Integrated Nuclear Education Advisory Services (INEAS)

Mission: Romania

Nuclear educational and training programme in Belgium

[Bucharest, Romania, 18-21 November, 2025]

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About Belgium

- Split into 3 major regions: Brussels, Flanders and Wallonia;
- Sub-divided into 10 provinces;
- Area: 30.689 km^2;
- Population: 11.825.551
- Nuclear reactors: 3 PWR type, found at two sites: Doel and Tihange.

What does Belgium need?

Existing fleet:

- Maintain the current fleet online;
- enough and skilled personnel for decommissioning

New fleet:

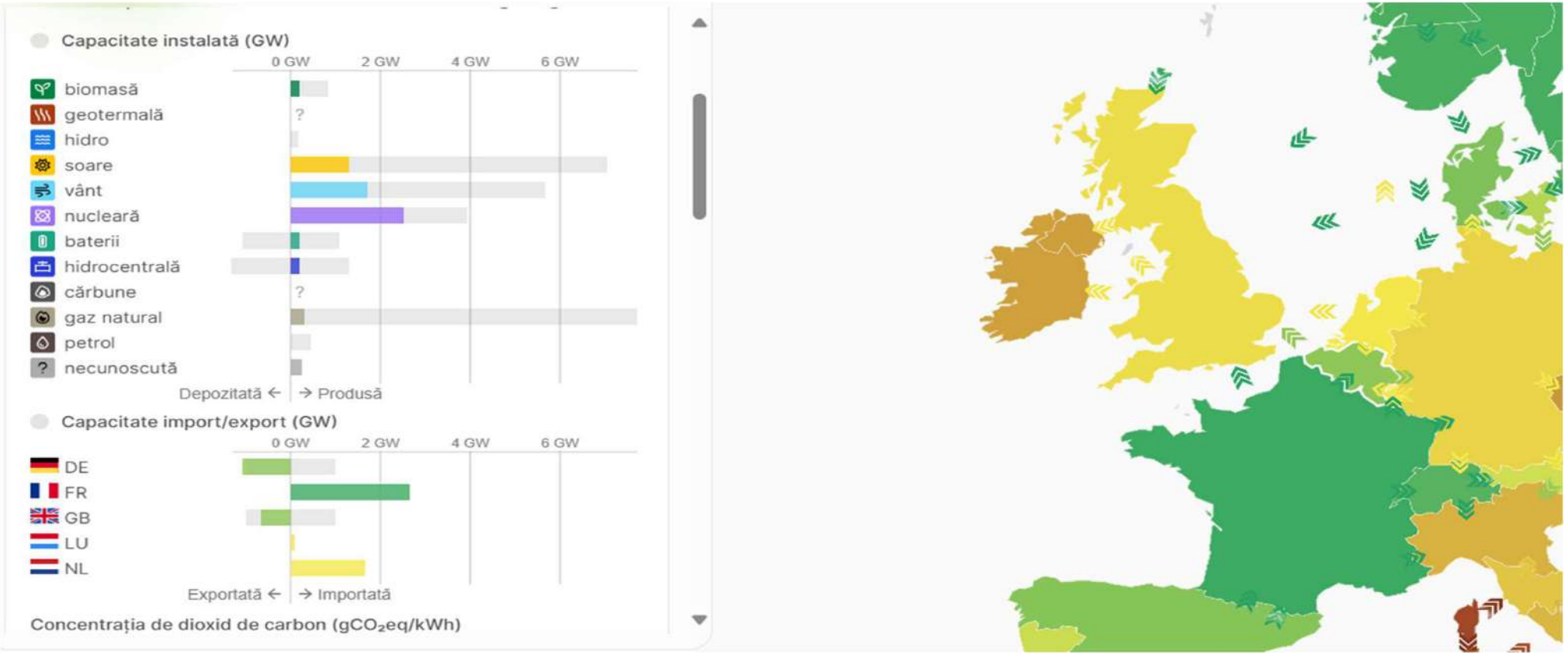
- SMRs in Belgium;
- SMRs outside Belgium

