performed by students from a media high school.
- In November for the SCK•CEN 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).

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 implicated in these exercises, as involved organization but also as ‘controller’ and ‘evaluator’, especially for the large scale exercise of Doel NPP (a Bel V representative was appointed as “federal exercise coordinator” and member of the exercise management group).

Other related activities

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. These forms issued by the utility to notify or provide further information to national authorities and other bodies concerned with emergency management were completely revised organizing the information exchanges and fluxes and ensuring that the required information reaches the right authority/bodies. Drafted versions of the revised forms were tested during the Tihange NPP, Doel NPP & SCK•CEN exercises in May, October and November 2009. It is now expected to finalise the forms taking into account the experience gained from these 2009 exercises and to apply the resulting forms and methodology to all concerned utilities (Doel & Tihange NPPs, SCK•CEN, Belgonucléaire, Belgoprocess and IRE in Fleurus).

Bel V took part to 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.

In the frame of the cooperation between FANC and Bel V, a specific working group was established to deal with emergency preparedness & response matters. The implementation of the conclusions of the group, approved by the management of both organisations, will lead to strengthen the FANC-Bel V response to nuclear or radiological emergencies and to integrate the Bel V’s HEC (Headquarters Emergency Centre) to the internal crisis centre of the FANC. This FANC’s internal crisis centre is expected to be operational in the first months of 2010.

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);

- Participation of a Bel V representative, as observer, to an inspection performed by the French Nuclear Safety Authority (ASN) at the Chooz NPP (24/02/2009);
- Participation of a Bel V representative, in support of the Belgian authorities, to the 5th meeting of the national representatives of Competent Authorities identified under the Early Notification and Assistance Conventions, including a workshop on latest preparedness and response arrangements and capabilities (IAEA, Vienna, 06-10/07/2009).

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. It is expected that Bel V will participate next year, as observer, to a thematic inspection dedicated to the on-site emergency response plan in France, most probably to a non-NPP nuclear installation.

The discussion between French and Belgian competent authorities (nuclear safety authorities, ministry of internal affairs, TSOs) aiming to elaborate a bilateral agreement on “preparation, alert, information exchange and assistance relative to radiological emergencies” was continued. Bel V took part to this discussion in support of the Belgian competent authorities.

CHAPTER 2

SAFETY ASSESSMENTS AND NATIONAL PROJECTS

2.1. POWER UPRATING & SG REPLACEMENT AT DOEL 1

A steam-generator replacement for the Doel 1 NPP was carried out at the end of 2009, together with a power uprating of about 10% (i.e. up to a thermal power of about 1310 MW) (see section 1.2).

The same modifications were implemented for the Doel 2 NPP in 2004. After these modifications, the Doel 1 and Doel 2 NPP are now identical again (same kind of steam generators, same operating parameters).

The last safety studies were received in the beginning of the year. 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). The necessary licensing safety analyses were finalised, and the Scientific Council of the FANC gave its final approval in May upon the positive advice of Bel V.

2.2. PROBABILISTIC SAFETY ASSESSMENT

In 2009, 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 2009, the activities were mainly devoted to PSA level 1 and partially to PSA level 2.

Given that in the future the scope of the PSAs will be extended to include fire and flooding PSA, preparatory discussions with Electrabel and Tractebel Engineering have been pursued to discuss the methodology that they intend to apply for the fire PSA.

Also in 2009, 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 PSA for different types of applications, including a prioritisation of these applications. Bel V analysed this proposal and it will be further discussed in 2010.

In 2009, 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 twelfth international "Technical Meeting on Risk-based Precursor Analysis", see section 4.4.

For the R&D activities undertaken in view of (existing or future) PSA applications and for PSA activities undertaken in an international framework (mainly OECD), see section 4.4 on Research and Development.

2.3. 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.

The studies of most of the subjects of these joint periodic safety reviews are underway. The available conclusions of various subjects are summarized on annual basis on the FANC-site.

2nd Common PSRs

Scope and methodology documents according to the guidelines of the FANC have been issued for Doel 3 and Tihange 2. These documents take into account most of the comments of the Safety Authorities.

