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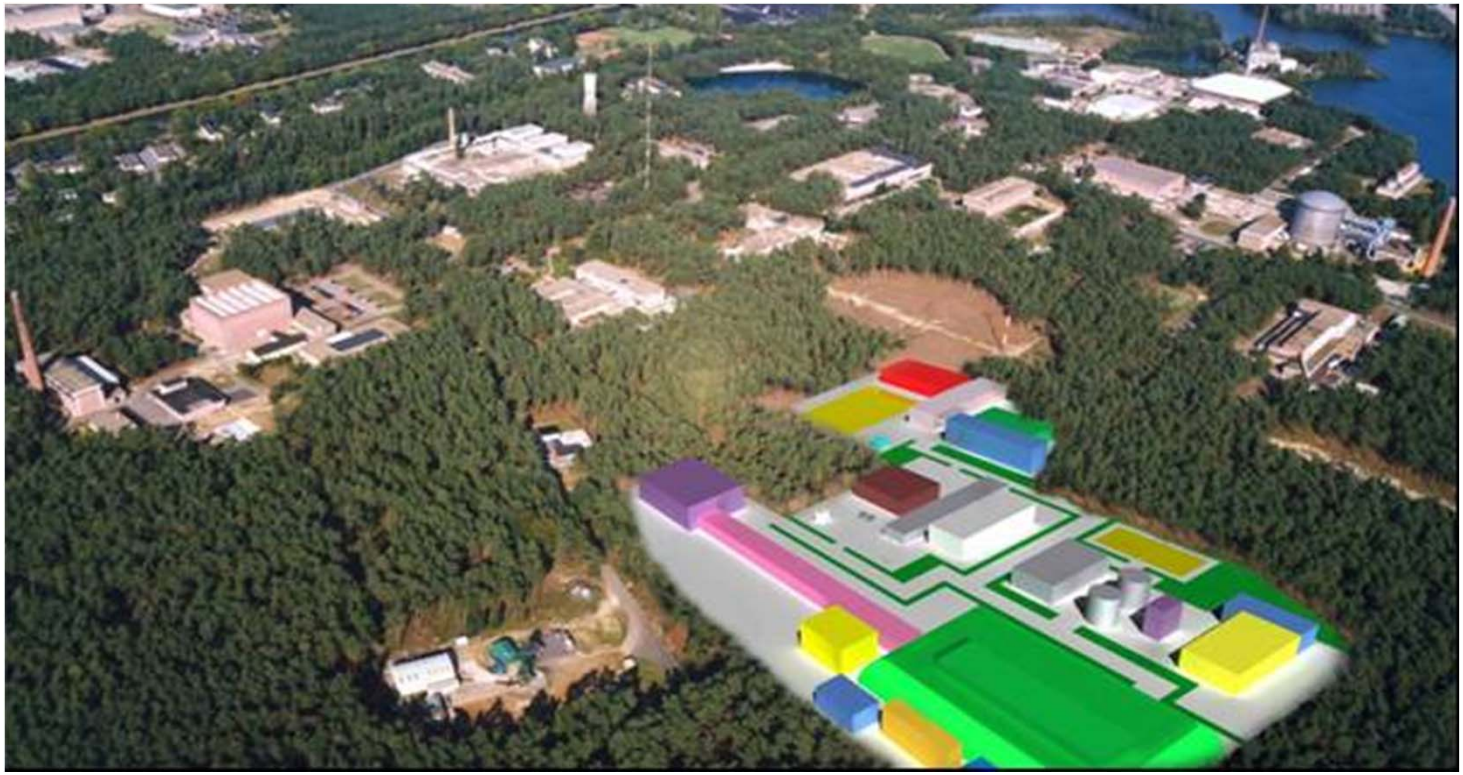
Research towards a sustainable option



Pierre D'hondt, Deputy Director-General
Visit of the Scientific Council of SCK•CEN to ULg
Liège, September 2, 2010

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Overview

- SCK•CEN: who are we?
- Research towards a sustainable option
- Collaboration with ULg
- Conclusions

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Who are we?