Preamble

By 2050, Europe will need about 500.000 new professionals working in nuclear (direct or indirect jobs) (*)

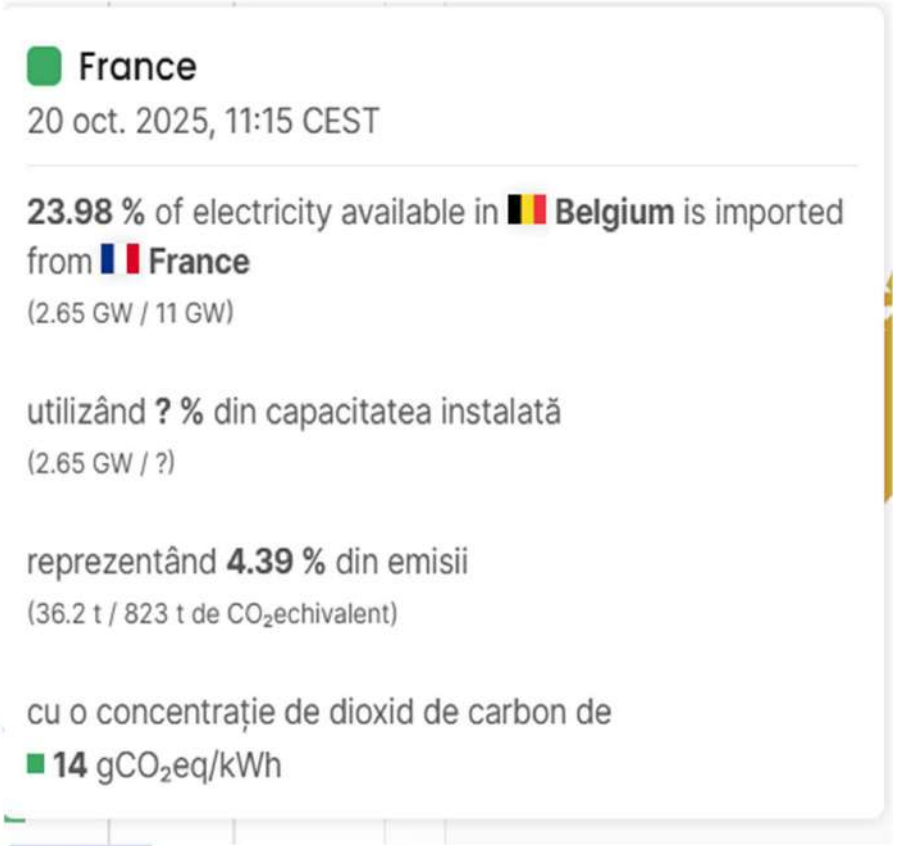
(*) found in the ENEN2plus project but more sources are advancing similar numbers