FANC and Bel V issued a strategy note on Long Term Operation (LTO), to be applied to the units of Tihange 1 and Doel 1 & 2. Accordingly, evaluations and results relating with ageing and design upgrade are requested 3 years before the 4th PSR deadlines. LTO is to be considered as part of the 2nd common PSRs (i.e. the 4th PSR for the concerned units).

A LTO project has been launched by Electrabel. The first results relating to the scoping of the safety-related components and the screening with respect to ageing phenomena haven been presented to the Safety Authorities and evaluated by Bel V.

2.4. 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.

EBL performed experimental tests of self-cleaning strainers in collaboration with Vattenfall R&D in 2009. These tests did not succeed in demonstrating the robustness of self-cleaning strainers. The investigations related to this option are therefore suspended.

In order to evaluate the potential clogging of the sump during the recirculation phase, new experimental specific tests have been planned. To simulate the most penalizing accidental conditions in these experiments, generic and specific studies are ongoing. The covered subjects of these studies concern especially the inventory of the debris source, break location, debris generation and transport, chemical effects, qualification of coatings (in collaboration with Laborelec), thermo-hydraulic hypothesis and downstream effects. Some feasibility studies of alternative insulation material or alternative strainers are also examined. The planning covers the period 2009-2012.

Plant specific problems were discussed. In particular, the filter and train separation at Doel 1/2 and the containment spray pump chimneys at Tihange 1 (located in the reactor building) are the subject of special attention.

2.5. NPPs SAFETY-RELATED COMPUTER-BASED SYSTEMS

Bel V maintains expertise in the area of digital instrumentation and control (I&C) systems and in the assessment of safety critical software, in particular by its participation to international working groups (cfr. § 3.3). In this technical domain, Bel V – like EBL and TE - currently faces two important challenges (i) the transfer of existing knowledge to younger and newly recruited staff and (ii) the increased amount of digital I&C upgrades in nuclear installations (NPP's and others); This increase is in part caused by the lengthening of the oldest reactors lifetime. It is therefore essential that Bel V keep an active technological watch over this rapidly evolving domain.

Below are some of the important upgrades in Doel and Tihange that were initiated or took place in 2009.

The nuclear instrumentation external systems (NIS) of the four more recent units Doel 3-4 and Tihange 2-3 need to be replaced. Potential suppliers have been identified, and the evaluation of the software qualification process has started.

For the Doel 1 and 2 units, the memory cards of the digital protection system were replaced and new ones qualified with their code images. An upgrade of the programming tools used to maintain the safety critical software of this system is also being considered.

In the context of the steam generators replacement project at Doel 1 (see section 2.1), an adjustment of the auxiliary feed water system, including the addition of a tank, was needed; the qualification of the ACEC 132 computer systems and software controlling the system was evaluated by Bel V. The embedded micro-processors of 6kV high speed transfer devices were also evaluated.

Doel 1 and 2 units have to be provided with new emergency power diesel generators. The architecture of the control computer-based system and the design of application software are important issues that have been delaying this project. The qualification process will be continued in 2010.

The internal nuclear instrumentation (RIC) of Doel 3 and 4 was replaced by a new system supplied by AREVA. The qualification of this software, which has an indirect impact on safety, was supervised by Bel V.

In Tihange 2, the long and painful process of qualifying the software of commercially available pressure transmitters, which are micro-processor based smart devices and are used to control the flows of atmospheric releases, was finally successfully completed.

A generic project aiming at consolidating the licensing approach to be followed in Belgium for safety related software-based systems is ongoing between TE and Bel V. There has been no real progress in 2009, and this project will be continued in 2010. Exchanges between TE and Bel V on future architectures for I&C safety related systems are expected to provide a synthesis of the main issues to be considered when new safety related and protection I&C systems need to be installed.

CHAPTER 3

INTERNATIONAL ACTIVITIES AND PROJECTS

3.1. 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 Organizational Factors (WGHOE);
- the CSNI Working Group on Fuel Safety Margins (WGFMS);
- various OECD projects (see also section 4.4 on R&D);
- the Incident Reporting System coordinators activities (IRS, IRSRR, FINAS).