- Belgian Nuclear Research Centre: a foundation
- created in 1952: cradle of nuclear research and energy development in Belgium
- the only nuclear research centre in Belgium
- tutorship: Belgian federal Ministry of Energy
- now: 640 staff, 40% with academic degree
- annual turnover: ~100 M€
  - ~45% government support
  - ~55% contract work
- creator of major spin-offs
- first-of-a-kind projects

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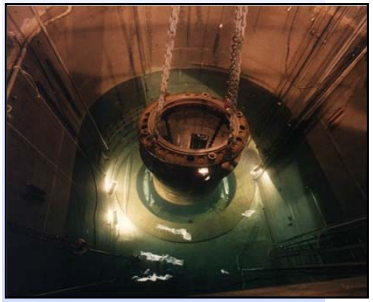
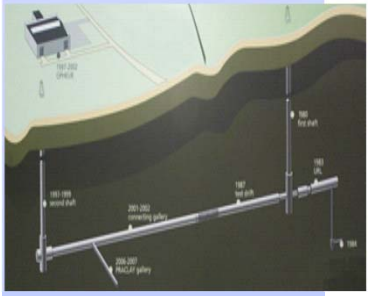
A history of 'first of a kind' projects





- historic destination: a 'meeting point' between industry and the academic world around large infrastructures
- BR1, BR2, BR3
  - 1956: BR1: first Belgian Reactor, Fermi type
  - 1962: BR2: multi-disciplinary world's most intense high-flux reactor
  - 1963: BR3: first PWR out of the USA
- 1966: Eurochemic : first pilot recycling plant
- 1963-74: development of MOX-fuel
- 1974: underground disposal lab HADES
- 1990: dismantling of BR3
- 2000-2008: extension of HADES
- 2009: VENUS transformed to GUINEVERE
- now: in the run for MYRRHA

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Since 1952 our mission has evolved

- 1950-1960:Introduction of peaceful applications of nuclear energy in Belgium
- 1970-1980:Diversification towards non-nuclear domains
- 1990:Transfer of non-nuclear activities to the region
- From 1990 for SCK•CEN:Priority on research on nuclear safety

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Research towards sustainable nuclear energy

CO_2 free

concentrated

economic

safety

waste

supply

societal applications

social acceptability

research & development

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… fits into the statutory mission of SCK•CEN

- research on
  - safety
  - waste management
  - protection of man and environment
  - fissile and other strategic materials
  - societal implications of sustainable energy
- training and education
- services towards
  - nuclear industry
  - the medical sector
  - the authorities in the field of nuclear applications

→ very broad spectrum of activities

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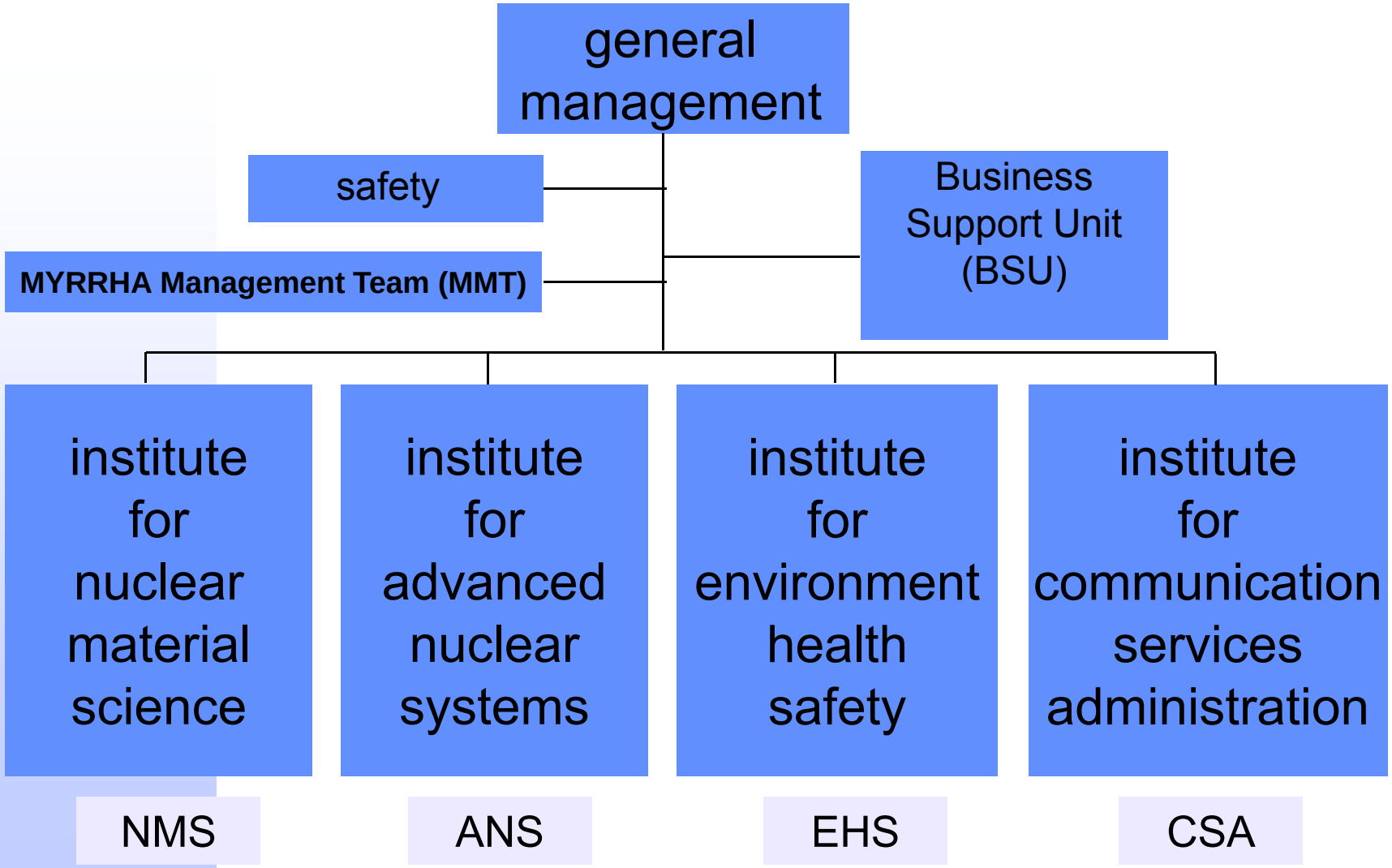
Organisation



