



1952 - 2002

SCK • CEN

THE BELGIAN NUCLEAR RESEARCH CENTRE



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Welcome to the history of the Belgian Nuclear Research Centre (SCK•CEN). The history of the Centre is part of the history of the second half of the twentieth century. Born from the rubble of the Second World War we go through a story of scientific optimism, economic development and well-being and growing concern for sustainability.

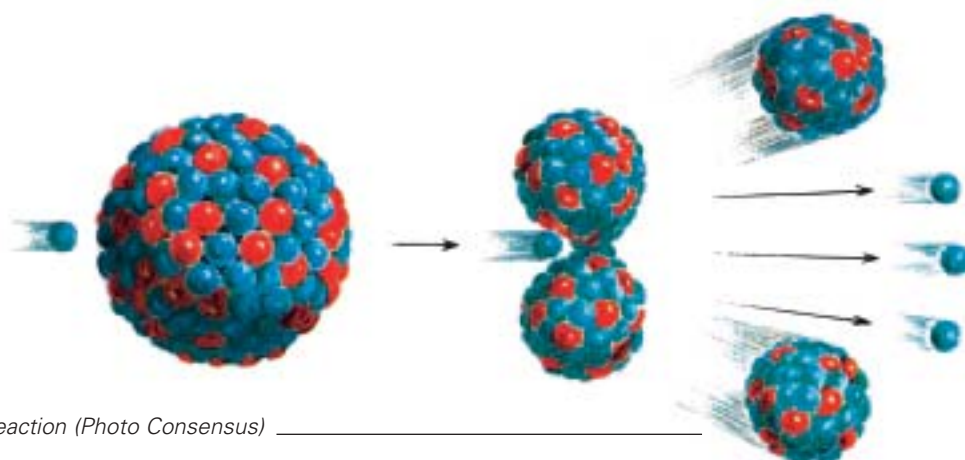
SCK•CEN is an example of Belgian capability, based on the work ethic, enthusiasm, and openness to the world. A small country has been able to achieve world firsts in high technology, such as the first pressurized water reactor outside the USA, the development and the first irradiation of MOX nuclear fuel, the operation of one of the most effective research reactors in the world, the first underground laboratory in clay, etc.

These results are the fruit of the vision of the pioneers, the effort of thousands of employees, the support of the Belgian taxpayer and the cooperation of many institutions within and outside the nuclear sector.



An aerial photo of SCK•CEN in Mol in 1963

Historical background



The chain reaction (Photo Consensus)

The nuclear chain reaction lies at the basis of nuclear energy: neutrons can split uranium (in particular, atoms of the ^{235}U isotope) into smaller components (fission products) with the release of energy and some more neutrons. When each atom is split, one of the neutrons released, is allowed to split another uranium atom, controlled by the reactor control system. This reaction illustrates the combination of opportunities and threats of nuclear energy, i.e. the opportunity for energy production with a minimum quantity of raw materials, but also the risk of the unwanted dispersion of fissile materials, radioactive waste and reactor accidents.



In 1972, in the Oklo uranium mine in Gabon (Africa) evidence was discovered of a natural reactor that had been active around 1 000 million years ago. In an underground layer rich in uranium ore, a chain reaction took place that lasted for thousands of years which ultimately came to a natural end. The radioactive waste that was formed there so many years ago, did not contaminate the environment outside the mine.

At the end of the 19th century, Wilhelm Conrad Röntgen succeeded in generating electromagnetic radiation that was more powerful than light. The X-rays enabled people and materials to be seen through, a technological revolution that gave a tremendous boost to medicine. Shortly afterwards, Marie Curie noticed that some raw materials emitted high energy radiation. This radioactive energy seemed to come from the very strongly bonded atomic nucleus. This led to Rutherford's model of the atom, which was later improved by Niels Bohr.



In 1896 Henri Becquerel discovered natural radioactivity. (Photo Belga)



In 1897 Pierre and Marie Curie spoke for the first time about radioactivity. In 1903 they shared the Nobel Prize for physics with Becquerel. (Photo Belga)

After Wilhelm Conrad Röntgen discovered X-rays in 1895 (Nobel Prize in 1901), medical diagnosis quickly made enormous progress, which was widely adopted during the First World War. In the ensuing euphoria it was also thought that X-rays and radioactivity would be able to cure many diseases. Since 1930 applications have mainly been limited to cancer therapy. (Photo Belga)



Nuclear physics and nuclear research only really got going after the discovery of the neutron in 1932. The fastest and biggest developments took place in the years 1934 and 1945. After the discovery of artificial radioactivity, Frederic Joliot-Curie warned of its possible explosive power in his Nobel address in 1936. The Germans Otto Hahn and Fritz Strassmann realized the first nuclear fission when bombarding uranium with slow neutrons.



In 1942 the first atomic pile in the world, built by Enrico Fermi, became critical. It was called the Chicago Pile 1 or the CP1.



The clock stopped in Hiroshima at a quarter past eight in the morning on August 6, 1945. On August 9, a second atom bomb was dropped on Nagasaki. Only one month before, the USA had done the first nuclear test explosion in New Mexico. The threat of further military applications in the context of the early Cold War led to the distribution of nuclear technology for peaceful purposes being subject to international controls. (Photo Natuur & Techniek)

Nobody expected that the uranium reserves in the Congolese mine of Shinkolobwe would play such an important role in the development of the nuclear sector in Belgium. In the Thirties uranium was primarily used for making radium for medical applications. Union Minière was the largest in the world market for this. In 1942 the USA started the Manhattan Project for the development of an atom bomb and uranium was highly suitable for this purpose. The Americans attempted to persuade the Belgians to sell the Congolese uranium reserves. Years before that, Einstein himself had been brought in to negotiate with the Belgian royal family to control these reserves. On September 26, 1944 the USA, the United Kingdom and Belgium signed a "Memorandum of Understanding". Belgium would supply 1 560 tonnes of uranium ore to the allies, the USA and the United Kingdom obtained the exclusive rights over the uranium stocks for a period of 10 years and in exchange Belgium

was given access to nuclear expertise for commercial, non-military applications. The tide turned in 1946 when the Americans approved the "Atomic Energy Act", better known as the Mac Mahon Act. The Act prohibited the distribution of scientific knowledge and technology on nuclear energy to other countries. This was at odds with the agreement with Belgium. In 1949 Belgium demanded a revision of the 1944 agreement. Pierre Ryckmans played a crucial role in the talks. The compromise of 1951 finally settled on a tax of 12 million dollars that would be levied on the export of uranium. This money would be paid to the Congolese treasury. The Congo in turn would transfer the money to Belgium for nuclear research. Around BEF 350 million (about M€ 8,5) went afterwards to the new institution, "Studiecentrum voor de Toepassingen van de Kernenergie" (STK - Research Centre for the Applications of Nuclear Energy).



The Umicore (Union Minière) factory in Olen today (Photo Umicore)

The Cobra movement consisted of artists from Copenhagen, Brussels and Amsterdam and was aimed at a return to more challenging, aggressive and bolder art. Pierre Alechinsky, painter, and Hugo Claus, writer, were two of the Belgian representatives.

In September 1951, Pierre Ryckmans commissioned a group of scientists to set up a new organization to study the applications of nuclear energy. The founders came from various circles of the scientific world, universities, government and industry. After consultations they decided to set up a non-profit association that would be called "Studiecentrum voor de Toepassingen van de Kernenergie" (Research Centre for the Applications of Nuclear Energy) or abbreviated to STK. The choice of this form of company shows that they wanted to stimulate the peaceful development of nuclear energy in the public interest. The statutes were published in the Staatsblad

(State Gazette) of April 19, 1952. The first meeting of the board of directors was held on May 9, of the same year. In only 45 minutes the members immediately took some important decisions. All participants in the meeting were convinced of their belief in nuclear energy as the energy source of the future. The objects of the association were described as "all research relating to the application of nuclear energy, and using all resources to stimulate and encourage such research". The work on the first Belgian reactor was provisionally done in the premises of the "Administratie voor Luchtvaartkunde" (Department of Aeronautics) in Rhode-Saint-Genève.

The statutes of 1952

<p>N: 1399.</p> <p style="text-align: center;">Centre d'Études pour les Applications de l'Énergie nucléaire, à Bruxelles.</p> <p style="text-align: center;">— STATUTS.</p> <p>Entre les comparants soussignés :</p> <p>M. François Boudart, administrateur de sociétés, domicilié à Ixelles, 32, avenue des Klauwaerts.</p> <p>M. Marcel Buyse, inspecteur général au Ministère des Affaires économiques et des Classes moyennes, domicilié à Schaerbeek, 38, avenue des Cerisiers.</p> <p style="text-align: center;">ASSOC. SANS BUT LUC. — VERENIG. ZONDER WINST. DOEL. — 1952.</p>	<p style="text-align: center;">Studiecentrum voor de Toepassingen van de Kernenergie, te Brussel.</p> <p style="text-align: center;">— STATUTEN.</p> <p>Tussen de ondergetekende verschijnenden :</p> <p>De heer François Boudart, beheerder van maatschappijen, woonachtig te Eisene, Klauwaertslaan, 32.</p> <p>De heer Marcel Buyse, inspecteur-generaal bij het Ministerie van Economische Zaken en Middenstand, woonachtig te Schaarbeek, Kerselaerlaan, 38.</p> <p style="text-align: right;">65</p>
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Pierre Ryckmans (deceased in 1959) was born in Antwerp on November 26, 1891. In 1915 he left for Africa as a member of the "colonial troops". He remained there until after the First World War when he was given the title of director of the territories of Rwanda and Urundi. After his return from Africa, Ryckmans remained involved with the region. He loved the African people and wanted to make Belgium aware of its responsibilities. Finally, in 1934 he became governor general of the Belgian Congo until 1946. In this position Ryckmans acted as a mediator between the politicians and the scientists in the issue on the uranium tax. He was the one who managed the account for the money that Union Minière collected from the tax. On January 1, 1951 he became Commissioner for Atomic Energy and was responsible for the promotion and coordination of all activities relating to nuclear energy. His aim was to set up a national research centre, which indeed happened. When purchasing the land in Mol, Ryckmans signed the contract as the representative of the STK. Ryckmans was the first chairman of the board of directors of the Centre.

Founders and also first members of the board of directors:

François Boudart, company director, Marcel Buyse, inspector general with the Ministry of Economic Affairs and Trade, Marc de Hemptinne, professor at the Catholic University of Leuven, Pierre Delville, company director, Marcel De Merre, company director, Georges Devillez, company director, Jacques Errera, member of the standing delegation of Belgium to the United Nations (UN), Max Freson, secretary general of the "Interuniversitair Instituut voor Kernwetenschappen" (IIKW - Interuniversity Institute for Nuclear Physics), Fernand Gilsoul, chief engineer with the Ministry of Colonies, Julien Goens, scientific attaché to the Belgian embassy in Washington, Jules Harroy, company director,

Louis Henry, director of the "Instituut voor aanmoediging van het Wetenschappelijk Onderzoek in Nijverheid en Landbouw" (IWONL - Institute for the Stimulation of Scientific Research in Industry and Agriculture), René Ledrus, scientific attaché to the Belgian embassy in London, Herman Robilliart, company director, Pierre Ryckmans, honorary governor general of the Belgian Congo and Commissioner of Atomic Energy, Pierre Smits, company director, Pierre Staner, administration director with the Ministry of Colonies, Amé Wibail, director general with the Ministry of Economic Affairs and Trade, Jean Willems, chairman of the IIKW.

1953



Albert Einstein (1879-1955) became famous through the theory of relativity in which he stated that mass was a form of energy. This means that nuclear reactions convert small quantities of mass into large quantities of energy. In 1939 Einstein wrote a letter to the American President Roosevelt informing him of German nuclear research and the prospects of an atom bomb. Later Einstein would call this the greatest mistake of his life and dedicated his prestige to a peaceful world free of violence. (Photo VUM)

A permanent establishment could not be set up in Rhode-Saint-Genèse and so on December 22, 1953 STK purchased 190 ha of land from the royal family for BEF 14 million (about € 350 000). Mol was quite a good answer to all of the technical, psychological and community criteria that had been placed on the establishment of a nuclear site. The site had to be large enough, sufficiently far away from residential areas, have a stable climate, and the local population had to approve the development. With this in mind the management made a number of visits to the mayor and the parish priest-dean of Mol, where they set out the

social and economic benefits of such a centre to them: strictly peaceful applications, much employment, future industrial development, the residence of scientific personnel with a high social status, and many visits by Belgian and foreign figures from the political, social, industrial and scientific world. In order to enable expansion, on August 20, 1958, SCK•CEN acquired a second site of 382 ha from the "Charbonnages de Houthalen". Another 44 ha, adjacent to the before mentioned sites, was bought together with a few other small parcels in 1995 from the Van den Wildenberg family.



The buildings in Rhode-Saint-Genèse now belong to the von Karman Institute for Fluid Dynamics.
(Photo von Karman Instituut)



Louis de Heem (deceased in 2000) was appointed director general. He was also director general of the "Maatschappij voor de Coördinatie van de Productie en het Transport van Elektrische Energie". (Agency for the Coordination of the Production and Transport of Electrical Energy)



The white sand in Mol-Donk
(Photo Gemeentearchief Mol)

SCK•CEN is mainly located in Mol-Donk in the region that used to be called the "Achterbosche Heide". Donk means: "a sandy elevation in a boggy region". In 1772 the Austrian administration passed a law to encourage development of the common land. It lasted until the 1847 "Development Act" which required the local councils to sell unexploited land to potential developers. On April 4, 1853, the Mol local council decided to sell the "Achterbosche Heide": "... sale of heathland to His Majesty...". Leopold I had great plans for his land in Mol, Postel, Dessel, Kasterlee, Retie and Geel. He had a farmhouse and barn built, and also a large park with a lake, the "Prinsenspark". He left other parts of the land

undeveloped which in time had to be converted to fertile agricultural land, meadows, pastures and fishponds. In addition, extensive pine forests were planted, including in the Achterbosse Heide. The first traces of the white sand extraction, which left behind large ponds, also date from the late 19th century. STK was not the only institution to set up in Mol-Donk. As early as 1911 there was an asbestos-cement factory here, later came a glassworks, and in 1929 the electricity power plant was built. The establishment of these companies was largely due to the Herentals-Bocholt canal, dug between 1844 and 1846.

1954



American scientists exploded the first hydrogen bomb in the Pacific Ocean. The power of the explosion was 750 times greater than the bomb that destroyed Hiroshima.

Between 1954 and 1962 the site of the Centre grew into one of the largest post-war construction sites in Belgium. Initially management instructed its own engineers to design 5 technical buildings, but they quickly brought in an architect. Jacques Wybauw embarked on the enormous task together with the engineers.