3.2. IAEA ACTIVITIES

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

Bel V experts participated in the following meetings:

- FASA Project in the United Kingdom
- IAEA Steering Committee Meeting on Competence of Human Resources for Regulatory Bodies in Member States with NPPs in Vienna
- Train-the-Trainers on INES as a preparation for training in Belgium
- Joint IAEA/NEA meeting of IRS National Coordinators in Paris
- FINAS meeting in Paris
- IAEA Mission - Peer Review Waste in Netherlands
- IRSRR (technical meeting on Incident Reporting System for Research Reactors) in Netherlands

3.3. COOPERATION WITH 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 comparison of PSA-studies.

The following main topics were discussed during the two 2009 meetings: new initiatives on regulations, status of the Chooz and Gravelines 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, long term operation of the nuclear power plants, and experience feedback of specific events.

Western European Nuclear Regulators Association (WENRA)

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

WENRA meetings

The Bel V Director-General 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)

A Bel V representative participated in the three RHWG meetings organized in 2009. The RHWG worked on a document concerning safety objectives for new nuclear power plants. Also the follow-up of the national action plans concerning the WENRA Reference Levels for existing nuclear plants was discussed.

In 2009, 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.

Bel V reviewed the proposals (developed by FANC) for the regulatory texts concerning the implementation of the WENRA Reference Levels in the Belgian regulations.

WGWD (Working Group on Waste and Decommissioning)

In 2009 Bel V focused its participation in the WGWD to the aspects related to the future implementation of the Safety Reference Levels (SRL) for the storage facilities of radioactive waste and spent nuclear fuel and the SRL for the decommissioning of nuclear facilities. Bel V participated in the WGWD-meeting, held in April in Brussels for these specific aspects. The activities of the WGWD about the development of SRL for radioactive waste disposal facilities are followed up by the FANC.

Task Force on Safety Critical Software

Bel V continued to take an active part in the activities of this taskforce, which is composed of experts from Bel V, and the British, Finnish, German, Spanish, and Swedish Safety Authorities and TSO's. US NRC experts also attended the task force meetings.

Their report on the harmonization of licensing practices for nuclear safety critical software – made publicly available in 2007 on behalf of the participating regulators – was updated and augmented at the light of new experience and comments received.

The task force met twice in 2009 and, in particular, completed a new chapter with common positions on the licensing of SMART/COTS software based equipment. Bel V had contributed with a first draft proposal to deal with this issue. The new 2010 version of the report has been made available on the web sites the nuclear regulatory organizations concerned under the title: "Licensing of safety critical software for nuclear reactors. Common position of seven European nuclear regulators and authorized technical support organizations. Revision 2010."

FRAREG

In 2009, the Sixth FRAREG meeting was organized in Cape Town (South-Africa). FRAREG is constituted of regulatory organizations of the countries that have operating NPPs of Framatome-design. These countries are Belgium, China, France, Korea and South-Africa.

The main topics discussed at this meeting were the evolution of the regulatory framework in each country, issues related to PWR hardware and operational aspects, licensing of new sites and reactors, Periodic Safety Reviews (PSR), and major occurrences and regulatory actions.

NERS

In June, Bel V hosted in its offices the twelfth NERS meeting and a Bel V representative acted as Chairman of this meeting. The main points on the agenda were: general information on regulatory organization in member countries; rules, regulations and licensing process; operational experience feedback: important events in the countries; licensing and construction of new nuclear power plants; safety assessment of “cranes” (fuel handling machines, polar crane in reactor building, ...); experiences with licensing of final disposal facilities; methods of calculation of third party nuclear liability insurance.

KFD

At the request of VROM/KFD and on behalf of the FANC, Bel V evaluated the issue of corrosion of the primary piping of the HFR – Petten. In its advice to KFD, Bel V considered that the restart of the HFR reactor for an additional 6 months of operation was acceptable under the conditions set (enhanced monitoring of the leak rates of the primary system and new inspection after 6 months of operation).

3.4. COOPERATION WITH TECHNICAL SAFETY ORGANIZATIONS

EUROSAFE

The EUROSAFE Programme Committee met in Brussels (February), Bootle (May) and Brussels (November), amongst others to prepare the EUROSAFE Forum which took place in Brussels in November.