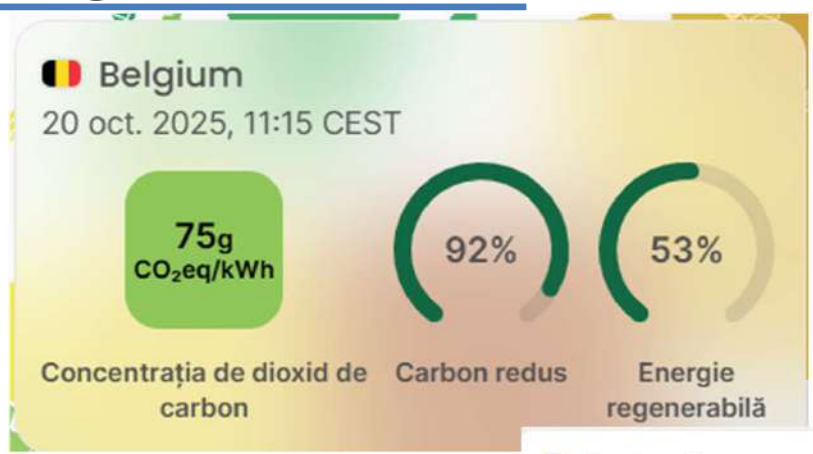
The Green Belgium: Energy production

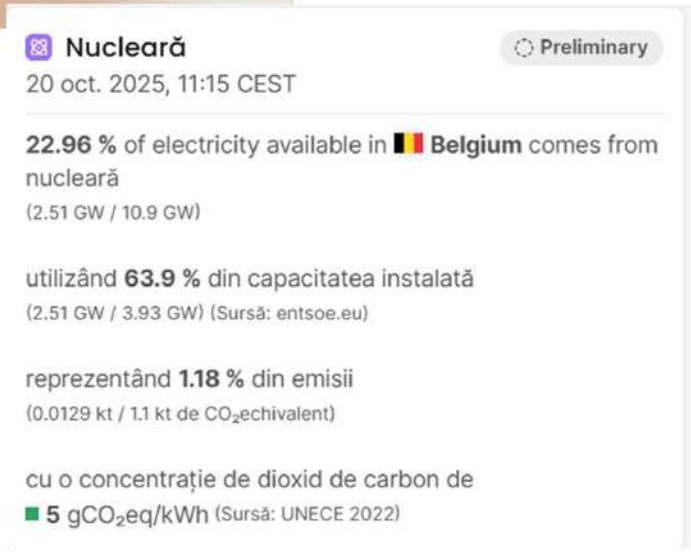


Source: https://app.electricitymaps.com/map/zone/BE/live/fifteen_minutes

Reminder: The Green Belgium





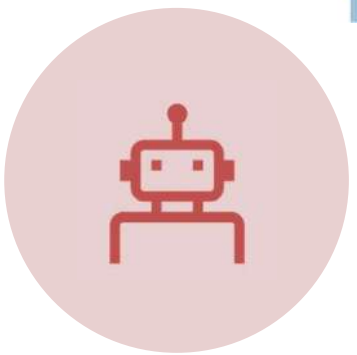


Source: https://app.electricitymaps.com/map/zone/BE/live/fifteen_minutes

The Belgian Nuclear context

NUCLEAR EDUCATION

NUCLEAR RESEARCH



NUCLEAR INDUSTRY/NPPS

General Situation

Belgian Nuclear Industry/NPPs

Plant name	Unit No.	Type	Model	Status	Capacity (MW)	Begin building	Commercial operation	Closed
SCK•CEN	1	PWR	Westinghouse (WH) BR-3	Decommissioned	10	1 Nov 1957	10 Oct 1962	30 Jun 1987
Doel	1	PWR	WH 2 loops	Shut down	445	1 Jul 1969	15 Feb 1975	14 Feb 2025
	2	PWR	WH 2 loops	Operational	445	1 Sep 1971	1 Dec 1975	(*1 Dec 2025*)
	3	PWR	Framatome 3 loops	Shut down	1006	1 Jan 1975	1 Oct 1982	23 Sep 2022[13]
	4	PWR	Belgian firms plus WH 3 loops	Operational	1039	1 Dec 1978	1 Jul 1985	(*1 Nov 2035*)
Tihange	1	PWR	Framatome 3 loops	Shut down	962	1 Jun 1970	1 Oct 1975	1 Oct 2025
	2	PWR	Framatome 3 loops	Shut down	1008	1 Apr 1976	1 Jun 1983	31 Jan 2023[14]
	3	PWR	Belgian firms plus WH 3 loops	Operational	1046	1 Nov 1978	1 Sep 1985	(*1 Nov 2035*)