The Mol residents talked about “den Atoom” (the atom) or “het atoomdorp” (the atom village). The plan grew into a threefold project, consisting of the necessary technical and administrative buildings, social amenities, and a residential quarter.



The Chemistry building



The Technology hall



The residential quarter



A general view of the site

Modernism was the main architectural movement in Belgium at that time. Architecture acted as an expression of the developments in science and technology, and the new feeling of life after the war. In addition to peace and quiet, STK had to project an image of seriousness and rationality. The uniformity of the materials and the simple proportions of the spaces and volumes of the buildings conveyed uniformity and austerity. The architect also

integrated the site into the forest environment. Trees had to be uprooted only where the buildings were to be built. Jacques Wybauw earned various mentions in the “Van de Ven” competition, including for the cafeteria and the family apartments, and architectural journals of the time repeatedly discussed the architectural style of the Centre. He also designed the buildings of Eurochemic, Euratom in Geel and the European School.

1955



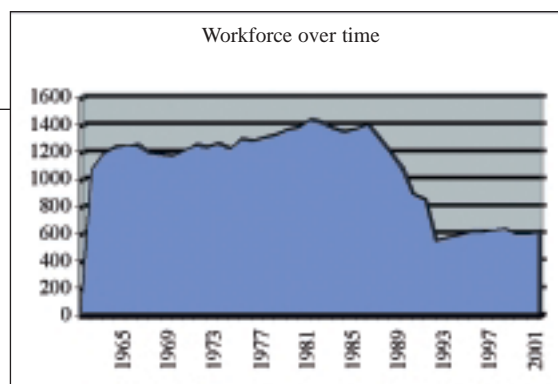
In his "Atoms for Peace" speech at the United Nations Conference in Geneva in July 1955, the American President Eisenhower proposed international cooperation in the development of peaceful applications of nuclear energy.

(Photo Belga)

In 1955, the teams from Rhode-Saint-Genèse started to gradually move to Mol, in order to effectively start work there in January 1956. They initially stayed in hotels in Geel, Mol and Westerlo while awaiting completion of the residential quarter. In 1955 the STK had 245 employees, 57 of which were academics. In 1963 this number had

risen to 1 299. The workforce consisted of people from different regions of the country and also from abroad. Some only stayed for a few years to specialize before continuing further in the industry. There were also student trainees. The Mol foreign register counted 28 different nationalities at a certain point in time.

The workforce reached a maximum of 1 402 employees in 1982. After the layoffs at the end of the Eighties and the demerger of Vito (Vlaams instituut voor technologisch onderzoek - Flemish institute for technological research) the number stabilized at around 600. There are currently 496 men and 108 women in service, and the average age of the employees is 43 years.



SCK•CEN is an organization of public benefit set up under private law. Despite the important role of the government in the supervision and financing of the activities of SCK•CEN, the employees are not civil servants.

Their status is determined by:

- Collective labour agreements (CLA);
- The individual contract of employment;
- The Contracts of Employment, Act of July 3, 1978.

By virtue of successive CLAs (of 1966 and 1968) and additional agreements, employees of SCK•CEN enjoyed protection against redundancy (the "security of employment"). The CLAs were negotiated in the Committee for Pay and Working Conditions, an ad hoc committee chaired by a delegate of the Ministry of Employment and Labour.

1956



A fire broke out in the Marcinelle coalmine near Charleroi on August 8, 1956 which led to the death of 262 miners. (Photo Belga)

“What sticks in my mind from the BR1 start-up period is the enthusiasm of all who participated in it. As the time approached for the first chain reaction, every employee who was in Mol at that time participated in the lengthy operation of loading the reactor. The reason for our enthusiasm was obvious: we felt we were giving our country access to a new energy source that it urgently needed”.

(Julien Goens, former director general)

On Friday May 11, 1956 at around 6.30 p.m., the BR1, Belgian Reactor 1, produced its first chain reaction. The reactor used graphite as a moderator, natural uranium as a nuclear fuel, and air as the coolant, with a power of 4 MW. The first design of the reactor was installed in Rhode-Saint-Genèse and was built in the premises of the “Administratie voor Luchtvaartkunde” (Department of Aeronautics). The employees of the Centre carried out the final design in close cooperation with specialists from Harwell (United Kingdom) and Belgian engineering consultancies.

Except for the supply of the graphite from the United Kingdom and the uranium from Union Minière in Katanga and fabricated in the USA, Belgian industry participated in the developments relating to the reactor. The reactor was mainly used for irradiation purposes. By the end of 1962, 16 000 irradiations had been performed, 40% for the production of radioisotopes, 30% for research by SCK•CEN itself, and 30% for external clients. Experimenters used it to study neutron physics, solid state physics and the behaviour of reactor materials. The reactor is still in use today.



A view of the BR1 reactor



The BR1 building as completed in 1956

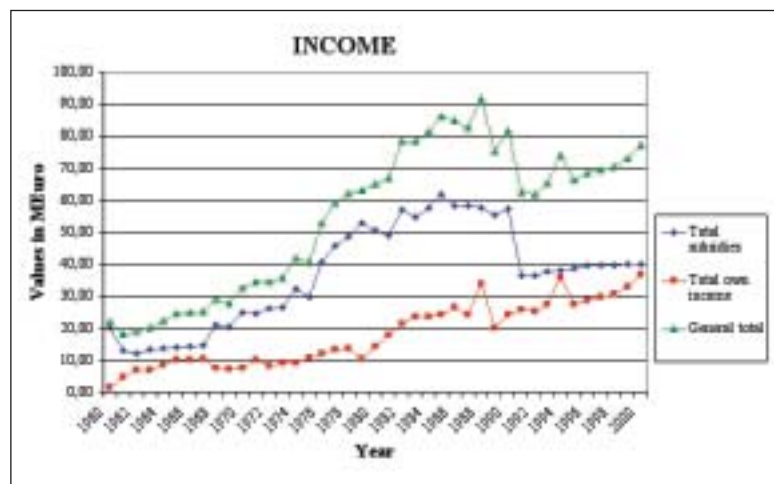


On March 25, 1957 in Rome the Ministers of Foreign Affairs of France, West Germany, Italy, Belgium, the Netherlands and Luxemburg signed the treaties establishing the European Economic Community (EEC) and the European Community for Atomic Energy (Euratom). The six countries thereby took a step further in the direction of economic integration, and the peaceful application of nuclear energy in the member states would be regulated. (Photo VUM)

On July 23, 1957 the Royal Decree that set up the Belgian Nuclear Research Centre as an organization of public benefit with a legal personality appeared in the Belgisch Staatsblad (Belgian State Gazette). The new statutes of the organization described the role of SCK•CEN as follows:

- "The collecting and keeping of scientific and technical documentation relating to the application of nuclear energy;
- Undertaking research of a scientific and technological nature regarding applied nuclear energy;
- Stimulating the training of specialized personnel relating to the application of nuclear energy;
- Performing supervisory and monitoring operations of a technical nature".

The board of directors consisted of a chairman, 2 deputy chairmen and 28 members from industry, science and education, members nominated by the government, and representatives from the electricity companies. A bureau assisted this board and monitored the implementation of decisions. The new statutes enabled mixed financing by government and industry. In October of the same year it was decided that the Ministry of Economic Affairs would act as the trustee. The subsidies obtained have had a significant impact on the development, the choices and operation of SCK•CEN over the years. The Centre obtained its own income from experiments and services to private industry, the government and the recently founded Euratom. The statutes have been refined on a number of points over the years.



The total income (green) consists of a government subsidy (blue) and income from contract research (red). The non-subsidized income has risen almost constantly, and was barely affected by the Vito demerger, in contrast to the subsidies that have remained almost constant over the last few years.

1958



At the Heysel plateau in Brussels, the 1958 World Exhibition drew in 42 million visitors. Its theme was "Assessment of a world, for a more humane world" and was about a world of peace with confidence in the future and scientific progress. The Atomium was designed as a tribute to this scientific progress and illustrates an iron crystal magnified 165 billion times.

(Photo VUM/ B. Coecke)

The Belgian Association for the Peaceful Development of Atomic Energy organized an exhibition in the reception pavilion in the lowest ball of the Atomium. The exhibition involved the main Belgian and Congolese institutions interested in nuclear energy. SCK•CEN naturally took part. The aim of the stand was to present the "immeasurable potential arising from splitting the atom as well as the marvellous horizons that it opens for the welfare of man and for a better standard of living". SCK•CEN exhibited:

- An operational cell in which radioactive iodine was produced;
- A model of the reactor core of BR3;
- A model of BR2;
- Drawings, models and texts relating to the achievements of SCK•CEN up until then.

Sabena provided a helicopter for the Expo to link Brussels to Mol. SCK•CEN also worked with the Belgian Association in order to organize conferences and guided tours of its own facilities in Mol. SCK•CEN also organized visits for secondary school pupils.



The commissioner general of the World Exhibition, Baron Moens de Fernig, examines the model of BR2.



Prince Philip, Duke of Edinburgh, visits the Atomium.

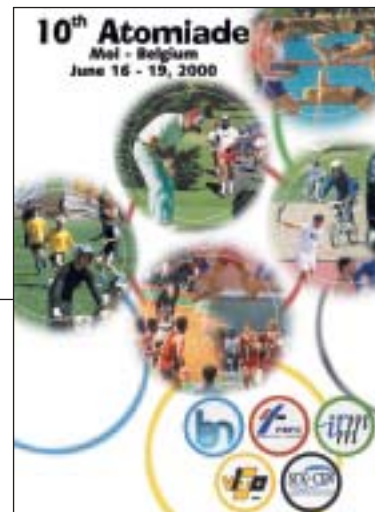
The American company Texas Instruments applied for a patent on the CHIP or the "miniaturized electronic circuit". It was no bigger than a match head and could contain the basic elements of every electronic circuit.

Since the creation of SCK•CEN in Rhode-Saint-Genèse, the employees had organized a number of activities. They even decided to have an annual "Saint Proton" party. This "saint" was celebrated on December 2, the anniversary of the first chain reaction in the world in Chicago. On June 27, 1959 the non-profit association Nuclea, was set up on the initiative of the Centre. This association still is responsible for the planning and coordination of all sporting, cultural and leisure activities.

The employees and their families, and the employees of neighbouring nuclear companies and institutions, can join. The activities range from football, tennis and golf, through theatre, to the organization of a library with a large range of French and other literature. Over the years the members of Nuclea have also participated in many intercompany competitions such as the Atomiade that brings together sports clubs from different European nuclear research institutions.



The Nuclea Sports Club



In 2000 the 10th Atomiade took place in Mol. 1 500 people from 35 institutions in 11 European countries took part.
(Photo Nuclea)



Count Marc De Hemptinne became the new chairman of the board of directors after the death of Pierre Ryckmans. He was a professor at the Catholic University of Leuven.



In the Lovanium University of Leopoldstad (now Kinshasa, Belgian Congo) the TRICO reactor went into service in the presence of Louis de Heem, the director general of SCK•CEN, and Mgr. Luc Gillon, rector of the Lovanium University and later deputy chairman and administrator of SCK•CEN. TRICO stands for a combination of TRIGA or "Training Isotopes General Atomic" and Congo. The reactor was mainly intended for isotope production and irradiating samples.
(Photo, from left to right: Mr de Hoffmann, president of General Atomic, L. de Heem, director general of SCK•CEN, Depi, first mayor of Leopoldstad, Mgr. Scalais, vicar apostolic of Leopoldstad, Mr J. Gonze, departmental director of Union Minière in Katanga, and L. Stevens, engineer at BELGONUCLEAIRE)

1960

SCK•CEN was repeatedly honoured by visits from many different personalities, ranging from kings and princes to secondary school pupils. On May 31, 1960 King Baudouin, Queen Juliana and her daughter Beatrix visited the Centre.

Such visits meant extra security measures, for which a close cooperation with the Mol police and other bodies was required. Enthusiastic spectators from the surrounding areas would frequently turn up on such occasions.



King Baudouin of Belgium, Queen Juliana and Princess Beatrix of the Netherlands – May 31, 1960



President Bourguiba of Tunisia – July 31, 1966



King Feisal from Saudi Arabia and Prince Albert - May 30, 1967



Minister Leburton – May 12, 1969

The communication policy of SCK•CEN is aimed at:

- Recognition of the social relevance of the research done at SCK•CEN and the justification of government funds for this research;
- Recognition of the excellence of the services of SCK•CEN by potential customers;
- The confidence of the people regarding the concern of SCK•CEN for the health and safety of its employees

and the population;

- As objective an approach as possible to the debate on energy policy.

The Centre pursues these objectives via technical visits, workshops arranged by SCK•CEN, contributions to nuclear training and an attendance policy in scientific forums.



*On April 8, 1961 the Russian Yuri Gagarin was the first man to completely orbit the earth in a spaceship. The trip lasted 1 hour and 48 minutes.
(Photo VUM)*

In the mid Fifties the STK decided to build a "Materials Testing Reactor" (MTR). In 1956 it entrusted the American engineering consultancy, Nuclear Development Corporation in White Plains (New York, USA), with the design. Managers of the STK, engineers from industry, engineering consultants and electricity producers took part in the design. The construction of the reactor began in September 1957. A full-size model of the core, the BR02, went into operation at the end of 1959. Belgian industry was used as much as possible for the construction of this reactor. On July 6, 1961 BR2

produced its first chain reaction. The Prime Minister, the chairman of Euratom, the American ambassador and a representative of the Ministry of Economic Affairs attended the event. The reactor was further tested up until the end of 1962, and became operational in December of that year. It is a reactor with a high neutron flux in order to examine the behaviour of all types of highly irradiated materials. It works on highly enriched uranium and is moderated and cooled by water. The BR2 is still the most powerful research reactor in Western Europe.



A view of the construction of BR2 from the air



The reactor dock before the assembly of the reactor

Just like other nuclear institutions and companies, SCK•CEN is subject to extensive supervision relating to safety. The Federal Agency for Nuclear Control (FANC) is responsible for all work in this respect further to the Act of April 15, 1994 and the implementing orders of July 20, 2001. This means for example that FANC examines all applications for changes to facilities or for obtaining licences. The representatives of FANC have continuous access to the facilities of SCK•CEN, and as SCK•CEN is a Class 1 nuclear establishment, an independent approved Class 1 organization must do the inspections. For the Centre this is currently AVN (Association Vinçotte Nucleaire). Systematic safety visits and supervision of

the safety studies done by the Centre are just some examples of the work of AVN. The registered organization discusses the decisions with the department of Physical Control (internal department required by law) of SCK•CEN and the Centre takes any necessary actions. According to the operating licence of June 30, 1986, the safety of SCK•CEN facilities must be fully re-examined every five (BR1 and BR2) or 10 years (all other facilities). The safety files are studied thoroughly together with the AVN. The conclusions and actions are given to the Scientific Board via the FANC, who is responsible for requiring further information or actions. This can lead to changes to the SCK•CEN operating licence.