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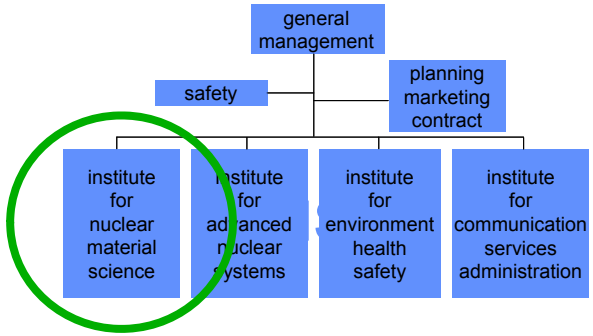

- the life management of existing power plants;
- the development and validation of new materials for advanced fission reactor concepts and for fusion;
- the qualification of evolutionary fuels for present day reactors and advanced research reactor concepts;

- the production of radioisotopes and n-doped Silicon;
- the development of new radioisotopes for medicine and industry.

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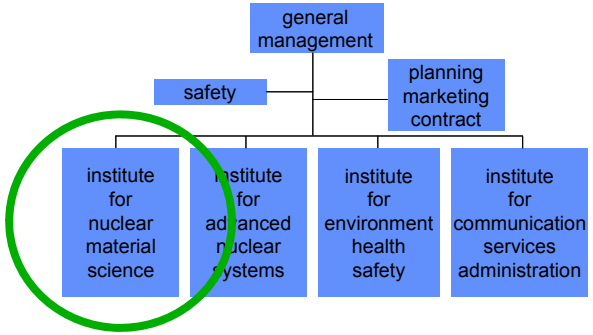

