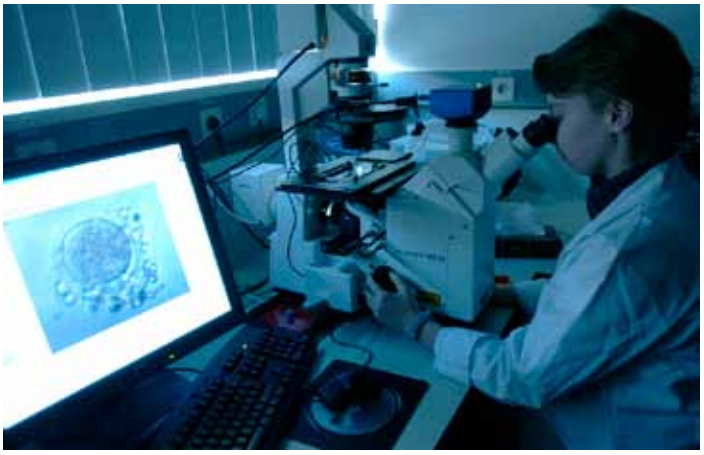
SCK•CEN
STUDIECENTRUM VOOR KERNENERGIE
CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE

Institute for Environment, Health and Safety

The general mission of the institute for Environment, Health and Safety (EHS) is to perform research and services to assure safety of man and environment in the context of peaceful applications of nuclear energy and ionising radiation.

SCK•CEN has the statutory assignment to perform, in priority, research related to nuclear safety, waste management, protection of man and environment, management of fissile and other strategic materials and societal implications of nuclear technologies. EHS is involved in all these research areas, both on a national and international level.



Strategic priorities

Biological effects of low radiation doses

EHS evaluates the potential risks of low doses of ionising radiation. Specific attention is paid to the radiosensitivity of the developing organism, to individual susceptibility, cancer and non-cancer effects of ionising radiation. We thereby provide the scientific background for occupational, accidental, medical or cosmic exposure to radiation. EHS also studies the adaptation of bacteria under extreme conditions (space, Antarctic platform, heavily polluted soils, irradiation) and contributes to the use of bacteria for water and waste recycling and oxygen and food production within the scope of long-term space missions, for which we study the influence of radiation and the absence of gravity.

Medical applications

EHS performs research towards optimisation of medical doses in radiology, interventional radiology, nuclear medicine and radiation therapy. Special attention is given to high dose procedures and paediatrics, dose optimisation studies for medical staff as well as development of biodosimetry-biomonitoring tools for the population. We perform biological as well as dosimetric research in the domain of hadron therapy and study the effectiveness of potential radiopharmaceuticals for cancer therapy or diagnosis.

Radiation protection

EHS studies the way radioactive materials spread in air, biosphere and geosphere and evaluates the impact of ionising radiation on man and environment. We research the processes and mechanisms ruling radionuclide behaviour and effects induced in non-human biota following irradiation. EHS also develops atmospheric, aquatic and terrestrial dispersion models and dose impact models. Specific attention is paid to research and services in nuclear and radiological emergency preparedness, crisis management and decision support.

Long-term management of radioactive waste

Research related to the management of low-, medium- and high-level radioactive waste deals with the evaluation and demonstration of the long-term safety of disposal systems. EHS studies solutions for deep geological and surface disposal and analyses their technical feasibility and acceptance.

For innovative reactor systems like MYRRHA and Generation IV, the impact on long-term waste management is evaluated.

Site clean-up and environmental restoration

Site clean-up and environmental restoration concentrates on the safe and economic decontamination and decommissioning of nuclear installations, including SCK•CEN facilities (e.g. the BR3 reactor). Our expertise is valorised in decommissioning of nuclear installations of third parties. We develop and improve chemical processes for the decontamination of installations and materials and for treatment of special nuclear wastes.

Safeguards

EHS performs research related to the management of fissile and other strategic materials. SCK•CEN supports and advises the Belgian authorities in matters of verification of nuclear materials (safeguards) and runs the Belgian “Safeguards support programme” for the IAEA. Current research includes safeguards for present/future nuclear installations, spent fuel measurement techniques and socio-political research on non-proliferation and decision-support tools for safeguards inspections.

Societal aspects of nuclear technology

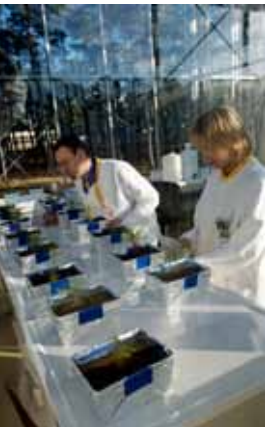
EHS investigates social, ethical and political aspects related to the development, use and implications of current and future nuclear technologies. Research focus is on justification, transparency and inclusiveness in policy and decision-making. Main application areas are: management of radioactive waste, nuclear risks and energy policy.

