

The world needs MYRRHA

Offering a technological solution to reduce nuclear waste and produce new, innovative, medical radioisotopes. That is the ambition of research installation MYRRHA. “This ambition now becomes a reality thanks to Belgian government funding”, beams Hamid Aït Abderrahim, Deputy Director-General at SCK•CEN and MYRRHA Project Manager. The government decision to support the project gave the construction of MYRRHA a sudden boost.

In September 2018, the Council of Ministers gave the green light for the innovative research reactor MYRRHA, the world's first prototype of a nuclear reactor driven by a particle accelerator. Thanks to a financial injection of 558 million euros, SCK•CEN can launch its construction on its site in Mol. The research centre started with the particle accelerator and its irradiation stations for fundamental and applied research, as well as for medical application.

The Belgian government co-finances the construction of MYRRHA. A vote of confidence?

Hamid Aït Abderrahim: With MYRRHA, we want to demonstrate that transmutation at a semi-industrial scale is possible. Through nuclear fission, transmutation transforms long-lived, highly radiotoxic residue – the so-called minor actinides such as neptunium, americium and curium – into less radiotoxic elements, which also have a shorter half-life. As a result, the geological disposal period can be reduced from 300,000 to 300 years, and the volume can be reduced a hundredfold. This means transmutation offers new perspectives for geological disposal. Furthermore, MYRRHA will contribute to the production of innovative radioisotopes and the development of cancer therapies with fewer side effects. In short: a project with social value.

The Belgian Government acknowledges this and decided recently that it would not wait any longer for the input of foreign investors. It supports the MYRRHA project. This is a vote of confidence. A clear signal for us, but also aimed at our partners abroad. It will undoubtedly boost interest in participation in the project. Meanwhile, France, Japan, Sweden, the US and China have already expressed an interest. I am therefore very happy that Belgium made the first move.



This decision took a while, though, but you always kept faith.

Hamid Aït Abderrahim: Of course! I didn't doubt for a second. The world needs MYRRHA: MYRRHA stands for medical diagnostics, better cancer treatment, ground-breaking research and processing of nuclear waste. Now, this becomes a reality.

Construction is now speeding up. When will MYRRHA be operational?

Hamid Aït Abderrahim: Rome wasn't built in a day, and this project too requires time. The construction of MYRRHA happens in three phases. With the funding from the Belgian government, we can achieve phase 1 of MYRRHA.

What does this phase consist of?

Hamid Aït Abderrahim: In the first phase, we build MINERVA, the particle accelerator up to 100 MeV energy, and the related Proton Target Facility. MINERVA enables us to demonstrate the reliability of the linear accelerator. We aim at commissioning this modular installation in 2026. On the one hand, we will then be able to produce medical radioisotopes and, on the other, to carry out fundamental research in physics and material research. Since the government announced its decision, we have already made quite a lot of progress. The particle accelerator has grown several metres! [Read more on page 16]

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Work doesn't stop there.

Hamid Aït Abderrahim: Indeed. During the first phase we will also make all preparations to increase energy to 600 MeV (phase 2) and to link up the particle accelerator with the MYRRHA reactor (phase 3). Construction of the MYRRHA reactor is also included in phase 3. Completion is planned by 2033.

Once MYRRHA will be operational, SCK·CEN can start transmutation. How much Belgian nuclear waste would you process?

Hamid Aït Abderrahim: More than 5,000 tonnes spent fissile material from nuclear power stations are waiting. Let's visual this amount for a second. After 40 years of operation, the nuclear waste of all Belgian nuclear power plants covers about the size of a football pitch, half a metre high. If we could process this waste, the height would be reduced to 5 mm.

WAVE OF RECRUITMENT

The construction of MYRRHA is gathering pace. "This has generated a strong wave of recruitment. Now, our team is 135 strong, in-house and outsourced staff. In 2019, we will recruit 81 workers, and in the coming years some forty more", says Hamid Aït Abderrahim, Deputy Director-General at SCK·CEN and MYRRHA Director. Moreover, the MYRRHA project will boost employment with external suppliers. "Make sure you keep an eye on our vacancies page if you too want to make a difference."

Why can't existing, water-cooled reactors take care of this job?

Hamid Aït Abderrahim: For transmutation, we need fast neutrons. Water slows down and is therefore not suitable as coolant. In the design of MYRRHA, we opted for a mixture of lead and bismuth. This choice threw up quite a few questions. Which structural materials does this coolant need? Is cooling still guaranteed when the primary pumps are switched off? A whole range of experiments are currently ongoing, such as in E-SCAPE, a 1:6th scale model of MYRRHA. In 2018, the first results of the large-scale experiment in E-SCAPE rolled off the press, so to speak. The system works. Cooling remains guaranteed! [Read more on page 20]

MYRRHA is clearly exploring the boundaries of the unknown. Will MYRRHA become the international technological hub for the nuclear industry?

Hamid Aït Abderrahim: With its range of unique and innovative applications, MYRRHA will indeed become a magnet for international scientists, research centres and universities. A new generation of experts will also be trained here in the future. This reinforces SCK·CEN's pioneering role that it has enjoyed since its creation. Belgian Reactor 1 (BR1) was the first research reactor on Belgian soil. Belgian Reactor 2 (BR2) is one of the most powerful and most flexible research reactors in the world. The dismantling of Belgian Reactor 3 (BR3) is a first in Europe. With MYRRHA, we forge ahead on this pioneering path and boost the development of innovative, safe and sustainable nuclear technology. Belgium too benefits from this: the nuclear know-how remains in the country.

MYRRHA is not only a technological, but also a socio-economic asset for the Kempen region, Flanders, Belgium and even Europe. How?

Hamid Aït Abderrahim: MYRRHA means employment opportunities. We need people to build the research reactor and later on to run it. I am talking of 700 people a year on average. Moreover, we will acquire new skills. And we can then valorise these skills via spin-offs. We will also continue exploring the boundaries, for example by focusing on the production of alpha isotopes or by developing new materials through research. All this will make the burgeoning of a new industrial cluster in the Mol region possible.

Pioneering also goes hand in hand with risk-taking. Is this new reactor concept safe?

Hamid Aït Abderrahim: Absolutely! If you switch off the accelerator, the reactor shuts down within a billionth of a second.