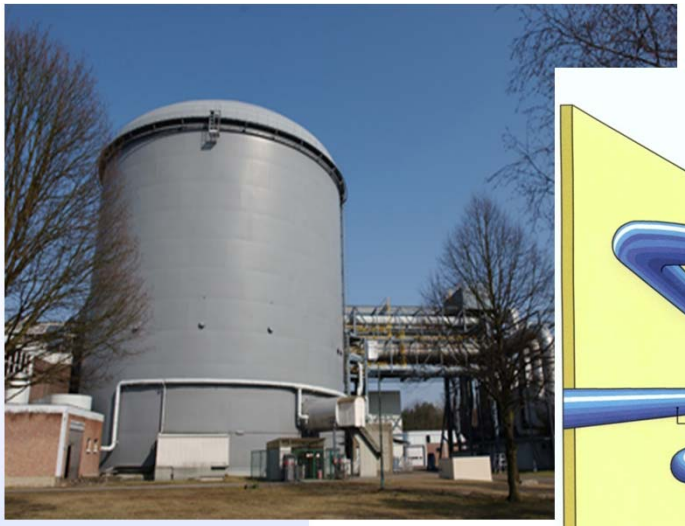

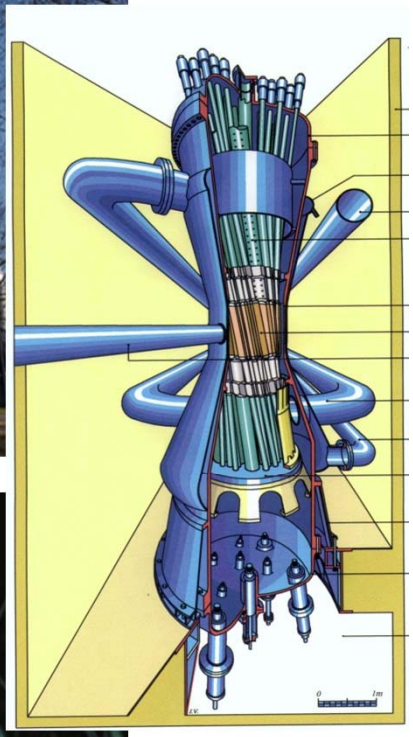

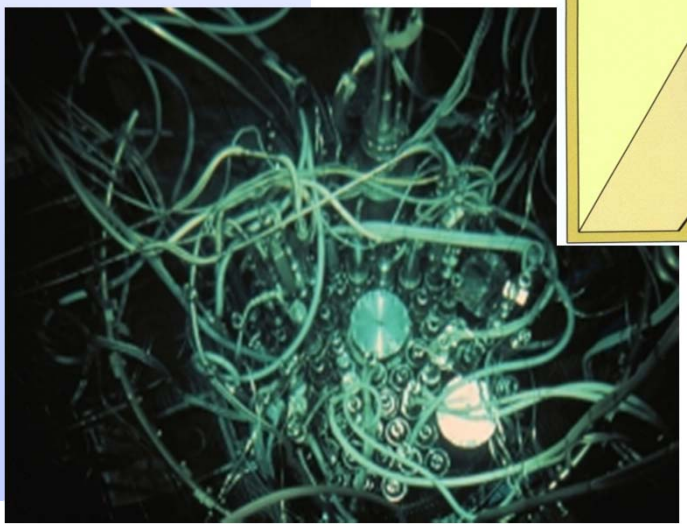

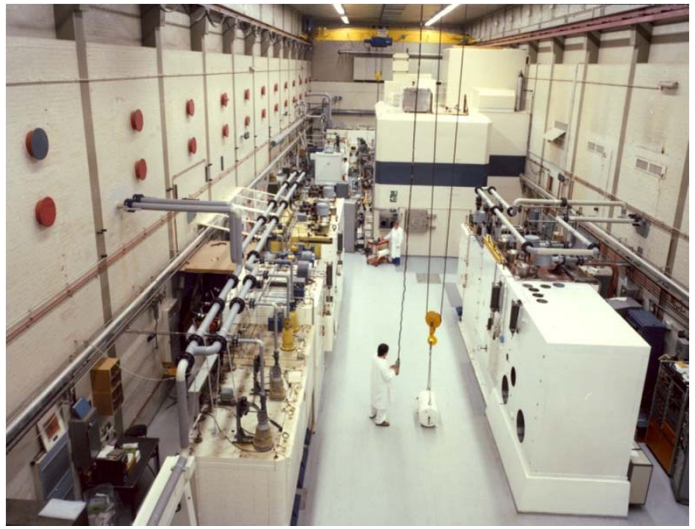

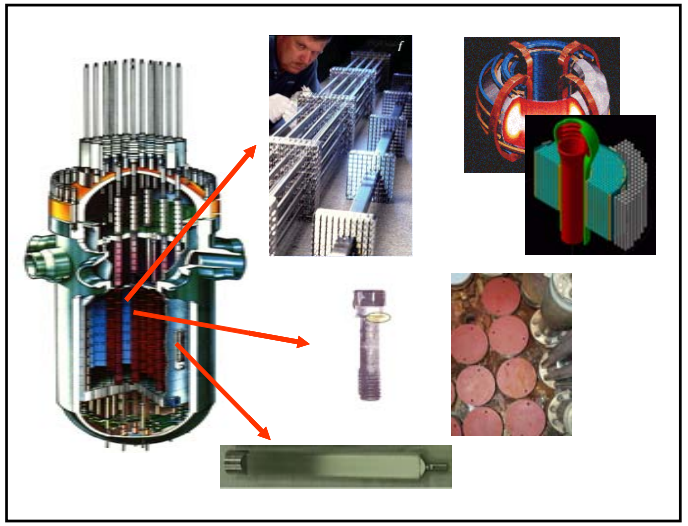

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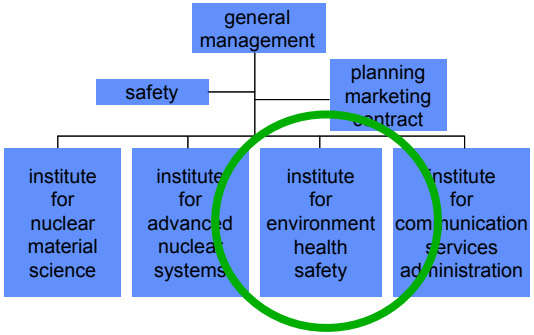

- to optimise decontamination and decommissioning;
- to contribute to safe disposal of low, medium and high level waste in cooperation with the Belgian authorities;

- to evaluate, predict, model the behaviour of radioactive pollutants in the biosphere and geological formations;
- to evaluate the radiological impact on the population and the environment;
- to develop emergency planning and the management and response to emergency situations;
- to apply molecular biology in the field of ionising radiation.