1962

Belgium decided to build a power plant around 8 years before BR3 came into service. The choice quickly fell on a Pressurized Water Reactor (PWR), a reactor cooled and moderated by water under pressure. In 1956 the Centre placed an order at the American company Westinghouse, who developed such reactors based on experience obtained from nuclear submarines. Originally the plan was to install the power plant in Schaarbeek in order to provide energy for the 1958 World Exhibition and thus to symbolically supply the Expo with the energy of the future. Because this plan did not go through, the SCK•CEN director general proposed installing the reactor in Mol.

Again, Belgian industry was used as much as possible for the construction. The people from Westinghouse and the future operating team were present when it produced its first chain reaction on August 19, 1962. The connection to the Belgian electricity network took place on October 25 of the same year. The BR3 would act as a demonstration unit for the construction and operation of an industrial power plant and acted as a pilot station for prototype nuclear fuels. The station is an example of "cross-fertilization" between research and industry. The national industry gained a firm foothold in this new technology at a very early stage and BR3 enabled the electricity producers to train their operating personnel for the application of nuclear energy in Belgium.



The construction of BR3



Bringing in the BR3 reactor vessel



Minister Spinoy pressed the button to start the BR3 on October 25, 1962.

1963



In 1962 the language boundary was set by law, the year in which the language laws were approved. This did not come about smoothly. There were repeated conflicts between Flemings and Walloons. In 1963 a service order set the rules for the use of languages within SCK•CEN. Although the Centre is situated in Mol, and thus in a Dutch-speaking region, a bilingual system was chosen. Management instructions had to be given in the language of the subordinates. In 1967, candidates for a hierarchical position had to prove with language exams that they mastered the two national languages sufficiently. This all led to community tensions within the Centre. The "Association des universitaires d'expression française au CEN" (the Association of French-speaking graduates at the CEN) demanded for example that every SCK•CEN member of staff could build a career on the basis of his personal merits without language impediments.

Conflicts over the language laws (Photo Le Soir)

In 1963 the implementing orders of the 1958 Nuclear Safety Act were published. A distinction has to be made between laws and operating licences:

1. The laws and their implementing orders mainly determine the general requirements for the protection of the population, employees and the environment against the dangers of ionizing radiation. These laws can be considered as an adaptation of international recommendations and European directives on radiation protection. The most recent law dates from July 20, 2001 and was published in the Belgisch Staatsblad (Belgian

State Gazette) on August 30, 2001. Dose limits for employees and the population, release limits for nuclear establishments, licence systems in general, and the management of radioactive waste are some of the items covered by the law.

2. SCK•CEN also has its operating licence. This licence only applies to the Centre and contains a description of the facilities, the specific release limits, and the allowed quantities of fissile material in the various laboratories and reactors. The FANC has to approve changes to the licences, and a Royal Decree has to confirm them.



Julien Goens became the new director general.



In 1963 the later rector of the State University of Ghent (RUG), Professor Julien Hoste, became the new chairman of the board of directors. (Photo RUG)



Retired General Letor replaced Julien Hoste in that same year.

1964

The zero power reactor VENUS is the only one of the 5 SCK•CEN reactors with a name. All the others have the abbreviation BR, which stands for "Belgian Reactor" plus a number. VENUS was built under the Vulcain project, hence the name VENUS (Vulcain Experimental Nuclear Study), the goddess of love, in contrast to her husband, the god of fire. The purpose of the Vulcain project was to demonstrate the feasibility of a reactor concept with a variable neutron spectrum (also known under the name of "spectral shift" concept). In this concept the liquid of the reactor gradually changes from "heavy water" (D₂O) into "light water" (H₂O) in order to compensate for the consumption of nuclear fuel. This method turned out to be

very promising for the nuclear powering of commercial ships. The entire project was carried out together with the United Kingdom Atomic Energy Authority and the Vulcain consortium, which consisted of a number of Belgian companies and SCK•CEN. On April 30, 1964 the reactor produced its first chain reaction. From 1964 to 1966 many types of experiments were done in the reactor, after which the specially converted Vulcain core was ultimately installed in BR3. In 1968 the Vulcain configuration of the BR3 was ended. After 1966, VENUS was converted to do neutron studies for new reactor core configurations and for the embrittlement of reactor vessels under neutron irradiation.



When it produced its first chain reaction, the former director Julien Goens presented a reproduction of Botticelli's Venus with the statement "avec mes compliments à l'équipe qui a fait revivre Venus" (with my compliments to the team who has brought Venus back to life).



The VENUS control room



VENUS/Vulcain

On December 30, 1965 at around 1 p.m., the VENUS reactor operators were working on the construction of a new nuclear fuel configuration. The operations started without making the reactor sufficiently sub-critical. The removal of a control rod before enough nuclear fuel had been taken away was not done according to the safety procedures and the reactor went critical. This led to a sudden increase in power (critical accident). The operator who was at the reactor was briefly exposed to a high dose of neutron and gamma radiation.

Colleagues immediately took the victim to the Medical Department and on the basis of the first measurements of the dose received, the doctors decided to transfer the operator to the Curie Institute in Paris. The evolution of the consequences, required the amputation of a leg. A thorough investigation determined a number of abnormalities from the applicable operating procedures. This led to changes, with regard to the procedures themselves, and relating to the training of operators. Since this accident the irradiation campaigns have proceeded without any accident or incident.



The USA sent combat troops to Vietnam. In fact this war had already started in the Fifties with France. As a result of the Cold War and the two divergent philosophies, communism versus free market, the USA believed that it had to intervene to stop the spread of communism, also in Vietnam. The war drew enormous criticism, both in America and in Europe. The conflict only finally ended with the capitulation of the South Vietnamese army in 1975. (Photo Reporters AP)

On March 19, 1965 SCK•CEN started up the new Radiobiology lab on site II in Geel. Here, the scientists carried out fundamental research on the influence of ionizing radiation on people and the environment, for example contamination of the environment by radioactive fall-out, contamination of test animals, and the contamination of people as a result of accidental or routine exposure in the nuclear industry or through medical treatment. The equipment consisted of a conventional biological laboratory supplemented by

facilities for research on contaminated animals, plants and soil. Vito took over the original facilities. The Radiation Protection department is continuing some of the research. SCK•CEN obtained a unique licence to do open-field experiments on the transfer of radioactivity, which turned out to be very useful later on, when dealing with accidents such as Chernobyl.

SCK•CEN has an experimental farm for doing animal and plant tests in the framework of biological and ecological research.



The Centre inaugurated the mechanical and metallographic hot-cells in the LMA building (Laboratory for Medium-Level Activity, later the LHMA, Laboratory for High-Level and Medium-Level Activity) in the same year. The laboratory was and is intended for analysing changes in the behaviour of materials after irradiation.

The measuring equipment and facilities are generally placed in protected ventilated cells. A hot-cell is a heavily protected sealed space where highly radioactive substances are used with remotely controlled manipulators. The operating staff can observe the activities through a lead-glass window, so that there is no danger to them. A series of cells and equipment were built in the same building for extracting, by evaporation, uranium and plutonium from irradiated nuclear fuel. As a result of the industrial success of the aqueous reprocessing in Eurochemic, SCK•CEN stopped the development of "dry" reprocessing technology. The USA and France, for example, continued however.



An interior view of the hot zone in the LHMA building today

Since the mid Fifties, SCK•CEN had done research into the reprocessing of irradiated nuclear fuel. This research required hot-cells and made the Chemistry and Radiation Protection teams familiar with handling irradiated materials that could contain traces of plutonium. It involved weakly irradiated metallic uranium from the Oak Ridge laboratories in the USA. In 1957, however, the international company Eurochemic was set up under the protection of the OECD (the Organization for Economic Cooperation and Development) and its aim was to set up a pilot factory to handle 50 to 150 tonnes of irradiated uranium each year. In order to enable Belgium to participate in this company, SCK•CEN agreed to transfer its research group and equipment to Eurochemic. Nevertheless, SCK•CEN still continued with the development of its own methods to reprocess irradiated nuclear fuel. In 1958, forty researchers, engineers, technicians and managers from Eurochemic were housed in the Centre. This group worked on defining chemical frameworks that

could act as a basis for a chemical process to be used in the factory to be built in Dessel. The construction of the Dessel site lasted from 1960 to 1966. On July 7, 1966 King Baudouin officially inaugurated the new factory. Factory operations, which had been taken over by Synatom, stopped in 1974. In 1985 the Belgian state acquired the site for a symbolic sum of one franc, including the liabilities not estimated at that time. The state entrusted the future work of decommissioning and waste processing to ONDRAF/NIRAS, who in turn passed it on to Belgoprocess, a wholly-owned subsidiary. Some years later in 1989 Belgoprocess took over the SCK•CEN waste processing plant. Belgoprocess currently specializes in the processing of radioactive waste produced in Belgium, in particular the safe processing and storage of radioactive waste, and the decommissioning of disused nuclear buildings. Belgoprocess also decommissions the former facilities of Eurochemic.



The Eurochemic building



The first stone of Eurochemic was laid on July 7, 1960 in the presence of Prince Albert.

Part of the regional plan in Mol, Dessel and Geel is coloured in as "areas for the establishment of nuclear facilities". This nuclear zone counts around 1 000 ha. They are:

Belgoprocess is a subsidiary of ONDRAF/NIRAS and is specialized in the processing and storage of nuclear waste in Belgium and the decommissioning of plants and companies.

FBFC-International is a subsidiary of the international group FRAMATOME-ANP and produces UO₂ fuel elements for PWR nuclear reactors, based on lightly enriched uranium. It also assembles MOX fuel elements for PWR and BWR (or boiling water) reactors on the basis of rods supplied by BELGONUCLEAIRE for example.

BELGONUCLEAIRE processes uranium and plutonium oxide powder into MOX fuel rods. Since 1973 SCK•CEN has been a 50% shareholder of the company.

Tecnobel provides services to the nuclear sector and industrial and sanitary maintenance.

IRMM is the Institute for Reference Materials and Measurements. It is a Joint Research Centre of the European Commission and develops European measurement units and standards on a nuclear and non-nuclear level.

Transnubel is specialized in the transport of radioactive materials.

1967



*On May 22, 1967 an estimated 323 people died in the most destructive fire Belgium had ever witnessed. The fire in the Brussels Innovation began at around 13.30 on the top floor and spread to the rest of the building in a few minutes. Apparently the fire safety left a great deal to be desired...
(Photo VUM)*

The operating of the BR2 began on the basis of an agreement concluded in 1968 between Euratom and SCK•CEN. This contract stipulated that the two institutions would operate the facilities, each for their own use, and could make them available to third parties. Between 1960 and 1967 the two institutions divided the investment and operating costs by a ratio of 1/3 for SCK•CEN and 2/3 for Euratom. After 1967 the participation of Euratom was limited to the provision of personnel. From 1963 to 1967 the Centre used BR2 to develop different reactor systems, in particular with gas and sodium cooling, together with Germany, the United Kingdom and France.

The coming into effect of the agreement concluded in December 1968 between SCK•CEN and GfK

(Gesellschaft für Kernforschung mbH in Karlsruhe) marked the year 1969. According to this agreement, the centres in Karlsruhe and Jülich and other German partners on the one hand, and Belgium and Euratom on the other, would jointly operate BR2. This contract formed part of the cooperation between Germany, Belgium, the Netherlands and the Grand Duchy of Luxemburg on fast reactors. The partners repeatedly renewed the agreement. It finally came to an end in 1982, together with the end of experiments for the development of the SNR-300 reactor in Kalkar. SCK•CEN continued the cooperation with the Karlsruhe centre until 1989 for the "Mol 7C" experiments, and finally in the framework of the fusion programme.



A view of BR2



An interior view of BR2

1968



*In May 1968 thousands of students occupied the universities of Paris. They were protesting against the consumer society and wanted to reform the universities. The students were supported in some companies where employees demonstrated or occupied factories. The protest was coupled with cultural innovations in music and art. Ultimately the Parisian authorities regained control of the streets, but the movement spread to other countries, including Belgium.
(Photo VUM)*

STK set up a Medical Department right from the start. This was long before the Royal Decree of April 16, 1965 on compulsory occupational medical supervision. The possible biological effects of ionizing radiation were not as well known then as they are now. This was also the reason why everyone had to undergo a medical examination twice a year and why a first group of radiobiologists was employed in the Medical Department. STK provided full medical services from the very beginning. The department could apply plaster casts, stitch wounds, the doctors made house visits, etc. The Medical Department then also had its own operating theatre and sterilization department for when seriously injured and radioactively contaminated people had to be operated on. In 1965 the radiobiologists moved to the new buildings on the Steenweg op Refie in Geel where the newly set up Radiobiology department was started.

There were also many companies and hospitals in the vicinity whose employees were subject to occupational exposure to ionizing radiation and who were examined by SCK•CEN. In accordance with the newly enacted law on occupational medical supervision in April 1968, the Medical Department was converted to an "Intercompany Medical Department for Occupational Medicine and Radiation Hygiene" (Interbedrijfsgeneeskundige dienst voor Arbeidsgeneeskunde en Stralenshygiëne - IBAS). In 1974, SCK•CEN again had its own occupational Medical Department. It not only monitors the employees of SCK•CEN, but also those of Belgoprocess, BELGONUCLEAIRE, ONDRAF/NIRAS, Vito, the European School and all the personnel of external companies who work in the controlled areas of nuclear companies. In total, this is around 2 800 people per year.



Examinations at the Medical Department



Even in the past, the Medical Department had its own examining rooms.



On July 21, the American astronaut Neil Armstrong was the first man to set foot on the moon. He said the following famous words: "That's one small step for man, one giant leap for mankind".
(Photo UPI)



In 1969 Eddy Merckx won his first Tour de France.
(Photo VUM)

From the end of the Fifties SCK•CEN concentrated research on the nuclear fuel cycle, mainly on the development of nuclear fuel elements made from plutonium for water-cooled reactors. Plutonium forms when uranium is irradiated with neutrons, and can again be split with the release of energy. The reuse of plutonium thus substantially increases the quantity of energy that can be released from natural uranium. Research in this respect brought SCK•CEN and BELGONUCLEAIRE to work together in 1960 on a research contract with the "Groupe Mixte", with the support of the joint R&D programme of Euratom and the USA. Belgium has America to thank for the plutonium for these experiments, through the pilot agreement of 1955. In addition, SCK•CEN could build on the expertise that the USA had already acquired in this area.

In 1962 the first two plutonium laboratories on the SCK•CEN site became active. Engineers and technicians, including Euratom trainees, manned the labs. In 1963, 12 plutonium-enriched fuel rods were placed in the heart of the BR3 reactor and for the first time in the world this form of nuclear fuel produced electricity. At the end of the Sixties it was examined whether plutonium could also be used as a nuclear fuel for breeder reactors. SCK•CEN and BELGONUCLEAIRE also did this research together and it resulted in the production of MOX (mixed oxide) nuclear fuel elements for the fast reactor in Kalkar. A large number of irradiations in BR2 supplemented this research. MOX is a nuclear fuel that consists of a mixture of uranium oxide and plutonium oxide. Currently BELGONUCLEAIRE has its own factory in Dessel for the production of MOX nuclear fuel.