Source: Wikipedia

Belgian Nuclear Industry/NPPs

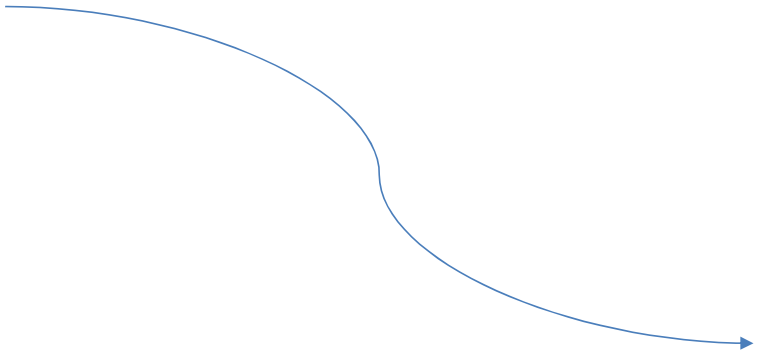
- In late 2020 the Mr. De Croo's Government /coalition agreed the nuclear phase-out by 2025, with a "plan B" option to continue 2GW of capacity if by November 2021;
- After several internal political debates and due to external political situation, in 2022, the plan to replace nuclear with gas-powered facility was postponed;
- In March 2022, Belgium officially decided to postpone closing the two reactors Doel 4 and Tihange 3 by 10 more years
- In January 2023, an agreement was reached and Engie (existing NPP operator) agreed to continue to invest in the existing NPPs and the government would reduce the costs for discontinuation of the other plants and for nuclear waste.
- Mid-may 2025, the Belgian Parliament voted (102 pro vs 8 against vs 31 abstentions) to scrap the nuclear phase-out plans: prolongation of the operation of Tihange 3 and Doel 4 until 2045

Sources: Wikipedia; www.dw.com; www.iaea.org; www.bnsorg.be; www.world-nuclear.org;

Human Resources in Nuclear: the General Situation

Human Resources need in nuclear

- Existing “producers” of HR will face difficult times in coping with demand;
- Collaboration (local; regional; international) is the key answer to fulfill the need



ENEN's findings: HR needs (EU)

Task-Force	Sub-sector	2023			Needed recruitments horizon 2035							
		Workforce			Retirement compensation			For growth				Total
		Direct jobs	Indirect jobs (supply chain)	Total Nuclear sector	Direct jobs	Indirect jobs (supply chain)	Sub-total	Growth rate Hypothesis	Direct jobs	Indirect jobs (supply chain)	Sub- total	
TF1.1	Industry (Utilities)	80	80	160	20	20	40	0,10	8,0	8,0	16,0	56,0
	Industry (Fuel)	50	60	110	13	15	28	0,10	5,0	12,0	17,0	44,5
	Industry (Engineering)	30	51	81	8	13	20	0,10	3,0	25,5	28,5	48,8
	Industry (Transport & others)	10	19	29	3	5	7	0,10	1,0	9,5	10,5	17,8
TF1.1 perimeter		**170**	**210**	**380**	**43**	**53**	**95**		**17**	**55**	**72**	167
TF1.2	R&D (indd Research reactors)	20	15	35	6	3	9	0,10	2,0	1,5	3,5	12,5
	Safety (Regulators+TSOs)	5	5	10	1,5	1,5	3	0,15	0,8	0,5	1,3	4,3
	Waste & Decommissioning	25	35	60	7,5	10,5	18	0,10	2,5	3,5	6,0	24,0
TF1.2 perimeter		**50**	**55**	**105**	**15**	**15**	**30**		**5**	**6**	**11**	41
TF1.3	Medical Physicists	10	2	12	4	0,6	4,6	0,08	0,75	0,15	0,90	5,5
	Radio pharma & Radio chem	1	1	2	0,35	0,25	0,6	0,50	0,50	0,50	1,00	1,6
	Space & Environment	0,3	0,3	0,6	0,09	0,06	0,15	0,05	0,02	0,02	0,03	0,2
TF1.3 perimeter		**11**	**3**	**15**	**4**	**1**	**5**		**1**	**1**	**2**	7
Total WP1 perimeter		231	268	500	62	68	130		24	61	85	215

Hypothesis 2.5% per year recruitments for retirement compensation

Initial considerations 1/2

- There are currently more than 100 nuclear reactors in operation within EU perimeter (Nuclear energy in the EU | ENSREG);
- Volatile environment: some countries decide to start a nuclear program or upgrade the existing one; some intend to maintain the current reactor fleet; some intend to close some or all nuclear power plants;
- Assessment of human resources and skills' needs at the horizon of 2035 maintaining the same perimeter;
- Provided we consider that indirect jobs are in majority in the supply chain (ratio indirect/direct for 2023 = 1.16 from our modelling approach).