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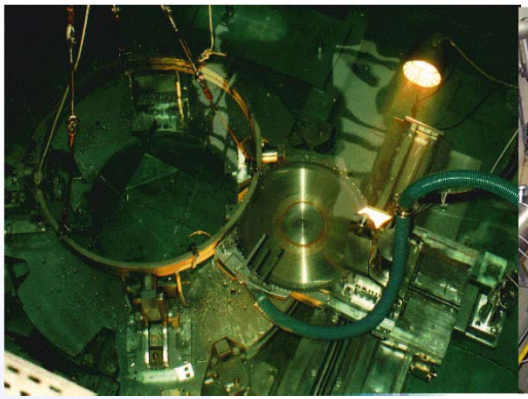
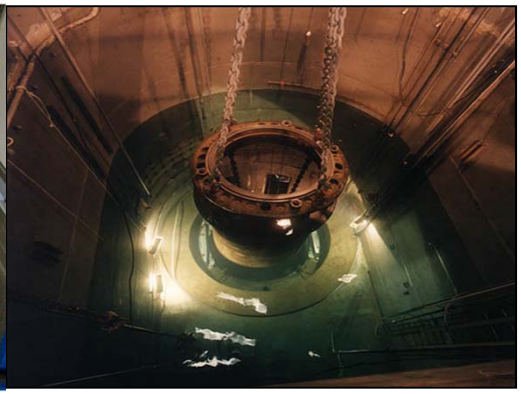
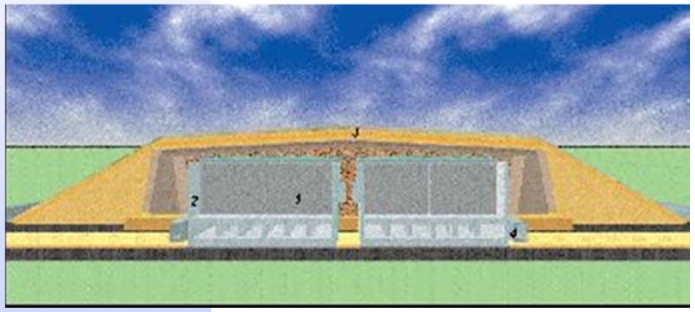
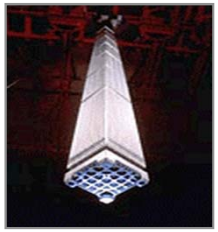
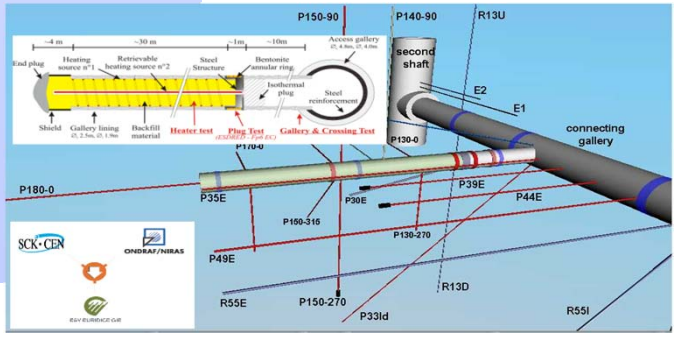
EHS











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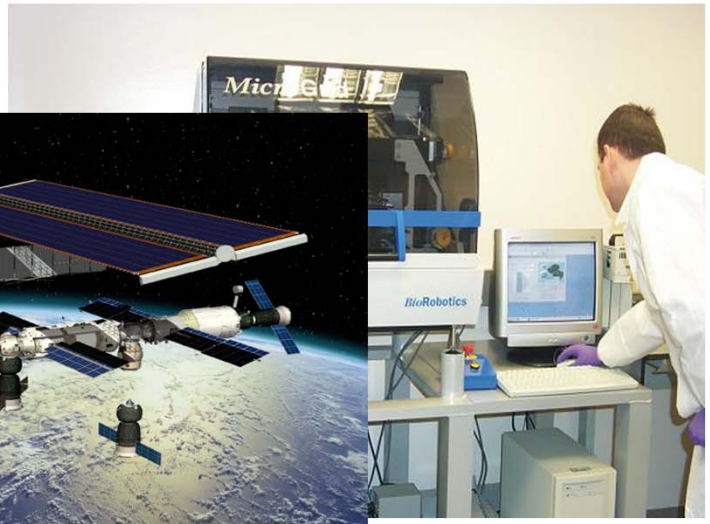