This year the Forum was organized around the theme “Safety implications of an Increased Demand for Nuclear Energy”. Besides a presentation of the Bel V Director-General in the opening session (see below on ETSON), Bel V also presented two papers in the technical sessions of the Forum and a Bel V representative co-chaired the seminar on nuclear installation safety assessment.

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 4.4 “Research and development”, under the item “Nuclear Safety Assessment”.

In the EUROSAFE Tribune #16 on “Ensuring Long-Term Nuclear Fuel Safety”, a Bel V representative co-authored a paper on “Consequences of fuel behaviour on nuclear safety”.

ETSON (European TSO Network)

The ETSON Assembly met in Paris (January), Brussels (June), Cadarache (July) and Brussels (November). In 2009, the Director-General of Bel V acted as Chairman of ETSON.

The network substantially contributes to all activities within the framework of the EUROSAFE 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.

At the EUROSAFE Forum (see above), the Director-General of Bel V, acting as ETSON Chairman, presented ETSON’s views on “Advantages of networking in response to an increased demand of expertise”.



EUROSAFE Forum in Brussels

In 2009, extension of the network was further explored and resulted in December in the acceptance of LEI (Lithuania) as new member of ETSON.

In July, ETSON organized (with high involvement of the ETSON Junior Staff Programme) its second Summer School in Cadarache (F). This year the Summer School also included a session on decommissioning and waste management aspects. Two representatives of Bel V lectured at this Summer School and two young staff members of Bel V participated.

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

Collaboration with IRSN

In the framework of the Cooperation Agreement between IRSN and Bel V, several activities were continued, amongst others related to emergency planning (see section 1.4 on Emergency Preparedness and Response) and the Cathare code and its applications (see section 4.4 on R&D).

3.5. ASSISTANCE PROJECTS OF THE EC

Practically all these projects are financed by the Tacis programme and, since 2007, the INSC programme of the European Commission.

Armenia

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

- support in regulatory matters, such as emergency plan, pyramid of regulatory documents, training in nuclear and radiation safety, regulatory review of PSA level 1, radioactive sources and review of the SAR; project AR/RA/04 started in December 2008 for a period of two years.
- 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 and a half year with an end date in February 2011.

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

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 is the task leader for the safety evaluation of the engineered near surface disposal facility.

Russian Federation

Bel V participated in four projects of assistance to Rostekhnadzor:

- RF/TS/50: provide support in licensing of decommissioning activities of the heavy water research reactor at the Institute of Theoretical and Experimental Physics (ITEF).
- RF/TS/51: provide support in licensing and supervision related assessments of remediation measures to be implemented at the Murmansk RADON facility.
- RF/TS/53: provide support in development of regulations for NPPs decommissioning and in development of methodology in licensing further operation or decommissioning of nuclear research installations.
- RF/TS/54: provide licensing support during preparation and implementation of industrial projects dealing with spent nuclear fuel and radioactive waste management.

Lithuania

Bel V participated in the project to support VATESI (VAT.05.01.01) in the field of decommissioning of the Ignalina NPP.

Georgia

Bel V supported the Nuclear Authorities of Georgia in the area of legislation, radiological waste management and inspection activities (GE/RA/02).

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 these two new financing instruments of the EC Bel V underlined the need for focusing on the licensing process and on institutional areas of the regulatory authorities.

Egypt

Bel V started its participation in November to the first co-operation project between the EC and Egypt.

Jordan

Bel V will participate in the first co-operation project between the EC and Jordan that should start early 2010.

Regional project Reg 01/07

This project concerns the provision of policy and advice related to the cooperation with Ukrainian and Armenian NRAs and their TSOs for strengthening their managerial and technical capabilities. Experts from Bel V will participate in the analysis of the needs of the regulatory authorities covered by this project and co-operate with these organizations on the definition of future EC projects.

Romania (bi-lateral contact)

Bel V exchanged experience on regulatory activities on PSR with representatives of the Romanian Safety Authorities (CNCAN) on 25 and 26 August 2009.