Glove compartments in the plutonium laboratories. A glove compartment is a gas tight cabinet, generally made from transparent plastic, in which operators can work on certain radioactive materials such as plutonium, using the gloves that reach into the cabinet.



The introduction of nuclear fuel assemblies into BR3 in 1963

1970



Paul Mc Cartney announced the break-up of the Beatles in 1970.
(Photo VUM)

By the Royal Decree of June 24, 1970, SCK•CEN amended its statutes in order to widen its field of activities outside the nuclear sector. The Centre had to use its infrastructure more intensively and wanted to make its potential and experience available to non-nuclear activities. In particular, they had specialized expertise and equipment in the field of environmental technology and materials, for example control stations, laboratories

for analysis, microbiology, waste processing, purification of gases, etc. The Centre did research on behalf of the government, science and industry in Belgium and abroad, in the area of the environment, energy applications, materials, information technology, nuclear fuel cells and hydrogen production by electrolysis. Nevertheless the emphasis remained on nuclear activities. Vito took over the non-nuclear activities in 1991.



The energy bus did audits in companies in order to encourage energy savings.



Laser research for cutting metals and treating surface coatings



Sampling river silt for ecological studies

For a long time SCK•CEN had produced and conditioned radioisotopes in BR1 and BR2. At that time the Centre had a Radioisotopes section. In 1970, the Belgian government decided to set up a separate institute for radio-elements.

Initially the plans for establishment caused problems. SCK•CEN had always opposed the geographic distribution of its activities. Some feared that this would harm the national character of the Centre.



The Radioisotopes department at SCK•CEN

In the most extreme case it was feared that SCK•CEN would have two operating offices: one in Mol, national and bilingual, and one in Charleroi, regional and monolingual. Finally the IRE (National Institute of Radio Elements) was set up as an institution of public benefit with a registered office in Brussels, just like SCK•CEN, and laboratories in Fleurus near Charleroi. The statutes were published in the Belgisch Staatsblad (Belgian State Gazette) of December 16, 1971. The institution was

responsible for conditioning, distributing and commercializing radioisotopes, mainly for medical applications, and also for developing applications in other fields, for example for the biomedical and industrial sector. SCK•CEN was responsible for the production. The Ministry of Economic Affairs approved this division of work and income, as set out in an agreement between the two institutions.



The hot-cells at IRE (Photo IRE)



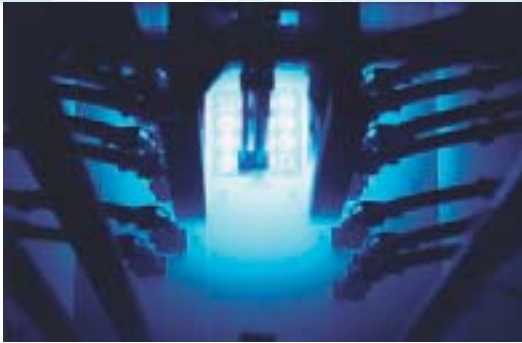
The IRE site in Fleurus today (Photo IRE)



André Baeyens became chairman of the board of directors.

1972

The Thetis reactor is the only reactor ever developed at a Belgian university. The university of Ghent built this research reactor in 1965 together with BELGONUCLEAIRE. In 1972 SCK•CEN made a boiling point detection system for the reactor. (Photo RUG)



In 1972 the Ministry of Public Health asked SCK•CEN to set up a monitoring network to measure lead, zinc, cadmium etc. in the surrounding air. SCK•CEN has its own weather mast in order to collect meteorological and climatological data.



Today the combustion of fossil fuels (coal, oil and gas) still counts for more than 4/5 of world energy consumption. The industrial revolution, which in the middle of the 20th century brought about a greater demand for energy, stimulated research into methods for producing electricity without consuming fossil fuels. The oil crisis of the Seventies made industrialized countries realize that political wranglings on a world level could easily harm them due to their dependence on these fuels. This phenomenon accelerated the development and application of nuclear energy as an alternative source. This technology lends itself to large-scale electricity generation and uranium is extracted in many places around the world, which ensures a stable market situation not influenced by politics. In the meantime, the technology has reached a certain maturity. Two reactor accidents, and the tenacious association between the peaceful use of nuclear energy as an energy source on the one hand, and military use on the other, have embedded a negative perception in the public. The failure of the nuclear industry to show the necessary transparency during

this period, and to set the dialogue on the right track, together with its poor image, ensured a global stabilization of the share of nuclear energy in the energy mix by the end of the previous century. Around 440 nuclear energy power plants currently provide 17% of world electricity. Most are in the USA, followed by France, Japan, the United Kingdom and Russia. The countries with the greatest share of nuclear energy in their energy mix for generating electricity are France (70%) and Belgium (55%). New power stations are mainly being constructed in the countries of Southeast Asia, who have seen considerable growth in their energy requirements. Debate on the use of nuclear energy for the production of electricity is currently being conducted at a political level. This can lead to a negative attitude (certain European countries) and a positive attitude inspired by the aim for market-economic independence (USA). The ever increasing demand for energy (mainly in developing countries) and the threat of the greenhouse effect have brought about new interest in nuclear energy.



As a result of the oil crisis the Netherlands and Belgium introduced car-free Sundays. The cause was the oil boycott by Arabian countries in response to Western support for Israel during the Yom Kippur war.
(Photo VUM)

From the Sixties onwards, SCK•CEN has been confronted with social problems on a few occasions. The unions wanted employee representation in the board of directors. As of 1971 members of the three unions would participate in the meetings in an advisory capacity, and the IOK (Intercommunale Ontwikkelingsmaatschappij Kempen) would represent the regional economy. Some years later, in January 1973, a new social dispute arose.

The unions and some of the employees unleashed a strike further to the blatant dismissal of a number of employees due to budget cuts. The strike lasted for around three weeks. In July the board of directors decided to apply the measures relating to the security of employment, although one union was not prepared to sign the new agreement.

As shown by the maps that the Count de Ferraris had drawn at the end of the 18th century, the area has undergone a true metamorphosis. The typical Campine landscape which came about through extensive agricultural activity, in which the largest area consisted of heathland, was able to be maintained until the middle of the 19th century. After the First World War, forests were planted en masse whereby the landscape was systematically changed into what it is now. Great Campine painters, including Jakob Smits and his pupils from the "Molse school", often praised and applauded the area for its beauty.

In 1990 a forest decree legally regulated the management of the SCK•CEN area whereby the forest functions had to be set out in an extensive management plan. Special attention was paid to the ecological and scientific function, without neglecting the general management of the area. A grazing project with Highland cattle is ongoing, and research is being done into breeding barn owls and other birds of prey. Hawks, tawny owls, kestrels, buzzards and barn owls were ringed. Plants and grasses were also catalogued. Ornithologists are working around the marshes, butterflies are being monitored, and a project is being carried out on the natural restoration of a typical lowland brook. The management is thus oriented towards preserving the ecological cohesion of the region in harmony with the more specific work of SCK•CEN.



Jakob Smits etched "Zandvlakten van de Kongo, te Achterbosch" (Sandflats of the Congo, in Achterbosch). The Congo used to be a company that exploited the Mol sandpits. Today the Nuclea yacht club is located here, from where you have a splendid view of the BR2 and BR3.
(etching - 140 x 99 mm - Jakob Smitsmuseum Mol)

The first microcomputer appeared on the market. Its launch was made possible by the development of the microprocessor: a combination of all the logical circuits needed for a computer on a minuscule slice of semiconductor material. As of then computers could be developed that were much smaller and powerful than the previous generation.

Shortly after its foundation, SCK•CEN played a leading role in the management and processing of radioactive waste in Belgium. From 1956 onwards the Centre dealt with the processing and storage of low-level waste originating from its own activities and from various waste producers, including university laboratories and hospitals. In the Sixties SCK•CEN did groundbreaking research into the processing of radioactive waste and developed advanced technological processes.

In the early Seventies various specialists recognized that the storage of medium-level and high-level radioactive waste was a problem that could jeopardize the future of nuclear energy further to the political decisions made in many countries not to store any waste from third countries. This meant that even small countries such as Belgium were required to develop their own storage systems. International cooperation in this respect also became particularly difficult. Belgium was also confronted with "historic" high-level radioactive waste from the activities of Eurochemic.

In 1974, SCK•CEN developed an R&D programme to evaluate the possibility of storage in deep geological formations. An inventory was made of the potentially interesting areas in cooperation with the Belgian Geological Service. On the basis of that, pilot bores were made, samples were taken and soil analyses of the Boom clay (located under the SCK•CEN site) were done in order to investigate the possibilities for storage in deep clay layers. In 1980 the construction of HADES (which stands for High Activity Disposal Experimental Site) was started on the SCK•CEN site. Hydrogeological and physico-chemical research was done in this underground laboratory, which is located at a depth of 225 metres, and tests were also done on corrosion and the interaction between the containers and the geological environment. The Centre supplemented this field research with laboratory research and studies on the impact on man and the environment. Regular safety and feasibility evaluations include the results of this research and also define the future research needs. Everything points to storage in clay being feasible and safe. With the construction of HADES, SCK•CEN confirmed its leading position on a world level. Today HADES is the reference laboratory for research into geological storage in clay formations.



Freezer tubes in the excavation of the first shaft



The first HADES gallery

1975

In the Sixties the Belgian government gave permission for the operation of the first nuclear power plants for electricity supply. In 1976 the power plants already counted for 20% of Belgian electricity generation and that figure is currently around 55%. The first three power plants in Doel and Tihange started industrial production in 1975. 7 generating stations are currently in operation spread around Doel and Tihange. Together they have a power of 5 600 MW. They are PWR or pressurized water reactors, for which BR3 acted as the prototype.



(Photo Tihange Electrabel)



(Photo Doel Electrabel)

Chronology:

February 15, 1975	Doel 1
October 1, 1975	Tihange 1
December 1, 1975	Doel 2
October 1, 1982	Doel 3
February 1, 1983	Tihange 2
July 1, 1985	Doel 4
September 1, 1985	Tihange 3

The fact that the first Belgian power plants were under construction when the oil crisis broke out, contributed to the Belgian programme being accelerated and expanded. Awareness grew that Belgium was particularly vulnerable, more so than other countries, regarding its energy supplies and that nuclear electricity production was an element in the security of supply. At this time the electricity market was considered to be a particularly stable national asset, such that the particularly long depreciation period for power plants was not a negative factor in the decision. Up until the early Eighties the policy on nuclear energy was rather oriented towards the industrial benefits and technical-scientific perspectives whereby development proceeded faster in Belgium than in most other countries (except France). Only after the Three Mile Island accident in 1979, and the Chernobyl disaster in 1986 in particular, did the emphasis in the political debate shift to the safety of this energy source in various aspects.

After these accidents confidence in science and industry, to keep the risk under control or to keep it at an acceptable level, has waned somewhat.

In this social and political climate, most governments are rather reluctant or even negative about the further development of nuclear electricity production. The maintenance of a nuclear expertise and the further support of safety are currently the main emphases of the authorities on research and industry.

Because of the uncertainty on the European electricity market and the wide supply of cheaper alternatives, there is little demand in the short term from European and American industry for new nuclear power plants. In this respect, the generating industry is undergoing a rationalization and consolidation process whereby the expertise in Europe can be maintained while awaiting the new demand for reactors. The European Commission also supports maintenance of the research potential. In Belgium, political and public sensitivity came out in the government declaration of 1999 which stipulated the reduction of nuclear facilities insofar possible.

In 1975 SCK•CEN got a new director general, Severin Amelinckx, successively professor at the universities of Ghent and Antwerp (RUCA), and a new chairman, Frans Van den Bergh.

(Photo from left to right: Severin Amelinckx, Mrs Amelinckx, Mrs Van den Bergh, Baron Frans Van den Bergh, Andries Kinsbergen - acting chairman in 1991 - and Paul Dejonghe, photo taken on December 5, 1986 at the homage of Baron Frans Van den Bergh)





*Air France and British Airways bring the Concorde into service on the Paris-Rio de Janeiro and London-Bahrain routes.
(Photo Reporters AP)*

In the period of diversification to non-nuclear activities, SCK•CEN created a number of spin-offs. A number of companies wanted to use the technology present within the Centre. SCK•CEN would often withdraw after a couple of years because participation in non-nuclear companies did not belong to the basic objectives. Some well known examples are:

Elenco NV (1975)

Set up by SCK•CEN, DSM and Bekaert, this company was responsible for the development and application of fuel cells. SCK•CEN mainly worked on improving the specific power and lifetime of electrodes.

Recytec NV (1979)

Recytec dealt with the acquisition of knowledge and the industrial and commercial operation of systems and products in the area of energy and raw material recycling. It carried out an initial project on the recycling of second-hand raw materials and fuels from compacted household waste for energy purposes.

Hydrogen Systems NV (1985)

Developed electrolytic equipment for the production of hydrogen.

Indaver NV (1985)

SCK•CEN was the co-founding shareholder of Indaver for the processing of industrial waste together with OVAM (Openbare Vlaamse Afvalstoffen Maatschappij - Flemish Public Waste Agency) and GIMV (Gewestelijke InvesteringsMaatschappij voor Vlaanderen - Regional Investment Agency for Flanders).



Indaver today (Photo Indaver)

The Committee of Wise Men was a research committee under the Ministry of Economic Affairs, that met to make recommendations on the electrical-nuclear facilities of Belgium. There was a strong presence of SCK•CEN experts, i.e. Xavier de Maere as coordinator, and the professors Hoste and Jaumotte as chairmen.

The committee came to a positive decision in 1976 about the further use of nuclear energy in electricity generation against a background of a strong increase in the demand for energy and a reduced supply of oil. The condition was, that the nuclear waste problem could be solved.



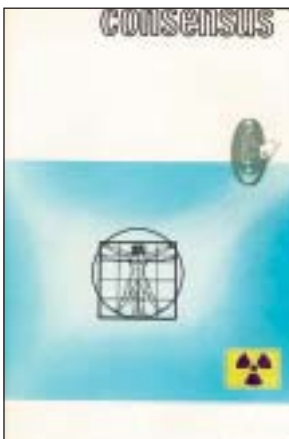
At the end of the Seventies, the punk movement emerged. The punks gained notoriety through their anarchistic ideas, but also from their appearance with Mohican haircuts and safety pins. The most famous representatives in music were The Sex Pistols.
(Photo VUM)

A quarter of a century ago SCK•CEN celebrated its 25 years of existence. The visit of King Baudouin and Queen Fabiola to the facilities of the Centre on October 6, of that year added lustre to this anniversary.