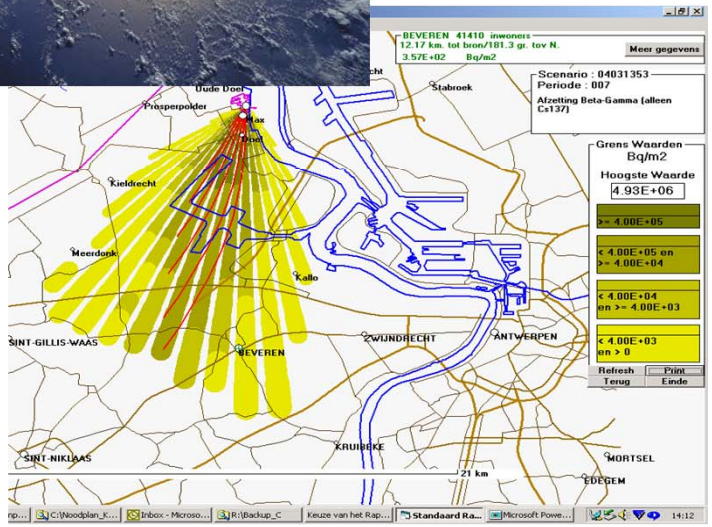

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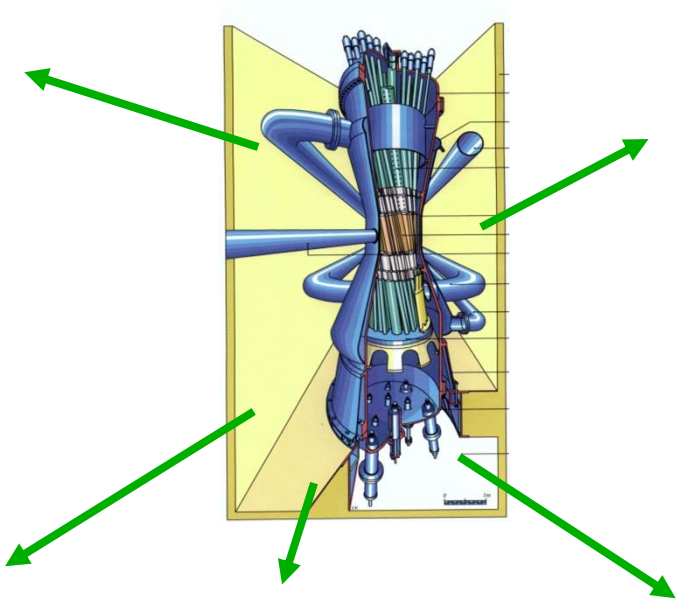
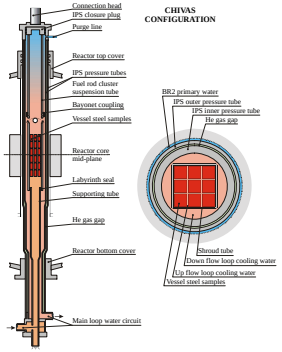
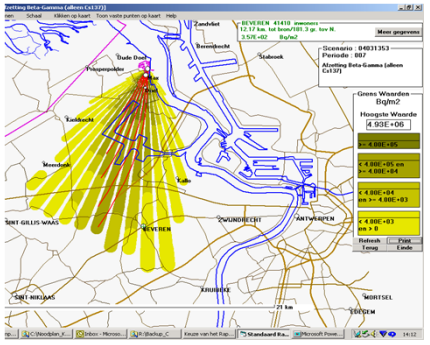
Today: BR2 central







~2026: end of life of BR2

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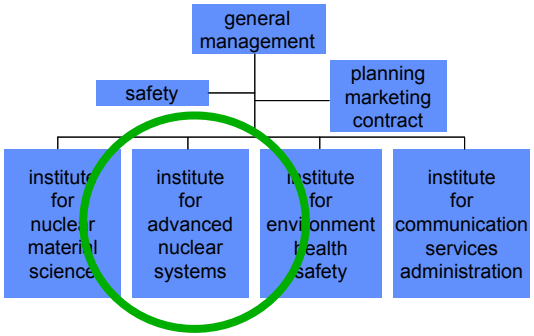
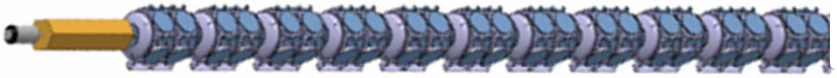


- to develop a fast spectrum experimental facility MYRRHA at Mol;
- to develop innovative experimental devices, and advanced measurement techniques for MTRs;
- to enlarge the participation of Belgian partners in the development and construction of ITER;
- to participate to the development of the most promising GENIV reactors.