Initial considerations 2/2

- Several scenarios were considered;
- We have assumed roughly ten new nuclear power plants to be built in an “average” 10% growth scenario;
- Various analysis models were used (literature review; direct contacts through developed questionnaires; extrapolations based on existing know how; etc.)
- Direct and indirect jobs were considered;
- Retirement based on existing know-how;
- Despite its major contribution in EU strategy, the ITER project and more generally fusion programmes were not taken in consideration.
- ...

Nuclear Research in Belgium

Belgian Nuclear Research Center

Yesterday

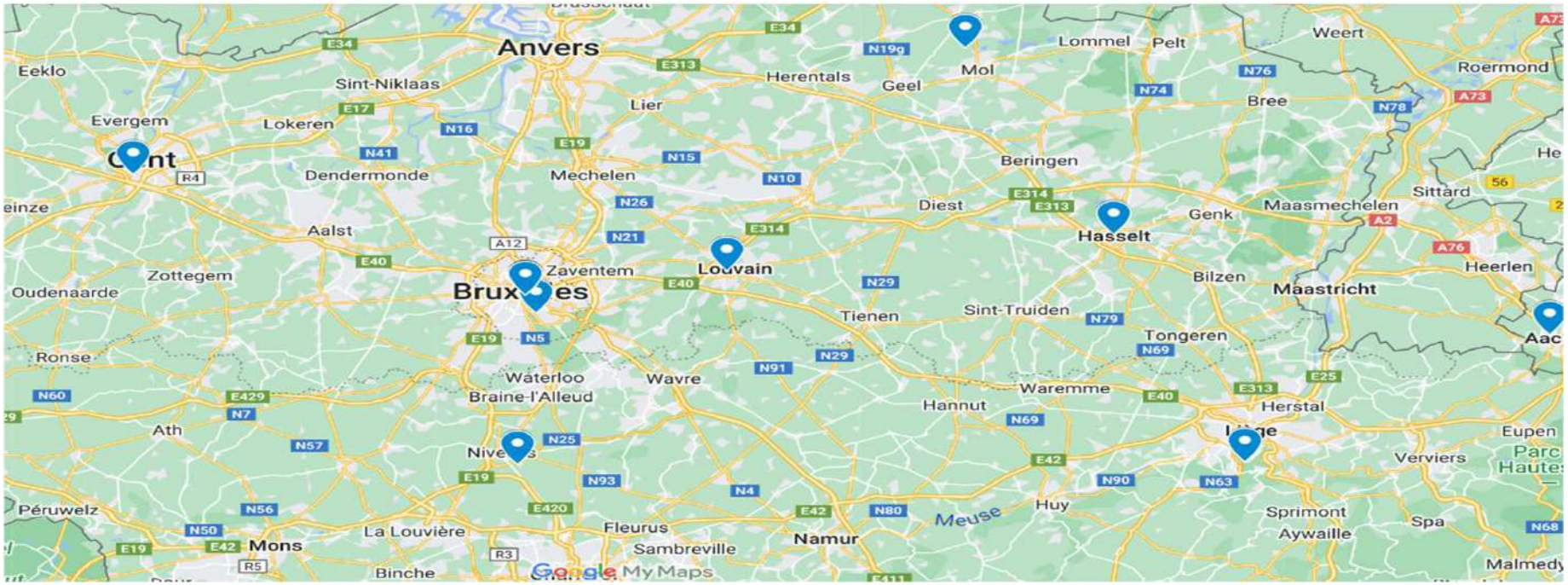
- The SCK CEN at the forefront of Nuclear Research in Belgium and in Europe. Founded in 1952 under the name of Studiecentrum voor de Toepassingen van de Kernenergie (Research Centre for the Applications of Nuclear Energy)
- BR 1(1956R)-2(1961R)-3(1962 first electricity prod. Nucl. R.)