Since the Forties society had developed so fast and so many new discoveries had been made, that the broad public sometimes lost its bearings. SCK•CEN believed that it also had the job of providing information to the interested public on research in both nuclear and non-nuclear activities, and on developments in nuclear energy. In 1977 the Centre started the popularizing magazine Consensus. This journal was a similar initiative to that of the Information bulletin of the Belgian

Association for the Peaceful Development of Atomic Energy that appeared in the Fifties and early Sixties. In addition, SCK•CEN had a number of journals for its own staff with general information on research, and also for example information on births and marriages. The "Personeelsblad" (Personnel Bulletin) of Nuclea appeared between 1960 and 1970, Turn Around between 1987 and 1989, and yet since 1993 Info-Flash.



1978



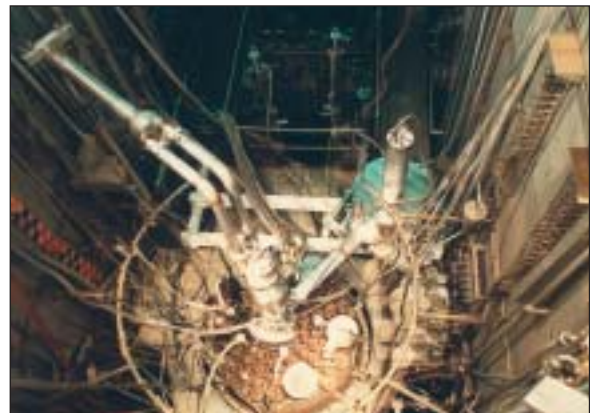
The baby girl Louise Joy Brown was the first test-tube baby in the world. The method of fertilizing an egg "in-vitro" would give many people the opportunity to have children. (Photo Reuters)

Fast neutrons cause the majority of the fission in fast reactors. Not water, but liquid sodium acts as the coolant in order to slow down the neutrons as little as possible. More fissile material can be made in this type of reactor than is consumed. It is thus a breeder reactor. This can increase the profitability of nuclear generated electricity. Initiatives were taken in this respect in various places in Europe from the Sixties onwards. Thus Belgium, the Netherlands, Germany, and to a lesser extent the Grand Duchy of Luxemburg, joined forces in the Debenelux project or the Schneller Brüter project. These countries wanted to develop and build a fast reactor together in Kalkar (Germany), the SNR-300 (SNR stands for Schnelle Natriumgekülte Reaktor). Nuclear power plants, constructors and electricity producers participated in the various countries concerned. SCK•CEN was present for Belgium. The basic research was done between 1968 and 1972. SCK•CEN did

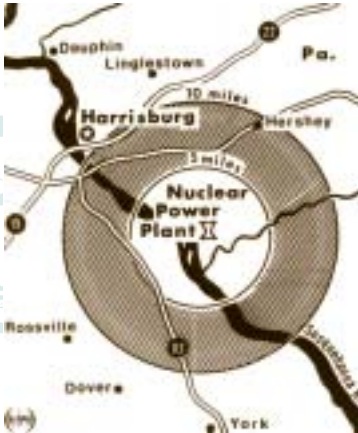
research relating to the nuclear fuel cycle, in particular the behaviour of materials under irradiation, the production technique for nuclear fuels based on mixed oxides, new cladding materials and certain aspects of the reprocessing of nuclear fuels from fast reactors. The "Mol 7C" experiments were well known in this research, which SCK•CEN carried out with the GfK (Gesellschaft für Kernforschung, later KfK, Kernforschungszentrum Karlsruhe and now FzK, Forschungszentrum Karlsruhe). Tests were done in the BR2 in the Mol 7C sodium-cooled circuit in order to study the safety aspects of fast reactors and in particular to examine the behaviour of an SNR-300 nuclear fuel bundle with a partial loss of the sodium cooling due to a local blockage of the sodium flow. The construction of the SNR-300 started in 1973 and had to be ready by 1979. The reactor was never given permission to load the nuclear fuel and start.



The SNR-300 in Kalkar during construction



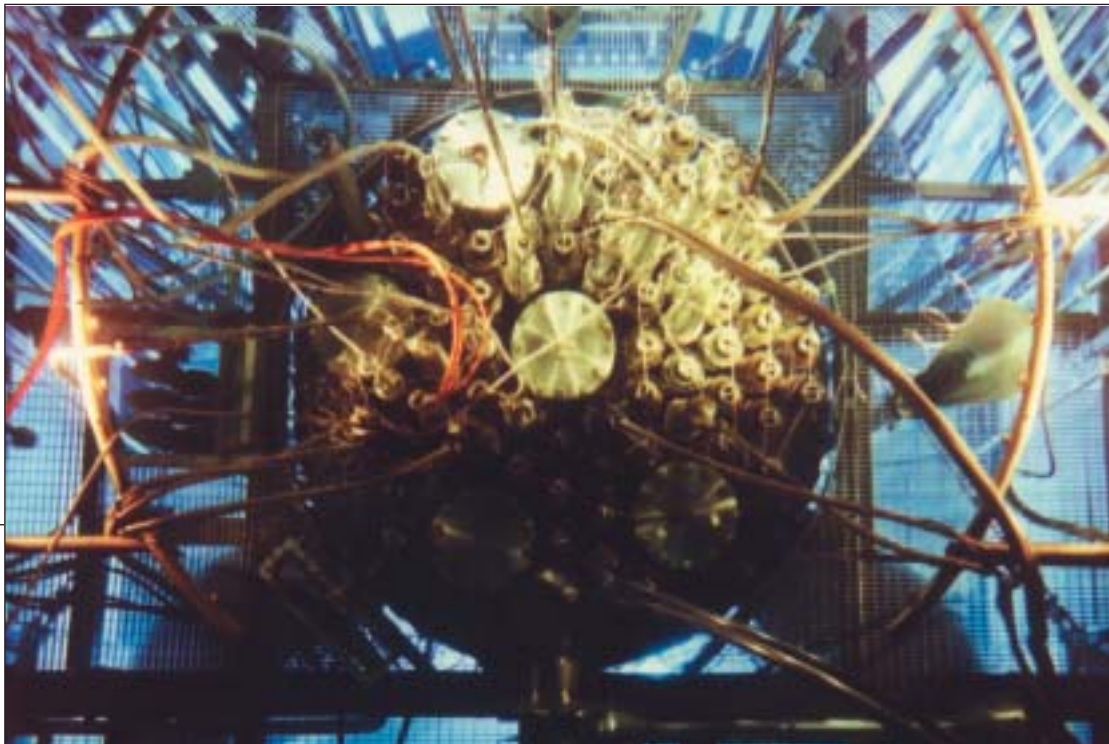
The Mol 7C6 experiment in 1988



On March 28, 1979 there was an accident in unit 2 of the nuclear power plant of Three Mile Island (TMI) near Harrisburg (Pennsylvania) in the USA. It led to a gradual meltdown of the reactor core of this PWR reactor. The impact was considerable, but nobody was harmed and the quantity of radioactive material released was negligible. The incident made it clear, however, that serious reactor accidents were indeed possible. The nuclear world responded with extensive corrective actions, mainly with regard to instrumentation and the role of the operators in order to keep the effect of human error under control. The TMI accident stimulated research into the dynamics of accident scenarios that lead to the meltdown of the core, and emphasized the importance of the resistance of reactor buildings. Safety analysis recognized that the human factor had been strongly underestimated. (Photo Belga)

The central reactor section of BR2 mainly consists of a beryllium matrix, consisting of 79 hexagonal components in which the nuclear fuel elements, the control rods and various end pieces are loaded. Together they form the reactor core. When inspecting the reactor with a television camera in 1974, a number of tears were discovered in the matrix. This came about because the neutron irradiation and the absorbed dose hardened and swelled the beryllium, causing it to fracture.

As it was decided that operations could only continue to be guaranteed subject to replacement of the matrix, the replacement operation was started in January 1978 and would last until early 1980. BR2 started producing chain reactions again on May 12, 1980. The matrix remained in use until the second overhaul and refurbishment in 1995. Then the beryllium matrix of BRO2 was adapted to the third matrix of BR2.



View from above of the BR2 reactor

In the mid Sixties research was done in France and Germany on the vitrification of waste. Vitrification is a method for converting high-level radioactive fission products, that occur during reprocessing, into a product that is suitable for final storage. The waste is embedded in molten glass. In 1980 a plan was conceived to build a demonstration unit of the German system on the Eurochemic site, which later became Belgoprocess, in Dessel for processing stored high-level radioactive liquid waste. In 1981 the first stone of PAMELA

(Pilotanlage Mol zur Erzeugung Lagerfähiger Abfälle) was laid. SCK•CEN already had experience at that time in developing systems for the gas purification of nuclear processes. Hence SCK•CEN was assigned with developing filter material for removing light volatile components such as caesium and ruthenium from waste gases. SCK•CEN would be responsible for testing the analytical equipment required for monitoring the gas purification units.



Shielded cells in the PAMELA building
(Photo Belgoprocess)

On an international level a valued tradition of cooperation grew, including with the IAEA, NEA and the European Commission. SCK•CEN concluded several cooperation agreements and received many international assignments. For SCK•CEN these initiatives meant recognition of its scientific knowledge and experience.

IAEA

is a sub-organization of the UNO's world central intergovernmental forum in Vienna for scientific and technical cooperation in the nuclear sector. In 1957, 18 states ratified the statutes of the IAEA and thereby officially set up the agency. Belgium joined in 1958. The IAEA currently has 132 members. IAEA stands for "International Atomic Energy Agency". SCK•CEN works with the IAEA on safeguards, for example, and Belgium recently offered to provide the underground laboratory (HADES) to the IAEA for extensive international cooperation.

NEA

is the nuclear energy agency of the OECD in Paris. This agency provides assistance to member states for the maintenance and further development required for the safe, environmentally friendly and economic use of

nuclear energy for peaceful purposes, through international cooperation on a scientific, technological and legal level. Belgium is one of the 27 member states of the NEA who together represent around 85% of the countries having nuclear facilities. NEA stands for "Nuclear Energy Agency".

EC-Euratom

does joint research into peaceful applications of nuclear energy. SCK•CEN worked on a number of research programmes of the European Commission right from the start. This also encouraged cooperation with other research institutions, including universities. SCK•CEN always participated actively in the programmes of the European Commission.

Alongside research, Euratom is also responsible for monitoring the non-proliferation of strategic nuclear materials in the European Union, for drawing up European regulations on radiation protection, and for controlling the environmental impact of nuclear facilities. Over the years the experts of SCK•CEN have been called in on many occasions for this work.

The Space Shuttle was launched on April 12. It was the first spaceship designed to be used more than once.

In the early Eighties SCK•CEN was doing a lot of work on waste management. Nevertheless the Centre did not want any long-term responsibility for waste, for example the storage of long lived isotopes, unless the government specifically assigned it with this task. However, the government chose to set up a separate organization. ONDRAF/NIRAS or the Belgian Agency for Radioactive Waste and Enriched Fissile Materials was born by the Act of August 8, 1980, and the statutes appeared in the Belgisch Staatsblad (Belgian State Gazette) on March 30, 1981.

ONDRAF/NIRAS would be responsible for all radioactive waste on Belgian territory, for the prevention, limitation, sorting and identification of waste, for the processing,

temporary storage, the long-term management, and transport of waste, and for work relating to decommissioning, inventorizing and managing enriched fissile materials. As early as 1981 it was decided that SCK•CEN would transfer the facilities and employees of the waste processing department to ONDRAF/NIRAS. In 1983 ONDRAF/NIRAS took over the relations with waste producers while SCK•CEN continued to operate the facilities in combined management. The final transfer followed on March 1, 1989. ONDRAF/NIRAS currently uses SCK•CEN for studies and research projects, mainly relating to the storage of radioactive waste.

Work in the former waste processing facilities of SCK•CEN



With the support of the European Commission, on October 19, 1981 SCK•CEN started a scorifying furnace for low-level radioactive waste, possibly containing plutonium. This FLK-60 incinerator enabled burnable and non-burnable waste to be treated together. The unburnt materials were melted together with the ash into a slag in a basalt-based granulate, in which the radioactive isotopes were fixed. SCK•CEN later sold a patent for the facility to the Japanese company JGC who operates such a furnace locally.

1982



*In the early Eighties there were demonstrations in a number of European cities against nuclear energy and nuclear weapons. The possible placement of American missiles on Belgian territory created a lot of commotion and Greenpeace took action against ships that dumped radioactive waste at sea. There were also protests in Mol.
(Photo Gemeentearchief Mol)*

Since the Sixties trains had carried varying quantities of conditioned and packaged low-level radioactive waste from the freight station in Mol to Zeebrugge, to then be shipped to a dumping site in the ocean. The waste came from various institutions, including SCK•CEN, the IRE, hospitals, the nuclear power plants of Doel and Tihange, Metallurgie Hoboken-Overpelt (MHO), Olen department, and other institutions in Switzerland and the Netherlands. This waste was conditioned in bitumen or concrete and then packaged in containers. All the waste was low level and remained far below the standards set by the London Convention. This world-wide convention was to prevent pollution of the sea through the dumping of waste. The national rules and regulations were also respected and there was also supervision by the NEA and the OECD. Ships took the containers to a dumping zone with a depth of 5 000 metres, around 750 km to the west of the Irish coast.



(Photo Consensus)

During a dumping operation in 1982, Greenpeace conducted actions to obstruct and slow down the work. The talks on banning dumping at sea were in full progress at that time. In 1994 Belgium signed the London Agreement relating to the ban on dumping radioactive waste at sea.

The end of the possibility to dump low-level radioactive waste (mainly the waste that had already been prepared for sea dumping) led to urgent storage problems for the Waste Department. Today, the possibility of permanently storing low-level short-life waste is being investigated in consultation with the population. Various countries already operate such facilities.



The "Centre de l'Aube" in Soulaines houses the French low-level radioactive waste with a short half-life in bunkers, filled and covered with concrete and shielded with plastic. When all bunkers are full, within 60 years, they will be covered with clay, bitumen, drainage layers and finally with topsoil and grass in order to give the environment a natural appearance again. Around 40 members of MONA (Mols Overleg Nucleair Afval vzw) visited the site in April 2001. A similar facility was earlier brought into use in France in the "Centre de la Manche". This storage site is now full and the final sealing is in operation.