MYRRHA concept

Accelerator (600 MeV proton)

Sub-critical reactor (57 MWth)



ADS *"Accelerator Driven System"*

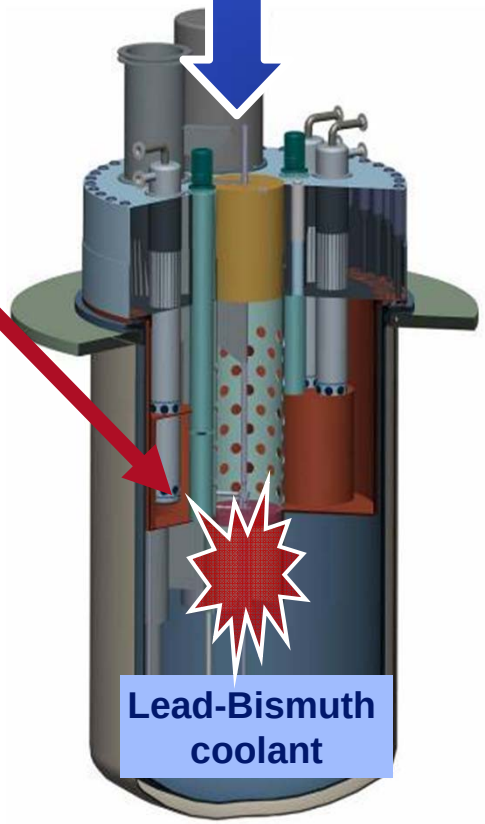
Spallation source
(proton ➔ neutron)

Neutron multiplier

Fast neutron source

Flexible irradiation facility

- Waste transmutation
- Material testing
- others: RI, NTD-Si,...



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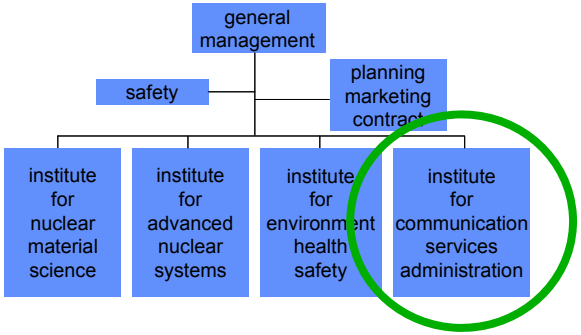
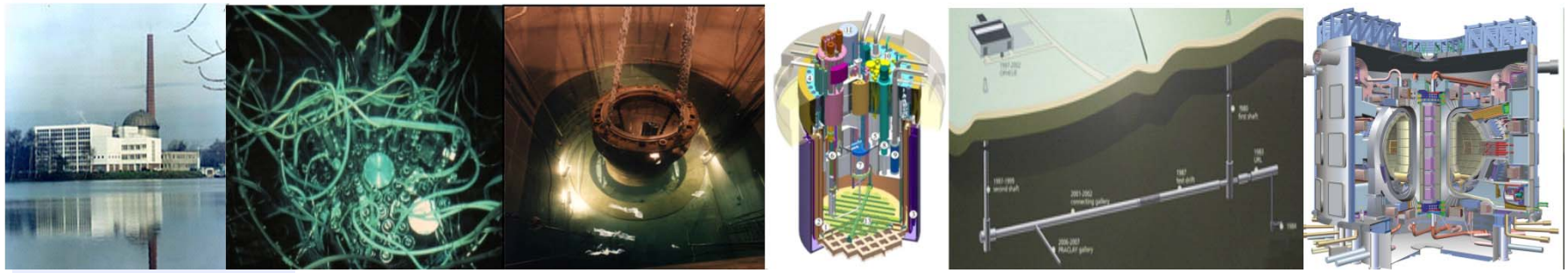
Education and training



- organised within the CSA institute
- custom-tailored courses in many disciplines
- training at our facilities
- PhD and post-doc programs
- seminars, topical days, summer schools, conferences



research, development needs education, training

BNEN

Belgian Nuclear higher Education Network

Your way to the European Master in Nuclear Engineering!