CHAPTER 4

EXPERTISE MANAGEMENT

4.1. 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 2009, 36 event-reporting forms have been established (31 forms for the 7 NPPs (Doel and Tihange) and 5 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 by lack of resources.

4.2. FOREIGN EXPERIENCE FEEDBACK

PWRs Operating Experience in perspective

At the end of 2009, the 7 Belgian power reactors have reached 208,8 reactor-years since their first criticality. Their average "age" is thus 29,8 years (min 24,6 - max 35,5 years). The two-loop Beznau 1 is currently the oldest operating PWR (40,5 years). 2 PWRs have reached criticality more than 40 years ago, and are still operating. We estimate the operating experience of the 298 PWRs/VVERs (power reactors greater than 50 MWe, including an estimate for 33 shutdown units) at the level of 7334 reactor-years. Two new connections to the grid in 2009: Tomari 3 (866 MWe, PWR, Japan) and Rajasthan 5 (202 MWe, PHWR, India). Final shutdowns in 2009: Hamaoka 1&2 (515/806 MWe, BWR, Japan) and Ignalina 2 (1185 MWe, RBMK, Lithuania).

The ARIANE program

The number of records till end of December 2009 has reached 1716 (8 new entries). 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: 13. For the perspective, 73 documents have been considered worth registration in the database (6191 since its inception).

Specific spreadsheets

Spreadsheets are preferred to exhaustively record a set of similar events, when their number is too large to be described in plain text as in Recurring Events Records. They can be used to retrieve particular patterns, and should be an easy source for PSA practitioners. The spreadsheets updated in the period concern "Turbine-driven safety pumps inoperable when needed during transients", "Configuration issues", and "Lightning induced transients".

4.3. 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 2009, several new engineers were recruited. This requires an important effort of the more experienced engineers to ensure an adequate transfer of knowledge. A coach is attributed to every

new recruited person, to facilitate their integration. The recruitment of a high number of new people also requires important efforts in training (see section 4.5).

This year some Bel V staff members started to participate in the Centres of Competence (CoP) created at the FANC. This is especially the case for some technical fields in which the FANC has important activities, such as radiation protection, waste management and evaluation of the security of nuclear installations. Participation to these CoPs is contributing also to the development of expertise of Bel V staff members.

The continuous implementation of the Bel V adapted Electronic Documentation Management software (KOLIBRI, based on Hummingbird DM) is an important step towards an efficient retrieval of information, good sharing of knowledge and a more easy integration of newcomers.

4.4. RESEARCH & DEVELOPMENT

Management activities

The total effort for the R&D programme 2009 amounted to 3700 hours, which represents about 5% of the total work time for the technical staff. Of this work effort, 800 h are related to projects performed under contract for the 6th Framework Programme of the EC.

In the framework of the Strategic Action Plan FANC-Bel V, the management of the Bel V R&D activities was presented to FANC. The objective is to achieve a better coordination of R&D activities with the FANC. In this respect, main issues on R&D activities are systematically brought on the agenda of the FANC-Bel V coordination meetings on "Transversal processes".

In November, the R&D Strategy for period 2010-2014 was approved and communicated to the complete Bel V staff. This document will be a guide when developing the yearly R&D Programs and for identifying needs to develop new or improved expertise within Bel V.

In 2009, Bel V signed the agreement for participation to the ROSA-2 project, managed by 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

In 2009, Bel V continued its participation to the PKL-2 project and started to participate in the new project ROSA-2, both being operated by OECD/NEA. The projects focused mainly on challenging phenomena for advanced computer codes and also thermal-hydraulic mechanisms that are not well understood by the scientific community. Bel V participation has an impact upon the understanding of relevant safety issues for current PWR plants as well as for the new generation of NPP.

Bel V, within its activity in the PKL-2 project, submitted a test proposal. The objective is to better understand the mechanisms leading to the natural circulation interruption in a primary cooling loop of a PWR.

Also within the PKL-2 activities, a Cathare 3D model for the ROCOM facility was developed in collaboration with IRSN. It was decided that the activities related to this topic will continue in a cooperative way. In addition a draft input deck for the PKL-2 facility was setup; it will be used for the analytical simulations of the PKL-2 tests for the upcoming year.