(Photo MONA)



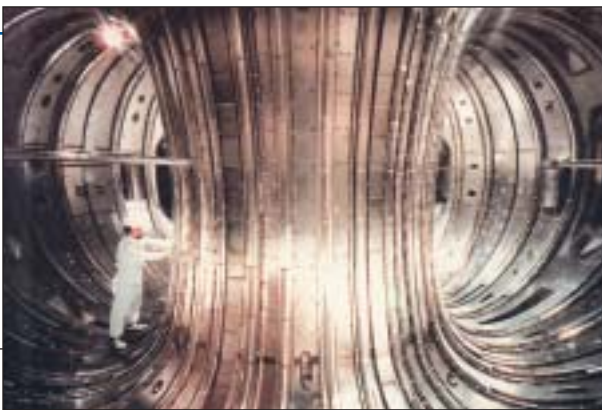
The famous cartoon artist Hergé, the creator of Tintin, died in 1983. The "Objectif Lune" (Objective Moon) story appeared in 1953 and portrayed a reactor that resembles the BR1. (Photo © Hergé / Moulinsart 2002)

The "Euratom-Belgian State for Fusion" association, set up in 1969, consisted on the Belgian side, of research groups from the Royal Military School and the Free University of Brussels. SCK•CEN concluded a cooperation agreement in 1975 and became an associated laboratory in 1982.

In 1983 the research efforts into fusion technology saw a substantial increase as a result of the approval of a series of research contracts with the European Commission. In nuclear fusion, one or more new atomic nuclei are formed with less mass than the combined mass of the original nuclei. Binding energy is thus released. The purpose of fusion research is to enable control of the fusion reactions and thus to be able to usefully apply the energy released in the form of heat. In the meantime, fusion energy has grown into one of the largest international research programmes, with a crucial relevance in the current debate on future sustainable development and energy production.

The European Commission largely aimed its programme at the JET and NET projects. JET stands for Joint European Torus and is the world's largest tokamak (using magnetic field positioning) for experimental research in the field of thermonuclear plasmas. JET is located in Culham (United Kingdom) and came into use in 1983. NET stands for Next European Torus, a preliminary design study aimed at demonstrating the physical and technological feasibility of a fusion reactor based on the tokamak principle. In the meantime the NET initiative has moved over to the ITER project where Europe, Japan and Russia are now working together on the International Thermonuclear Experimental Reactor.

The research in Mol, originally aimed at lithium technology and corrosion and mass transfer studies, is now focused on the behaviour of fusion components and materials under neutron and gamma radiation (material structure, instrumentation). In recent years this has also been extended to safety and decommissioning studies, and with research into the social acceptability of thermonuclear fusion.



The experimental machine JET
Interior view of the vacuum vessel
(Photo Consensus)



In order to eliminate tritium from liquid effluents of a reprocessing plant, SCK•CEN developed the ELEX process.

1984



In 1984 the International Red Cross announced that despite the presence of many aid organizations, around a million people in areas of Ethiopia affected by famine and drought could not be helped. A civil war in the north in particular was hampering the aid efforts. Various initiatives sprang up around the world to help people, for example Live Aid, with appearances by many artists.
(Photo Reporters AP)

On August 25, 2 ships collided with each other off the coast of Ostend. One ship, the Mont-Louis, had containers on board filled with toxic uranium hexafluoride. Measurements by SCK•CEN employees showed that nothing had been released.
(Photo W. Slegers)



In order to respond to the political demand for diversification, the SCK•CEN management contacted the American Stanford Research Institute (SRI) to do a study on diversification and the maximum exploitation of the research results. A joint team from SRI and the SCK•CEN looked for opportunities that were in line with the skills of the Centre, for which there was a market demand and which took account of the social forces that came into play. Eight hundred ideas were generated in the field of materials, environment, energy and technology, from which 50 potential projects were distilled. These projects were given a score on the basis of criteria such as low

investment cost, potential for the Belgian market, competition, potential market growth, long-term market prospects, compatibility with the Belgian situation, existing SCK•CEN strengths, need for further research, possibilities for patents and innovation potential for SCK•CEN. The projects that scored the best were chemical and physico-chemical sensors, the provision of technical test and evaluation services, membranes, micro-organisms, ceramic materials and biotechnology. You will see most of these subjects appear in the Vito annual reports.

The Centre did fundamental research right from the very first years, mainly on neutron physics, solid state physics and radiobiology. The researchers published many scientific papers and often worked together with universities and institutions in Belgium and abroad. In the Seventies and Eighties the fundamental research took on an increasingly applied character, partly in cooperation with industry.

SCK•CEN developed the Mibemol time-of-flight spectrometer for materials research using neutrons, under an agreement with the IKW (Interuniversitair Instituut voor Kernwetenschappen - Interuniversity Institute for Nuclear Sciences).

This was built at the ORPHEE reactor of the Laboratoire Léon Brillouin in Saclay (France). After installation in France, the spectrometer was used by the Centre up until the early Nineties, as well as for dozens of projects for foreign research institutions. With the time-of-flight spectrometer in Saclay, the SCK•CEN studied molecular and ionic movements in crystals using inelastic and/or quasi-elastic scattering of neutrons.

Fighting broke out between rival supporters before the kickoff at the European Cup final between Liverpool and Juventus Turin. The ensuing panic resulted in 39 dead persons. The drama in the Heysel stadium raised many questions about the organization and safety measures at football matches.

In 1977, commissioned by the “Dienst voor Nijverheidsbevordering”, and in the framework of the non-nuclear activities, the possibilities for using “soft energy sources” (sun, wind and geothermal energy) in Belgium were investigated, together with their potential for industrialization. SCK•CEN thus developed solar collectors in order to study the use of solar energy for heating and electricity production. Employees at the SCK•CEN Main Workplace did many designs.

In 1981 a 10 m² solar collector was installed on the roof of the Solar Cell building to research the thermal conversion of solar energy. The heat output was then examined.

In order to put this experience into practice, SCK•CEN decided to build a small solar facility with collectors in Hulshout, with the support of Bloso, to heat a swimming pool and provide hot tap water.

For research into the photovoltaic conversion of solar energy, research was done into amorphous silicon as a suitable material for the production of solar cells due to its strong light absorption and high photoconductivity.

The solar collectors on the roof of the Solar Cell building



Throughout its history SCK•CEN has developed many answers to the challenge of the non-proliferation (uncontrolled distribution) of nuclear weapons.

It developed skills with regard to the accounting of nuclear materials, the destructive and non-destructive metrology of nuclear materials, and gave suitable advice to the Belgian authorities. In order to be able to guarantee this advisory role, it was necessary to monitor developments in international law and regulations.

The concern of SCK•CEN regarding non-proliferation is an expression of the Belgian undertaking in this respect. It was further expressed through intensive contacts with Euratom and the IAEA, through the active partnership in ESARDA (European Safeguards Research and

Development Association) and through the development of a technical support programme for the application of safeguards for the IAEA. There were also demonstration projects in nuclear facilities in cooperation with the Belgian nuclear industry, theoretical studies, etc. The materials researched were both fresh and irradiated materials in all stages of the nuclear fuel cycle. In this respect, SCK•CEN has its own extensive research programme and draws in university and polytechnic students. The successful cooperation with the Free University of Brussels in a PhD thesis is a good example of this. SCK•CEN has also set up a laboratory for the non-destructive characterization of the various waste flows by direct measurement of the spontaneously-emitted gamma rays or neutrons.



SCK•CEN uses a Q² test system for low-level waste in order to measure the radioactivity.

1986

Chernobyl is in the Ukraine, close to the border with White Russia and Russia, approximately 2 000 km from Belgium. There were four nuclear reactors at the Chernobyl nuclear power plant. Reactor number 4 exploded on April 26, 1986 at 1.23 in the morning. Because of the atmosphere of secrecy that then prevailed, the Soviet authorities did not announce this serious accident. The wind carried the radioactive cloud that was released. It reached Finland and Sweden on April 28, where an increase in radioactivity was measured. Some time later the Soviet authorities confirmed that there had indeed been an accident in a nuclear reactor in Chernobyl. A radioactive cloud reached Belgium on the night of 1 to 2 May 1986. This was observed by SCK•CEN through a slight increase in the measurements from its measuring equipment. From then on there was an extensive

measurement programme in order to monitor developments and give advice to the government. The radioactivity of numerous vegetables, other foodstuffs, drinking water, grass, milk, etc. was measured. The Centre and the government used the Emergency Room for many days in order to answer telephone enquiries from all over Belgium. The accident caused acute radiation sickness to 134 people in Chernobyl, 28 of which died in the first few weeks. Two emergency workers were killed in accidents. The lives of people in the vicinity of Chernobyl were very seriously affected, and for some population groups there was a substantial deterioration in their health. For the Belgian population, the impact of the Chernobyl accident was negligible.



A view of the destroyed reactor
(Photo Reuters)

SCK•CEN researchers carrying out measurements in the neighbourhood of Chernobyl



Agalev wil onderzoek naar Afval- en Vergunningenbeleid

Direkteur Amelinckx: 'Onderzoek zeker niet afgesloten'

Some newspaper headlines from the period (Agalev wants investigation into waste and licensing policy - Amelinckx, director: "Investigation certainly not complete")

The "TRANSNUKLEAR scandal" (abbreviated to TNH) probably marks the darkest period in the history of the SCK•CEN. TNH was the German transport company located in Hanau near Frankfurt, that in the years 1980-1987 transported nuclear waste from Germany, Switzerland and Italy to Mol in order to be processed and conditioned here.

In 1987 it came to light through the German press that TNH had won people over with fraudulent practices, both among the producers of waste and in Belgium, and used the waste to generate a circuit of black money. SCK•CEN came into the media spotlight because the head of the Waste Processing department was involved, together with a Belgian company that provided miscellaneous services. The courts of Hanau and Turnhout initially convicted all of the individuals involved, but in Belgium serious procedural errors ensured the discharge of a number of people concerned in proceedings in the Court of

Cassation. The rights of defence had been violated by the simultaneous examination of the Belgian suspects by the parliamentary investigation committee. On the civil side, SCK•CEN then put in a claim for damages against the company in Belgium, which is still ongoing.

Despite the crisis that the TNH scandal brought about, in the Nineties an arrangement was made with all the (main) German producers, together with ONDRAF/NIRAS, and the nuclear waste was largely taken back.

In addition to the financial drain and the damage to its image, the TNH scandal demonstrated that SCK•CEN had inadequately organized itself to optimally perform industrial operations on such a scale. A strict quality control of its obligations, contracts, billing and production costs remedied this. Belgoprocess took over the industrial processing of radioactive waste and installed new processing units.



From left to right:

Paul Dejonghe, Remi De Cort and Georges Stiennon jointly took over the interim day-to-day management of the Centre for a while in 1987 and 1988. Paul Dejonghe was acting director general. Ivo Van Vaerenbergh was chairman.

1988

In 1988, the third state reform took place. In particular, the Brussels Capital Region took shape and the Communities and Regions were given greater authorities. In this year, King Baudouin spoke of Belgium as a federal state for the first time.

Royal Decree No. 515 of March 31, 1987 to restructure the finances of SCK•CEN required the Centre to submit a restructuring plan and obtain additional financing. The demand for a restructuring plan followed an audit done by Arthur Andersen for the trustees. The "action plan 1988-1993" contained the following objectives:

- Adaptation of the programme to the development of strengths in a limited number of fields;
- Rejuvenation of the personnel structure;
- Reduction of the costs of the nuclear infrastructure;
- Renovation of the infrastructure;
- Reduction of general costs.

In order to achieve these objectives, a new collective labour agreement had to be introduced for compulsory/voluntary early retirements, the shut-down of BR3 and the rationalisation of general functioning. The new director general who started in 1988 had the main task of implementing this "Turn Around" plan. Research was limited to subjects in which the most know-how had been acquired and which had a future, the personnel structure was rejuvenated and adapted to the capacity of the company and the costs linked to the nuclear infrastructure were decreased.

The renovation had its inspiration in a "corporate charter" that set out the main principles of SCK•CEN.



Carl M. Malbrain becomes director general.



In the Eighties the economic situation deteriorated, largely as a result of the oil crisis, also for SCK•CEN. Inflation quickly drove wages upwards, with a government already looking for savings that could not compensate for these costs. This led to successive restructurings and the early departure of 656 people, under conditions set in collective labour agreements.

On the other hand it was also realized that the ultimate decommissioning of the nuclear facilities of the Centre would require many resources that had not been provided. In this respect, the situation of SCK•CEN differed little from that in practically all foreign facilities.

On December 18, 1990 the Minister of Economic Affairs and the Centre concluded an agreement on financing both liabilities. The government would finance the costs of early retirements provided in the collective labour agreements of 1986-1987 and 1988-1990, and the decommissioning of the facilities, as they existed on December 31, 1988. This was a total of M€ 228 (1988 value).

Since then SCK•CEN has made provisions in its own capital and reserves for the decommissioning of new plants and the disposal of radioactive waste in the future.

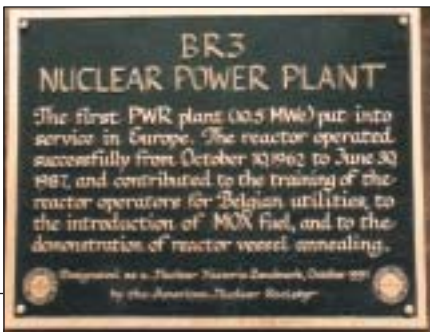


After the Second World War, Germany and Berlin were split into two parts. The USA, the United Kingdom and France converted the one half into a democratic republic, the USSR the other into a communist state. An "Iron Curtain" kept the two halves apart. Only in 1989 did the leader of the East Berlin Communist Party announce the opening of the border with West Berlin. Shortly afterwards there was a mass migration and the residents celebrated the "fall of the wall".

(Photo Reporters AP)

On June 30, 1987 SCK•CEN stopped the BR3 operations because it could no longer satisfy the operating licence due to the problems in demonstrating that the integrity of the pressure vessel was assured in all circumstances. BR3 was the first PWR reactor in Western Europe and would also be the first to be decommissioned. In 1989 the European Commission decided to select BR3 as a pilot project to demonstrate the technical feasibility of the decommissioning of a PWR. Thereafter SCK•CEN also demonstrated that the costs of this could be kept to a minimum, with the strict safety of personnel, people and the environment taken into account.

Decommissioning started by decontaminating the primary cooling circuit. Then the internal structures of the reactor vessel, which support the reactor core and the instrumentation, were cut into pieces with existing but modified cutting techniques, and then taken away and stored. Because water provides excellent protection against radiation, and also enables a good direct view of the work, these activities were done under water by remote control. In 1999, the 28 tonnes weighing reactor vessel was lifted out in order to be dismantled in the same way. This event was a first for Europe and could be directly monitored on the Internet. During the decommissioning, groundbreaking work was done in the development of robots and telecontrolled tools in order to keep the exposure of employees to radiation during the decommissioning work as low as possible. According to the schedule, the plant will be fully decommissioned in 2007.



The American Nuclear Society recognized BR3 in 1991 as a "Nuclear Historic Landmark".



The decommissioning work requires special safety clothing.



In 1999 the vessel was removed amid great attention.