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PhD and post-doc programs

- The SCK•CEN finances about ten PhDs and postdocs per year;
- Other funding possibilities through:
  - FWO, FNRS, IWT
  - ESA
  - BELSPO
  - Industry
- Procedure:
  - Publication of projects on our WEB end of novembre
  - Search for promotors and students
  - Selection on file and oral presentations in may/august

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PhD's in the past at ULg (1)

- 1994-1998: Paul Van Uffelen
  - Title: Contribution to the modelling of fission gas release in light water reactor fuel.
  - Promotor: Prof. C. Vandenberg
  - SCK•CEN mentor: K. van der Meer
- 1995-1998: Marc Scibetta
  - Title: Contribution to the evaluation of the circumferentially-cracked round bar for fracture toughness determination of reactor pressure vessel.
  - Promotor: Prof. Nguyen-Dang Hung
  - SCK•CEN mentor: E. van Walle

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PhD's in the past at ULg (2)

- 1996-2000: Véra Pirlet
  - Title: The investigation of the Neptunium complexes formed upon interaction between high-level waste glass and Boom Clay medium.
  - Promotor: Prof. J-F. Desreux
  - SCK•CEN mentor: P. Van Iseghem
- 1997-2001: Benoît Petitfour
  - Title: Oxidation and direct conditioning of contaminated sodium.
  - Promotor: Prof. A. Germain
  - SCK•CEN promotor: A. Rahier

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PhD's in the past at ULg (3)

- 1998-2002: Eric Cantrel
  - Title: Electrochemical oxidation of organic solid and liquid waste by Ag2+ in nitric acid.
  - Promotor: Prof. J-P. Pirard
  - SCK•CEN mentor: A. Rahier
- 2000-2004: Isabelle Fucks
  - Title: The safety culture according to a "comprehensive approach". A contribution to Risk Governance within complex systems.
  - Promotor: Prof. C. Zwetkoff
  - SCK•CEN mentor: F. Hardeman

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PhD's in the past at ULg (4)

- 2001-2005: Thierry Aoust
  - Title: Aspects of spallation reactions in the intermediate energy range.
  - Promotor: Prof. J. Cugnon
  - SCK•CEN mentor: E. Malambu
- 2005-2009: Nicolas Morin
  - Title: Studies on the response to spaceflight related conditions in the cyanobacterium.
  - Promotor: Prof. A. Wilmotte
  - SCK•CEN mentor: N. Leys

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Running PhD at ULg

- 2010-2013: Bart Rogiers
  - Conditional stochastic simulation of groundwater flow and contaminant transport in a sandy aquifer at Mol/Dessel.
  - Promotor: Prof. A. Dassargues
  - SCK•CEN mentor: D. Mallants

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Educational cooperations

- Pierre Van Iseghem: Invited lecturer for the course "Nuclear Fuel Cycle"
- Dominique Lamy: Assistant "Analyse Numérique"
- Vincent Massaut: Invited lecturer for the course " Démantèlement des centrales nucléaires"

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Collaboration in the BELSPO-project "SEPIA"

- SEPIA =
  Sustainable **E**nergy **P**olicy **I**ntegrated **A**ssessment
- 15/12/2007 - 31/12/2010
- Partners: SCK•CEN , UA, ULg, VUB, VITO
- ULg: Prof. dr. Marc Jacquemain, Patrick Italiano
- SCK•CEN: Jantine Schröder, Gaston Meskens, Da Ruan

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Collaboration Agreements in preparation

- Development of aptamer-based radiopharmaceuticals for cancer diagnosis and targeted cancer therapy.
  - ULg: Prof. Edwin De Pauw and Prof. André Luxen (faculty of Sciences:department of Chemistry)
  - SCK•CEN: Nathalie Impens, An Aerts and Sarah Baatout (Radiobiology unit)

- Effects of Cosmic Radiations and hadrontherapy on gene splicing and DNA damage repair;
  - ULg: Dr. Charles Lambert and MSc Eric Ernst (faculty of Medecine: laboratory of Connective Tissues Biology)
  - SCK•CEN: Marjan Moreels, Rafi Benotmane, Roel Quintens, Michäel Beck and Sarah Batout (Radiobiology Unit)

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Conclusion

- SCK•CEN does innovative research for the safe application of nuclear energy on the short and long term and we have a future-oriented project: MYRRHA;
- SCK•CEN emphasizes the need for keeping up with and enlarging fundamental knowledge, education and training in order to prevent the loss of innovative research;
- SCK•CEN contributes in an important manner to non-power related society-relevant applications of nuclear energy;
- SCK•CEN wishes to re-inforce its collaboration with the Belgian Universities in general and hopes to realize this in the near future with ULg.

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Stichting van Openbaar Nut
Fondation d'Utilité Publique
Foundation of Public Utility

Registered Office: Avenue Herrmann-Debrouxlaan 40 – BE-1160 BRUSSEL
Operational Office: Boeretang 200 – BE-2400 MOL