The Natural Circulation Interruption (NCI) phenomenon was revisited with the Cathare code, using new approaches and enhanced nodalization. Results of these investigations were summarized in a research paper and submitted to the ANS Nuclear Technology Journal.

Bel V participated actively to the Cathare user club (CUC) and presented its activities with the Cathare code as well as some suggestions (including the parallelization, time step management, ...) to enhance code calculations and performances. Some of them were added in the updated versions of the code.

Mechanical studies

The seismic hazard was re-evaluated in view of the future periodic safety reviews of the Belgian nuclear installations.

Fission Products and Aerosols Behaviour

Bel V attended the 4th Programme Review Group (PRG) meeting on 11-12 May 2009 and the 5th PRG meeting on 30 November - 1 December 2009 of the BIP project. This project, coordinated by OECD/NEA, investigates the behaviour of iodine in support of nuclear reactor containment and fission product assessment.

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

Several documents on the experimental program and reports on test results have been provided by AECL. This includes test data reports for previous Radioiodine Test Facility (RTF) experiments, as well as the Second Year Reports for the BIP experiments on Adsorption of Iodine on Containment Surfaces and on Organic iodide formation from (painted) surfaces.

Bel V's participation in BIP offers a good opportunity to keep in touch with new knowledge in the field of iodine behaviour and with severe accident research in general.

PSA and its applications

A Bel V representative participated in the 10th OECD/NEA/CSNI/WGRISK meeting (March 2009).

A Bel V representative participated in the OECD/NEA Workshop on "Implementation of Severe Accident Management Measures" (ISAMM-2009) (Böttstein, Switzerland, 26-28 October 2009). The workshop represented an update of the status of Severe Accident Management (SAM) measures and their implications since the OECD/CSNI workshop held in 2001. The workshop put the emphasis on the current status and insights related to SAM and on the relationship with PSA Level 2.

Two Bel V representatives participated in the "12th Technical Meeting on Experiences with Risk-Based Precursor Analyses" (Brussels, 04-06 November), organized by Electrabel.

Presently, an important effort is on-going to update the PSAs for the Belgian NPPs. Also the scope is extended to full Level 2 (with source term analysis) and Fire PSA. Further, Electrabel plans to extend its PSA applications. Therefore, it is important that Bel V continues to develop and to maintain its expertise in the wide area of PSA methodology and applications.

Fire protection

In 2009 Bel V continued to participate in the PRISME project, coordinated by OECD/NEA, by attending the PRISME meetings and by performing some calculations with CFAST in order to take part to the writing of a paper with the results of the first benchmarking exercise.

Discussions about a continuation in a PRISME-2 project took place between the members of PRISME. Bel V expressed its wishes concerning the content of the PRISME-2 project. A decision on participation in PRISME-2 will be taken in 2010.

In the framework of the FHA (Fire Hazard Analysis) and the Fire PSA, the Licensee will use a zone model and a CFD code in order to analyze the fire development and spreading. Therefore, the development of internal competences in the use of codes for fire modeling is very important. In order to be able to perform an independent review, Bel V chose to utilize two different codes than those used by the licensee. Competences are being developed in the zone model CFAST by participating in the PRISME project and some contacts were established in the aim of obtaining a CFD code.

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 2009, the work focused mainly on the development of technical SAGs for specific technical areas. At the end of 2009, 9 technical SAGs are under development (Mechanical Systems; Electrical Systems; Human factors; Organizational factors; Environmental Qualification; Severe accidents; Safety systems (fluid and auxiliary systems); Incidents and precursor analysis; Transient and accident analysis). For the SAG on "Deterministic severe accident analysis" agreement was achieved on a final draft.

For WG2 on "Identification of Research Needs", a Bel V representative participated to a meeting of this WG. This WG focuses on defining the TSO viewpoint on needs for R&D (for instance by reviewing and commenting documents developed by SNETP).

For WG3, a Bel V representative participated to a meeting of this WG. Experiences in the use of the EUROSAFE Portal were discussed.

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

Participation in the Halden Reactor Project (HRP)

Bel V continues to participate in this project.