In 1956 SCK•CEN obtained a licence to release liquid radioactive waste into the Molve Nete in order to dispose of the remaining radioactive waste not caught by the purification equipment of the waste processing units. The law stipulated a release limit derived from a possible maximum dose of 5 mSv/year for members of the population. In the spirit of the Sixties and Seventies this release limit was regularly fully utilized in practice. This caused measurable contamination on the banks of the Molve Nete, but within the limits of the allowed exposure for the population. The distribution of these environmental measurements caused considerable protest among the population. SCK•CEN made all of its

measurements public and endeavoured to explain the matter to the action groups. The fact that the release pipe, which was originally only on SCK•CEN site or public land, was now also on private land after the sale of some land, was a source of much commotion. In the meantime the release licence has been transferred to Belgoproces, the maximum allowed exposure has been reduced to 1 mSv/year, in accordance with the regulation of 2001 and more attention is paid to the optimization principle (ALARA or As Low As Reasonably Achievable). The current releases of Belgoproces are limited to a very small fraction (0.3% in 2000) of the reduced release limit.



The Molve Nete (Photo Belgoproces)

Since 1989-1990 SCK•CEN has actively worked on the economic and social development of the region. First of all the Centre became a member of the "Strategisch Plan Kempen" (SPK - Campine Strategic Plan) whose aim in 1988 was "to develop the district of Turnhout into one of the most prominent European regions". This is done, for example, through the PLATO project, in which SCK•CEN provides executive staff to support SMEs in various

fields such as management, personnel, quality and the environment. Moreover, SCK•CEN is an active member of the non-profit association INNOTEK, the innovation association, located in the "Technologiehuis van de Kempen" in Geel, where it is also a member of the board of directors, and of the "Kempens Bedrijvencentrum", also in Geel.

SCK•CEN was split by the Royal Decree of October 16, 1991 (Belgisch Staatsblad (Belgian State Gazette) November 22, 1991). The non-nuclear activities were transferred to the Region of Flanders who set up Vito, which stands for "Vlaamse instelling voor technologisch onderzoek" (Flemish institute for technological research). In 1989, 37% of the national subsidies for the Centre were transferred to the Region of Flanders. This 37% was roughly equal to the share of non-nuclear activities of SCK•CEN. Vito was thus regional and Flemish. SCK•CEN

remained under federal supervision. A split meant a marked decrease in personnel and accompanying technical and scientific expertise, facilities and financial resources for nuclear research. Nevertheless, SCK•CEN started to work on a qualitative revival with the emphasis on nuclear reactor safety experiments, research on radioactive waste, decommissioning, and radiation protection. Vito concentrates on research into the environment, energy, raw materials and materials.



The main entrance is an entrance for both SCK•CEN and Vito staff.

Professor Roger E. Van Geen (deceased in 1995), the former rector of the Free University of Brussels (Dutch-speaking) and chairman of the National Board for Scientific Policy, became chairman. After the resignation of chairman Van Vaerenbergh, Andries Kinsbergen, governor of the Province of Antwerp, was temporarily acting chairman.





On March 24, 1992 Dirk Frimout was the first Belgian to go into space with the American space shuttle Atlantis. Dirk Frimout visited the Centre on November 14, 1994.

In 1987 the SCK•CEN board of directors set up the WAC (Wetenschappelijk Advies Comité - Scientific Advisory Committee) and the DACs (Departementele Advies Comités - Departmental Advisory Committees). These advisory bodies would assist management in the definition and streamlining of the scientific programmes. They have to help assess the scientific activities and output. There are currently three DACs, the radioactive waste and decommissioning DAC, the radiation protection and decontamination of contaminated areas DAC and the reactor safety, nuclear fuels and reactor materials DAC. A direct consequence of the work of these bodies is the AWM programme (Aspirant Wetenschappelijk Medewerkers - Trainee Scientific Workers).

Since 1992 the Centre has recruited 46 scientists under this status, all postgraduate or post-doctorate researchers, in an attempt to draw in strong young talent from universities. Eighteen of them have already graduated, 5 have chosen other jobs, and the others are working hard to complete their theses.

On April 20, 2001, the biennial prize Prof. Roger E. Van Geen has been awarded to Kristiaan Temst from the KU Leuven.



In the early days STK was a demanding organization for training, mainly with the Americans and to a lesser extent the British. Immediately after construction of the laboratories and reactors, SCK•CEN started providing its own training through work placements for students from universities and polytechnics. In 1962 around 300 students, half of which were foreigners, had a work placement there. Typical was the role of BR3 in training operating staff from Belgian and even French nuclear electricity power plants. With its nuclear laboratories and reactors, the applied research and practical training was quite complementary to the rather fundamental research at the "Interuniversitair Instituut voor Kernfysica" (Interuniversity Institute for Nuclear Physics), later the IIKW, and the basic education given at universities and polytechnics. In this period and in subsequent decades, many SCK•CEN scientists held teaching posts at universities. In the early Nineties SCK•CEN launched a new programme to rejuvenate its personnel and to provide training in order to bridge the gap caused by successive waves of retirements for example. Every two years the Centre awards the "SCK•CEN - Prof. Roger E.

Van Geen Scientific Prize" for work that provides an original contribution or makes substantial progress in the area of fundamental or applied nuclear research (value: € 12 500). Each year, prizes of € 1 500 and € 1 000 are awarded for the best university and polytechnic thesis. These initiatives add to the work on "lifelong learning" or "continuous training". SCK•CEN continually organizes training for its own personnel, or its personnel goes to specialized courses outside the Centre. SCK•CEN organizes training for third parties together with the IAEA or the European Commission. Typical examples are the "international school for Radiological Protection (isRP)" and the TC-OCEM courses (Training Course - Off-site Emergency Management). The European Commission recently accepted an SCK•CEN project, ENEN (European Nuclear Engineering education Network) with 22 European partners, to set up European training for nuclear engineers. SCK•CEN also took training initiatives on radiation protection in medical nuclear diagnosis and treatment. Recent European legislation is the driving force in this respect.



On July 31, 1993 King Baudouin died in Motril (Spain) from a cardiac arrest. After the death of his brother, Prince Albert took the oath on August 9, as the sixth King of the Belgians. (Photo VUM)

As the first large nuclear institution in Belgium, SCK•CEN has always paid a lot of attention to the development of an internal Emergency Plan. The objectives of this plan are:

1. To set up, coordinate and if necessary strengthen the intervention teams and resources at the site or in the immediate vicinity of the accident, in order to limit the impact of it for the site and the environment as much as possible.
2. To immediately warn internal employees, external employees and visitors on the technical site of SCK•CEN and Vito.
3. To announce and pass on all necessary information to the Coordination and Crisis Centre of the Government (CGCCR) and to qualified authorities.

There are two distinct nuclear alarm stages within SCK•CEN: Site Emergency (incident limited to a facility - no release) and General Emergency (release risks or actual discharge into the environment). In the "Site Emergency" stage, the members of the Emergency Room (SCK•CEN crisis centre) meet to evaluate the situation. Sirens announce a "General Emergency". This is the signal for people to muster at specified areas. The Emergency Plan building responsables communicate instructions to the personnel issued by the Emergency Room. SCK•CEN also has a number of measurement vehicles to take measurements at the site of the accident or in the vicinity.



The measurement unit of SCK•CEN during an emergency plan exercise in Chooz

The strength of SCK•CEN has been proven at the time of incidents such as the sinking of the Mont-Louis close to the Belgian coast, and especially after contamination of Belgian territory after the reactor accident in Chernobyl. A Royal Decree approved in 1991, describes the Emergency Plan organization for nuclear accidents with an impact on Belgian territory. SCK•CEN has various roles in this respect. In addition to its role as a nuclear operator, the Centre also acts as an advisor within the "evaluation unit". This unit has to assess the impact of an accident on the basis of technical data, measurements and calculations, and convert them into advice for a committee of ministers, which has to decide on what protective measures to take. Within Flanders, SCK•CEN also coordinates the teams who take measurements. SCK•CEN can deploy measuring teams over the whole of

Belgium. Finally there are high-performance accredited laboratories that enable food samples or samples from the environment to be analysed in detail. In everyday practice, outside crisis situations or exercises, the Centre works constructively with the government on a federal, provincial and local level. This results in training sessions, support for information campaigns, representation of Belgium in international advisory bodies, etc. SCK•CEN also develops computer models to assess the impact of an accident as quickly as possible, often even before the release. SCK•CEN plays an important role at a European level in training decision makers by organizing courses in Belgium and abroad or by producing manuals. It also contributes to a substantial extent to European research on computer systems to support decision-making in nuclear emergency situations.

The QA or Quality Assurance system at SCK•CEN is a management system that was started in 1993 in three routine laboratories under pressure from external customers. In the meantime this has grown into about twenty groups, not only in routine laboratories but also in research laboratories and projects, and in a service or production environment such as BR2.

The aim is to guarantee a minimum level of quality in SCK•CEN output, whether it be scientific publications, analytical results or products such as radioisotopes. To this end, a number of procedures have been drawn up and the system has been constructed from the bottom-up in order to ultimately come out into a set of well considered internal directives. In this way, a good substrate is created for a process of continuous improvement.

The success of the implementation has been endorsed and accredited since 1995 by external organizations such as Beltest and BKO (Belgische Kalibratie Organisatie - Belgian Calibration Organization) for routine analyses and calibrations according to the ISO 17025 standard.

In order to manage this knowledge (more than 1 000 procedures have already been produced) a website has been developed as a source of information, training and communication for the personnel. This system has now been supplemented by an automatic system of corrective and preventive measures for complaints, audits, etc.

In addition to the above benefits, all this leads to better traceability of data, clarification of the internal organization, an open and transparent culture, and to debate on the internal organization and an increase in the technical knowledge of the research and analysis methods.



The ISO 17025 certificate

SCK•CEN has been using computers since the Sixties. The first central computer was a Ferranti. In addition, the Centre also used minicomputers in scientific set-ups. In 1970 there was a switch to a central mainframe, not just for computational work but also for office work and communications. In 1990, 160 terminals were connected to the mainframe for 500 users. In early 1995 a local network of personal computers replaced the mainframe. Still before the ascent of the personal computer, small computers such as the Commodore PET were popular, for which SCK•CEN designed and commercialized expansion cards. The use of the personal computer came in slowly: in 1990 there were just 150 in use. Today there are around 900 computers for 600 users.

SCK•CEN was connected to the EARN, the computer network for the academic and research community. It was

possible to communicate and share computing capacity with other large computing centres over the network. In 1993 this network was replaced by the Internet.

Up until the mid Eighties there was no central computing department but there was the Applied Mathematics section that formed part of the Reactor Studies department. This group developed many internal applications and at its summit consisted of 32 people. In the demerger with Vito, a large proportion of the computing facilities went to Vito. Hence SCK•CEN set up an Infoplan project to wind down the use of the mainframe, which resulted in the installation of a computer network, an extensive stock of PCs for office applications and the establishment of an internal information technology department. Some Unix workstations are still used for specific applications. Linux was also recently introduced.

1995

On June 21, 1995 the EIG PRACLAY was set up. EIG stands for Economic Interest Group, PRACLAY for Preliminary demonstration test for CLAY disposal. SCK•CEN and ONDRAF/NIRAS set up this joint venture in order to extend the underground laboratory with the PRACLAY project. The aim was to demonstrate the technical and operational aspects of the storage concept for high-level and long half-life waste and to build a pilot installation as a model for industrial operation. The existing HADES would be extended by an additional shaft and connecting gallery, and a PRACLAY gallery would be built, along with a demonstration gallery and mock-up. On December 18, 2000, the statutes of the EIG PRACLAY were amended. In addition to greater autonomy and some technical changes to the statutes, the name was changed to EIG EURIDICE. EURIDICE stands for European Underground Research Infrastructure for the Disposal of nuclear waste in Clay Environment. The group

now manages the above-ground and underground infrastructure, the first and second gallery of HADES (the lab and test drift), the connecting gallery and the PRACLAY gallery. The second shaft was completed in 1999.

The connecting gallery will be completed this year. The PRACLAY project has a long start-up and winding-down phase. The final report is planned for 2015. The photo shows the EURIDICE entry shaft.



At the end of 1994, after a world slump in the supply of Molybdenum99 (^{99}Mo), the most frequently used radioisotope in nuclear medicine, IBA (Ion Beam Applications, Louvain-la-Neuve) proposed producing ^{99}Mo on the basis of the ADS (Accelerator Driven System) concept. IBA asked SCK•CEN to be responsible for the designs of the sub-critical core of this ADS and to determine its performance. In 1995 the Centre decided

to become a partner in the project and was responsible for the design of the sub-critical core and the spallation target. This new system for the production of radioisotopes would be called ADONIS or Accelerator Driven Operated New Isotope System. IBA would be responsible for designing the particle accelerator. The feasibility study concluded in 1997, that ADONIS should be able to produce half of the world demand for ^{99}Mo .



Paul Govaerts became the new director general.



After the death of professor Roger E. Van Geen, Jean-Marie Streydio, professor at the Catholic University of Louvain, became temporary acting chairman.



The next year he was replaced by Frank Deconinck, professor at the Free University of Brussels.



The loading of the new beryllium matrix in BR2

After the replacement of the matrix in 1979-1980, the reactor was again overhauled in this year. The beryllium matrix had to be replaced again. Over the years that a reactor operates, various structures and materials become more brittle through the effects of radiation. The pressure

vessel of the BR2 reactor was thoroughly examined for embrittlement, fatiguing of the steel, resistance and corrosion through various tests such as visual inspections with a camera and ultrasound tests.

It is known that materials undergo microstructural changes under the influence of neutron irradiation that affect their mechanical properties. In this respect, the Reactor Materials Research (RMO) department studies the behaviour of reactor materials in order to guarantee the integrity of each component during reactor operation. Particular attention is paid to the reactor vessel, as this is the only irreplaceable component. There is a monitoring programme for each of the Belgian nuclear power reactors, that enables the neutron induced damage to the vessels to be monitored. The monitoring capsules are tested and evaluated in the Laboratory for High-Level and Medium-Level Activity (LHMA) where modern test and research techniques can be applied, both before

and after irradiation. In addition to the monitoring programmes within RMO, there are also research activities aimed at the physical understanding of radiation damage. The experience and expertise derived from these research activities can then be applied to the monitoring programmes. Alongside various other fields of research, the decommissioning of the BR3 reactor gave the RMO the opportunity to study real pressure vessel steel. In 1998 SCK•CEN laboratories for Reactor Materials Research and Reactor Dosimetry acquired an accreditation certificate that is used in the framework of the monitoring programmes for Belgian nuclear power plants.



In the Central Buffer Zone (CBZ), SCK•CEN temporarily stores its non-conditioned radioactive waste in safe storage while awaiting transport to the processor. The CBZ also has various rooms for decontamination, reducing and characterizing radioactive materials and waste.