Today

- SMRs: EAGLES-300;
- Myrrha;
- E&T Academy;
- HADES;
- Nuclear Materials (att. to medical radioisotopes);
- Advanced Nuclear Systems;
- Radiation protection;
- Space;
- Etc.

Nuclear Education in Belgium

Nuclear Education in Belgium



Belgium has a strong tradition of nuclear education, with several universities offering programs in nuclear engineering and related fields.

Nuclear Education in Belgium

- The nuclear engineering courses at the **Université catholique de Louvain (UCLouvain) and KU Leuven** began in the late **50s.** Belgium and UCLouvain have been a pioneer in nuclear education in Belgium and in Europe, offering programs in nuclear engineering and related disciplines.
- The nuclear program at **Ghent University, known as the Department of Materials, Textiles, and Chemical Engineering (MaTCh), began in the 1950s**. Ghent University has a long history of involvement in nuclear research and education, particularly in fields related to materials science, chemical engineering, and nuclear engineering.
- The nuclear engineering program at the **Université Libre de Bruxelles (ULB) began in the 1950s**. ULB has a longstanding tradition of involvement in nuclear research and education, with its Institute of Nuclear Sciences (ISIB) being established during this period.
- The nuclear engineering program at the **Université de Liège (ULiège) began in the early 1960s.** ULiège has a long-standing tradition of involvement in nuclear research and education, with its Department of Nuclear Engineering (DEN) being established during this period.
- **Hasselt University** established its nuclear program relatively recently compared to other universities in the country. The nuclear program at Hasselt University began **in the early 2000s.** Hasselt University's Institute for Materials Research (IMO) has been involved in nuclear research, particularly focusing on materials science aspects related to nuclear energy and applications.

The Belgian Nuclear higher Education Network

"In the 1990's, the academic education in nuclear engineering in Belgium consisted of two interuniversity programmes of one year of post-graduate studies complementary to the civil engineering degree - both in the Flemish and the French community. These programmes existed for several years but suffered from strongly reduced student numbers."

[...]

"It was in this context that five Belgian universities and the Belgian Nuclear Research Centre SCK CEN decided to act and remodel the nuclear education scene in Belgium with the creation of the post-graduate BNEN programme"

Source: https://bnen.sckcen.be/en/about-bnen/history

BNEN

The BNEN programme is governed by an inter-university agreement between the rectors of the three universities in the Flemish community (KULeuven, UGent, VUB), the presidents of the three academies in the French community under which the universities UCLouvain, ULg and ULB resort and the director-general of SCK CEN.

The day to day management of the programme, student issues and general policy is governed by the BNEN Academic Committee in which each university has one member present, together with the Administration Manager of the BNEN, the BNEN secretary and one student member.

BNEN

"The Belgian Nuclear higher Education Network organises a one-year (60 ECTS) master-after-master programme in nuclear engineering.

The primary objective of the BNEN programme is to educate young engineers in nuclear engineering and its applications and to develop and maintain high-level nuclear competences in Belgium and abroad.
BNEN catalyses networking between academia, research centres, industry and other nuclear stakeholders.
Courses are organised in English and in a modular way; teaching in blocks of one to three weeks for each module allows optimal time management for students and lecturers, facilitates registration for individual modules, and allows easy access for international students."

BNEN: the Academic opening 2025-2026

15:00h	Welcome address | Francis Berghmans, **Dean of the Faculty of Engineering, VUB**
15:10h	Introduction to the nuclear landscape *(draft title)* | Gerben Croonenborghs, **Head of Cabinet - Minister of Energy** M. Bihet
15:20h	Contributions to the Belgian SMR Program from the joint **ULB/VUB** chair in Reactor Physics and Safety | Matteo Zanetti**, ULB**
15:40h	Automated robust optimization of compact heat exchangers for lead-cooled SMRs | Niels Horsten, chair UCLouvain / **KU Leuven**
16:00h	Opening of the 24th BNEN academic year 2025-2026 | Peter Baeten, Chairman BNEN **Director of SCK CEN**
16:30h	Reception

This presentation should be considered only for reference.

Thank you for your attention

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