R&D on waste and decommissioning

Waste disposal

In order to maintain and further develop its expertise in waste disposal safety assessment Bel V has pursued in 2009 its involvement in R&D activities related to two projects partly funded by the European Commission within the 6th Framework Programme: the PAMINA project (Performance Assessment Methodologies in Application to guide the development of the Safety Case) and the MICADO project (Model uncertainty for the mechanism of dissolution of spent fuel in nuclear waste repository).

Bel V has used the MELODIE code in cooperation with IRSN for the performance assessment of geological disposal facilities.

In 2009 Bel V also developed R&D activities to strengthen its knowledge about the safety assessment of surface disposal facilities. For instance, investigations about the use of simulation tools like HYDRUS-2D have been launched.

Decommissioning

Bel V continued its participation to the FASA project ("International Project on Use of Safety Assessment Results in the Planning and Implementation of Decommissioning", coordinated by IAEA), which is dealing with the implementation of the results of the safety assessments on the planning and conduct of decommissioning.

Participation to the FASA project is fruitful and should be continued. Output of this project might be used to put Belgian regulations, safety assessments and inspection practices on decommissioning in accordance with those of countries having a broader practical experience on decommissioning.

R&D on radiation protection, in particular long term radiological safety and impact on non-human species

The technological watch and literature survey on the subject of long term radiological safety and impact of ionising radiation on non-human species continued.

An exchange of information on R&D issues started between FANC and Bel V. A Bel V representative participated in some meetings of the CoP (Centre of Competence) on radiation protection, launched within the FANC.

4.5. TRAINING

In 2009, the number of hours dedicated to training amounted to 17000 hours, i.e. 22% of the total number of technical man-hours, compared to 14% in 2008 and 10% in 2007.

The reasons for such a significant increase are the following:

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

To be mentioned is the development of a programme of internal basic training sessions for all newcomers. This programme contains 20 sessions which are planned to be organized before the end of 2010. 4 of them have taken place in 2009:

- Presentation of the new Quality Management System of Bel V
- Context and activities of WENRA, including information on the Action Plan under implementation in Belgium
- Deterministic safety approach, complementarity with probabilistic approach
- Introduction to probabilistic safety analysis

Examples of external training courses with participation of Bel V newcomers in 2009 are:

- Design and Operation of PWR reactors at Areva (6 people during 3 weeks)
- Introduction to Pressurised Water Reactors at Westinghouse (2 people during 1 week)
- Full training to the operation of a PWR in Scaldis, the training center of Doel NPP (1 future inspector during the whole year)
- ETSON Summer School on nuclear reactor safety assessment organized in Cadarache (2 people during 1 week).
- ISAR course on Nuclear Safety, Regulation and Legislation organized in Garching (2 people during 1 week)
- Full training course on radiation protection of 120 hrs duration, organized by XIOS in Flemish and ISIB in French (3 people during the year)



ETSON Summer School 2009



Visit of the HADES laboratory

Also to be mentioned is the participation of Bel V staff members to numerous specialized or refresher training activities, in particular a training of 3 days on the new features of the INES scale for all inspectors, 2 training courses of one week on the ASME Code (sections III and XI),

APPENDIX 1

LIST OF ABBREVIATIONS

ANRA	Nuclear Safety Authority of Armenia
ARIANE	Automatic Retrieval of Information on Abnormal Nuclear Events
ASME	American Society of Mechanical Engineers
ASN	Autorité de Sûreté Nucléaire (France)
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)
ETSON	European TSO Network
FANC	Federal Agency for Nuclear Control
GRS	Gesellschaft für Anlagen und Reaktor Sicherheit (Germany)
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)
KFD	Kern Fysische Dienst (The Netherlands)
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
OSART	Operational Safety Review Team (IAEA)
PRG	Programme Review Group
PSA	Probabilistic Safety Analysis
PSR	Periodic Safety Reassessment
PWR	Pressurised Water Reactor
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
TRC	Technical Responsibility Centre (Bel V)
TSO	Technical Safety Organization
VATESI	Lithuanian State Nuclear Safety Inspectorate
VVER	Russian Pressurised Water Reactor
WENRA	Western European Nuclear Regulators Association