The Club-House was built as one of the first social buildings. In the first place it was a hotel for people making short visits to the Centre. The Club-House also had a restaurant and reception rooms. It was opened on April 17, 1958, on the very same day that the World Exhibition opened. In 1997 the Club-House was completely renovated and further extended with an auditorium.

For many years SCK•CEN has studied cancer mortality in the vicinity of the Mol-Dessel nuclear facilities. This research started in the early Nineties because rumours were then circulating that there was a higher frequency of cancers (primarily leukaemia) in the vicinity. The Centre studied cancer mortality among the residents of Mol, Geel, Dessel, Retie and Balen in the period 1969 to 1992 together with the National Institute of Statistics. In contrast to the above claims, it was found that there was no increase in cancer mortality in the vicinity. This study will be further extended in the future.

SCK•CEN also coordinates the Belgian side of an international research project on "cancer mortality among employees of the nuclear sector" which comes under the WHO - World Health Organisation, International Agency for Research on Cancer.

SCK•CEN analyses cancer mortality among all employees who were registered on the payroll of SCK•CEN, Belgoprocess, BELGONUCLEAIRE and Electrabel (nuclear power plants in Doel and Tihange) for more than one month in the period 1953-1994. This study will be further followed up in the future, but from the current analysis it seems that there is a total lower mortality (all causes of death) among men and lower cancer mortality than in the general male population in Belgium. Among females these mortality data are not significantly different from the general population. No increase in mortality by leukaemia was found, but the number of cases is too small for a meaningful statistical analysis. In the course of this year the World Health Organisation hopes to publish the global analysis on almost 500 000 employees in the nuclear sector from around the world.

Cancer deaths in the vicinity of the nuclear site of Mol-Dessel in the period 1969-1992. The ratio of the number of actual deaths to the number normally expected is between the following limits with 95% confidence:

Cancer type	Sex	Expected number of deaths	Observed number of deaths	SMR	95% CI
All types	Male	2794,56	2585	92,50	89-96
	Female	1715,15	1501	87,51	83-92
Leukaemia	Male	80,91	61	75,39	58-97
	Female	57,94	45	77,67	57-104
Lung	Male	1013,23	1070	105,60	99-112
	Female	100,47	69	68,68	53-87
Thyroid	Male	4,85	6	123,71	45-269
	Female	9,17	11	119,96	60-215
Breast	Female	361,62	278	76,88	68-86

SMR = standardized mortality ratio
95% CI = 95% confidence intervall

1998

In 1998 Panamarenko won the J. C. Van Lanschot prize for Sculpture of the Low Countries. The prize gives wide recognition to the complete works of a plastic artist. In making his flying machines, vehicles and spaceships, Panamarenko is fascinated by natural laws, the movements of insects and animals, the natural elements and energy sources. He has developed his own language of shapes that is based on science.



In 1998 SCK•CEN took the initiative to integrate human and social sciences into its research programme. The Centre encouraged universities to work with them on these projects. Many young researchers were recruited with backgrounds in philosophy, psychology, law, economics, communication sciences, etc. University professors and other experts also participate in the projects. Two large working groups made up of young researchers, SCK•CEN employees and external experts discuss the ethical aspects of radiation protection and the role and culture of experts (nuclear in particular).

PhD and post-doctoral theses deal with specific subjects such as sustainable development, transgenerational ethics, safety and communications, risk perception, economic consequences of accidents, legal aspects, etc. The purpose of the projects is to tackle complex problems within nuclear research more completely by using human and social sciences. The encouragement of multidisciplinary research should stimulate dialogue with society and cooperation with universities with regard to these social disciplines.

On October 7, 1998 the new labs of the Corrosion Group opened in the Technology building. The researchers use them to study the corrosion behaviour of materials at high temperature and under pressure.



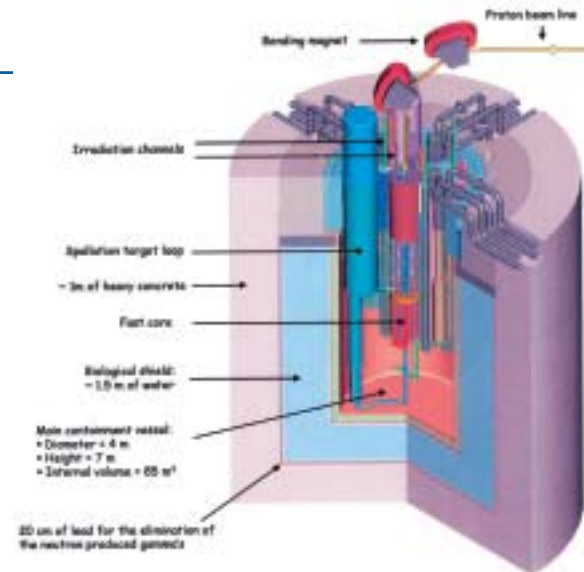
After the dioxin crisis broke out, hundreds of millions of chickens, eggs and derived products were destroyed on the instruction of the government, resulting in empty shop shelves.

In 1998, after completion of the ADONIS project, SCK•CEN launched the feasibility study for the MYRRHA project. The development of the preliminary design started in 1999 for a period of 3 years and is supported by a strong, internationally respected R&D programme. The purpose of the project is to replace the BR2 reactor and to extend its applications, made possible by the higher neutron fluxes and energies. These relate to experimental studies on reactor safety, medical applications and the radiation resistance of materials for space travel and telecommunications. Thanks to the external supply of

spallation neutrons, the system also enables research into the devastation of high-level long-life radioactive waste (transmutation). At the end of 2002 it has to be decided whether to start on the detailed technical design, in a way that the facility can be built and made operational by around 2010. MYRRHA's development and usage will enable the training of a new generation of researchers, essential in the future, irrespective of political and economic choices.

MYRRHA is an Accelerator Driven System (ADS) and consists of:

- A powerful and innovative proton accelerator (350 MeV / 5 mA) that will be developed by IBA (Louvain-la-Neuve), the world leader in the accelerator market;
- A "spallation source" in which neutrons are formed by the reaction of protons with a liquid lead-bismuth amalgam. SCK•CEN will do this challenging work;
- A sub-critical neutron multiplier consisting of fissile material (uranium and plutonium), in which the spallation neutrons are multiplied by splitting nuclei (SCK•CEN). The great advantage is that the production of neutrons stops when the proton stream stops.



On the threshold of the 21st century, SCK•CEN reviewed its strategic objectives. It formulated its new mission as follows:

"In the context of sustainable development through research and development, training, communication, and services, SCK•CEN will contribute to innovations in the field of nuclear safety and radiation protection, industrial and medical applications of radiation, and the end of the nuclear fuel cycle".

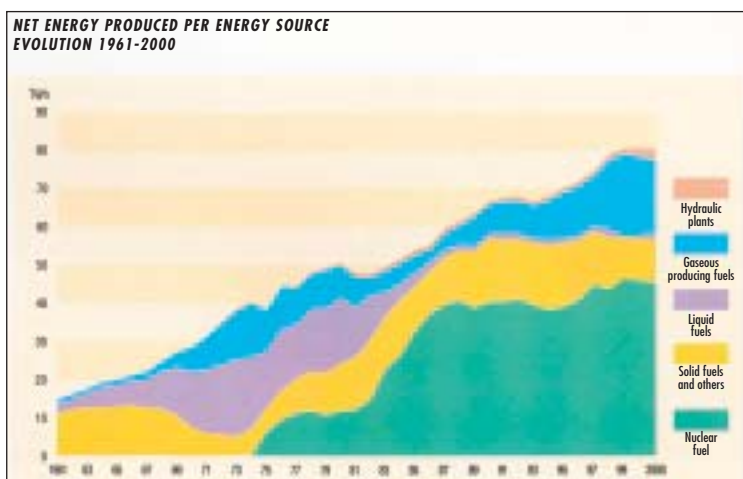
The horizons of SCK•CEN are not limited to the scientific or technological aspects, but cover all social problems of its work. In the future a greater emphasis will be placed on the socio-economic, ethical, psychological and legal aspects. The results of the work of SCK•CEN will not only be distributed through scientific publications and reports, but also, and to a much greater extent than before, by means of symposiums, general communications and training.

The strategic subjects selected were reformulated:

- Reactor safety: reactor physics, materials and instrumentation;
- The MYRRHA project: a versatile neutron source;
- BR2: one of the most effective research reactors in the world;
- Storage of radioactive waste: "masters" of clay;
- Gaining international expertise by decontaminating its own facilities;
- Radiation protection: access to high-level research to the benefit of government and industry;
- Safeguards: scientific support for Belgian and international undertakings;
- Medical applications of radiation, diversifying our know-how to the benefit of public health;
- Social aspects: nuclear problems as a challenge for the academic world;
- Communications, information and training, transparent for the current and following generations.

In 1999 the Ministry of Economic Affairs instructed the "Commissie voor de Analyse van de Middelen voor Productie van Elektriciteit en de Reëvaluatie van de Energievectoren" (abbreviated to the AMPERE Committee - Committee for the Analysis of Resources for the Production of Electricity and the Re-evaluation of Energy Means) to "make recommendations and proposals on the future choices regarding electricity production so that it corresponds to the needs of society, the economy and the environment of the 21st century". It consisted of 16 members, representatives of universities and scientific organizations in the country, including Jean-Marie Streydio, acting chairman of SCK•CEN in 1995, and Ernest Mund, chairman of the safety of reactors, nuclear fuels and reactor materials DAC. The committee paid particular attention to the possible gradual exit from nuclear energy, the possibilities to manage the demand for electricity and the need to develop renewable energy sources.

The committee submitted its report to the Minister responsible for energy in November 2000. One of the 9 specialized working groups worked on nuclear electricity and made a number of recommendations regarding electricity production from nuclear energy and getting out of nuclear energy. On the assumption that nuclear power plants have a lifetime of 40 years, in accordance with the government declaration of July 7, 1999, the committee noted that the first power plant would only be closed in 2014 and that Belgium would have fully got out of nuclear energy by 2025. In order to be able to guarantee the operational safety of the electronuclear sector, the safety of the population and public health, the committee considered it necessary to maintain a scientific and technological capability. This implies continuing research and development in the nuclear field. In addition, the committee believed that the electronuclear option had to be kept open in a context where hydrocarbons, including natural gas, were becoming more expensive and because the exploitation of nuclear energy did not emit any greenhouse gases.



(Photo BFE – Trade Association of the Producers and Distributors of Electricity in Belgium)

The non-profit associations MONA (Mols Overleg Nucleair Afval – local partnership) and STOLA (Studie- en Overleggroep Laagactief Afval - Study and consultation group Low-level waste, Dessel) are partnerships between ONDRAF/NIRAS and the municipalities of Mol and Dessel respectively. Both have the role of examining whether the storage of low-level and half-life radioactive waste is technically feasible and socially acceptable in their municipalities. For this they asked the participation of their own residents.

In 1998 the government decided that the ONDRAF/NIRAS studies on the storage of low-level radioactive waste, must

be limited to the existing nuclear zones of Mol, Dessel, Doel, Tihange and Fleurus and any interested boroughs. In MONA and STOLA, the residents, together with ONDRAF/NIRAS, are examining the feasibility of the storage of low-level radioactive waste in their boroughs. The associations are developing an integrated project which, in addition to the storage project, also include a social project. If the study shows that the borough can store low-level short lifetime radioactive waste, then there is a possibility that the population will allow storage. If however MONA or STOLA decide that storage is not sufficiently safe, or is not technically or socially feasible, it will be revised or stopped.



September 11, 2001 is engraved in the memories of everyone as the day when 2 airplanes flew into the WTC towers in New York. (Photo Reporters AP)

The Gulf War syndrome or the Balkans syndrome is a collective term for a series of symptoms such as headaches, skin complaints, reduced resistance, chronic fatigue, etc. observed among soldiers who served in these regions. Until now it has not been proven whether these soldiers have more health complaints than is statistically normal, or whether there is a link between the symptoms and possible exposures to depleted uranium (primarily). Depleted uranium is used as a screening material for radiotherapy sources in hospitals, as a counterweight in the rudders and flaps of certain aircraft or in the keels of ships, and in the military world for armour plating tanks and the tips of certain types of armour-piercing ammunition.

Prior to dispatching the Belgian soldiers to the Balkan region, there were contacts between the Armed Forces Medical Department, the FANC and SCK•CEN relating to the preventive measures that could be taken in the event of possible exposure. SCK•CEN also later measured 4 000 urine samples from these Belgian soldiers. No analysis gave any indication of possible absorption of depleted uranium.



Measurements on depleted uranium in Kosovo (Photo EPA – Belga/N. Xhemaj)



The SCK•CEN library was set up in 1953 in order to make nuclear literature from all over the world available to its employees. Right from the start, article 4 of the SCK•CEN statutes, stated that it had the task of “collecting and keeping scientific and technical documentation”. The library also played the role of a national nuclear library offering a wide scientific collection for emerging nuclear companies, universities and the government. Up until 2001 the library was joined with Vito. In February the SCK•CEN part relocated to another building. To date, the concept of a library has been placed within a wider framework of information and knowledge management, and ever more suitable information is being provided “on the desk” through the Internet and intranets.

SCK•CEN is at the service of community and industry. The future programme will be determined by the democratically interpreted will of society and the needs of industry that SCK•CEN can meet with its people and infrastructure.

In the Fifties, the government and Belgian industry wanted to board the nuclear boat. SCK•CEN has made a successful contribution in this respect. In the Seventies the nuclear industry matured and the resources of the Centre were increasingly geared to high technology non-nuclear activities. Vito (Flemish institute for technological research) still testifies to the success of this operation.

After the Chernobyl accident the priorities were placed on research into nuclear safety. This emphasis will probably continue to mark the programme of SCK•CEN over the next few decades. Even after the shutting down of the Belgian nuclear power plants a thorough knowledge of nuclear fuels and reactor materials is essential. The issue of the storage of radioactive waste and the safe decommissioning of old facilities will be further completed in cooperation with ONDRAF/NIRAS (the Belgian Agency for Radioactive Waste and Enriched Fissile Materials).

The increasing applications of ionizing radiation, also outside nuclear energy production, require radiation protection expertise based on research, including support of the FANC (Federal Agency for Nuclear Control).

As announced in our strategic plan, we will further diversify within the nuclear field, into medical applications, training, social aspects, space travel, etc. The long-term future will, however, be highly determined by the role that society and industry places on nuclear energy, whether nuclear fission or nuclear fusion.

The daily life at SCK•CEN will be strongly influenced by the future of our great irradiation infrastructure. With MYRRHA we hope to be able to produce a European facility for future safety research and production of radioisotopes, including for the IRE (Institute of Radio Elements).

Finally the world of today, and probably of tomorrow, is increasingly being confronted with the great challenge of questions on sustainable development. SCK•CEN aims to fully deploy its capabilities in the role that best corresponds to its status and core competencies.



The registered office in Brussels today

An aerial photo of SCK•CEN in Mol today



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