Measurements and calibrations

EHS delivers research and services in the following domains: external personal dosimetry, anthropogammametry, environmental dosimetry, low-level radioactivity measurements of biological and environmental samples, in situ contamination measurements, radon measurements, calibration of nuclear and non-nuclear quantities. Measurement laboratories perform analyses for third parties and support SCK•CEN research programmes and the authorities for the surveillance of the Belgian territory and in case of emergency. Most analyses are BELAC accredited.

EHS expert groups

Within the institute for Environment, Health and Safety (EHS), 8 expert groups study the behaviour and impact of radioactive materials in air, geosphere and biosphere, and analyse the potential effects of ionising radiation on health and environment.
EHS also pays attention to safeguards, policy support and societal and ethical aspects of nuclear applications and research.

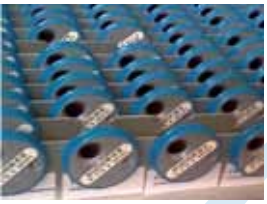


Molecular and Cellular Biology

- The individual susceptibility to ionizing radiation and the related cancer as well as non-cancer risks.
- The impact of ionizing radiation on female reproductive cells, on the development of the embryo and the brain.
- The biological effects of the medical use of ionizing radiation and radioactive substances in radiotherapy and medical imaging.
- Epidemiological follow-up of nuclear workers and population living in the vicinity of nuclear installations and development of biodosimetry tools for the rapid monitoring of populations in case of nuclear accidents.
- Study of adaptation of bacteria to extreme conditions and potential impact of bacteria on long-term storage of radioactive waste.
- Contribution to the ESA space programme by studying biological effects of space conditions on man and bacteria and on sustainability of life support systems.

Radiological Impact and Performance Assessments

- Study of radionuclide behaviour in geosphere and biosphere and model development to predict radionuclide behaviour.
- Integrated performance and safety assessment of radioactive waste repositories in close collaboration with the Belgian nuclear waste agency NIRAS/ONDRAF. Includes modelling of radionuclide release from a multi-barrier near-surface or deep disposal facility to the geosphere and biosphere.
- Impact assessment of radiological substances on man and environment and evaluation of options to influence impact.
- Research into the effects induced by ionising radiation on non-human biota.



Society and Policy Support

- Policy and decision support related to current and future nuclear technologies.
- Emergency planning and management of emergency situations in the field of nuclear and radiological incidents including the malevolent use of radiation sources.
- Radiological impact assessments by modelling and monitoring for routine and emergency situations.
- Societal aspects of nuclear technology with emphasis on robustness, transparency and stakeholder involvement in decision-making.
- Technical support and advice for the authorities and other parties in safeguards matters.

Radiation Protection Dosimetry and Calibration

- Research on neutron and space dosimetry and on dosimetric techniques.
- Optimisation studies for staff and patient doses in the medical sector.
- Services for radiation dosimetry and anthropogammametry.
- Calibrations for internal and external clients according to strict QA procedures.

Waste and Disposal

- Study of behaviour of nuclear waste and their packaging under disposal conditions.
- Study of geochemistry and transport of radionuclides in engineered and natural barriers, including their long-term evolution.
- Main research partner of the Belgian nuclear waste agency NIRAS/ONDRAF.

EURIDICE

The SCK•CEN expert group EURIDICE provides scientific and technical staff to the Economic Interest Grouping EURIDICE between SCK•CEN and NIRAS/ONDRAF for the exploitation and further development of the HADES underground research facility and the performance of demonstration projects:

- PRACLAY demonstration project for geological disposal of heat-emitting high-level waste.
- Study of the thermo-hydro-mechanical behaviour of geological disposal in clay environment.
- Valorisation of installations and know-how through research projects.

Dismantling, Decontamination and Waste

- Decontamination and decommissioning of the obsolete nuclear installations of SCK•CEN, e.g. the BR3 reactor.
- Tools for material management and ALARA optimisation of decommissioning tasks.
- Management of the nuclear waste and technical liabilities of SCK•CEN.
- Development of chemical processes for the decontamination of installations and materials and for treatment of special nuclear wastes.
- Valorisation of know-how, in association with industrial partners, by taking part in commercial decommissioning projects.
- Support of projects and installations in relation to their radioactive waste issues.

Low-Level Radioactivity Measurements

- Services for clients for surveillance of their personnel and environment.
- Expertise in analysis of biological and environmental samples for alpha, beta and very low gamma activity.
- Use and development of chemical methods to achieve very low detection limits.
- Use of accredited methods according to ISO17025.

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