

# 05 | Collaboration

Developing the next generation of experts through **innovative partnership**.



**E**stablished in 2016, the Centre for Innovative Nuclear Decommissioning (CINDe) is a pioneering PhD Hub set up by NNL in collaboration with Sellafield Ltd and based at Workington Laboratory.

CINDe is an essential component of how, at NNL, we are helping to strengthen the nuclear sector's talent pipeline and embracing fresh thinking to stay at the cutting edge of research and development. Significantly, CINDe gives researchers at our partner universities an opportunity to work closely with subject matter experts in our laboratories.

Together we provide meaningful solutions to current nuclear industry challenges, in support of our national decommissioning efforts.

## Impact

Delivering real and sustainable innovation

Producing novel research that is leading to direct and on-the-ground innovation;

Contributed over £350,000 of new research and development infrastructure in West Cumbria to date;

Helping to reduce the cost of the UK's decommissioning work at

Sellafield, as well as at nuclear licenced sites around the UK and internationally;

Attracting diverse and vibrant talent to the nuclear workforce, reflected in our win of the Nuclear Decommissioning Authority's (NDA) Best People Strategy Award 2022;

Offering a pathway for the UK's next generation of scientists and engineers to take up high-quality, high-skilled careers in the science and technology community;

Working with local schools across the North West to engage children and young people in STEM.

Building on the success of CINDe so far, we will evolve the Hub over the coming year to involve a broader consortium of universities and, whilst decommissioning research will remain the primary focus of our researchers, to widen the scope of the Hub's work.



## Partnerships

A unique partnership between industry and academia

“CINDe is great for research and for the researchers. Working together with NNL means that we are able to take our technology out of the lab and test it in the extreme and challenging environments encountered on nuclear sites such as Sellafield. The researchers themselves get exposure to the processes and practices of the nuclear industry, gaining industrial experience that is often missing on traditional PhD programmes.”



**Professor Barry Lennox**  
The University of Manchester

To date, CINDe has welcomed 20 multi-national and multi-disciplinary researchers from across Lancaster University, the University of Liverpool and the University of Manchester. Based at NNL's Workington Laboratory, they carry out independent yet related projects that form the focal point of their PhDs throughout the four years of their studies.

As well as benefiting from the expert support of our teams at NNL, the researchers receive guidance from their university supervisors throughout their projects ensuring that their work is directly relevant to industry and meets robust academic standards.



“We have found CINDe really beneficial as it produces scientists who understand both the practical and technical challenges at nuclear sites such as Sellafield. This is reflected in the quality and value of the research that is produced and the number of researchers who then find jobs directly supporting our mission of environmental restoration.”



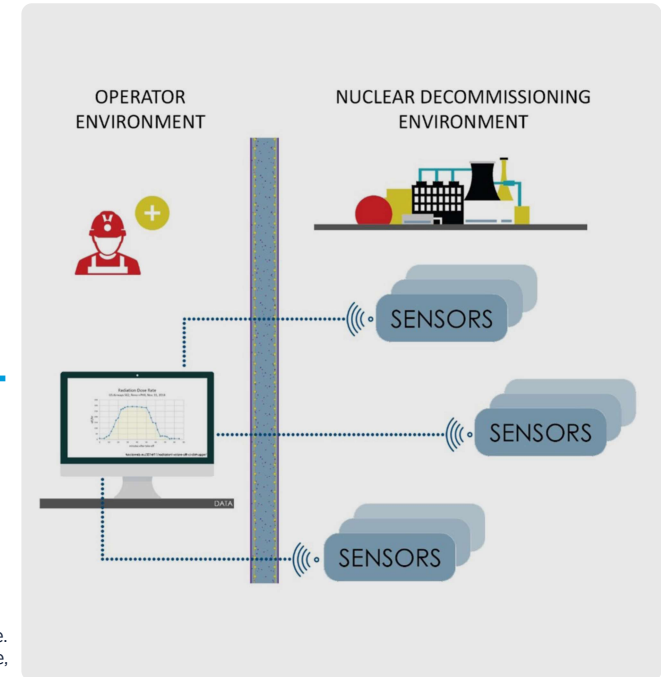
**Dr Katherine Eilbeck**  
Head of Technical Assurance and Governance, Sellafield Ltd.

### Supporting wireless communications in nuclear decommissioning environments

Wireless Sensor Networks (WSN) are deployed across a wide range of sectors, including aerospace, agricultural science and consumer electronics, to monitor the physical conditions in their environment, such as temperature, humidity and pressure. Importantly, a WSN is scalable, flexible, reliable and does not require a human operator to access the ecosystem being monitored.

In the nuclear industry, there have been few deployments of WSN technologies for instrumentation and control due to the nature and composition of nuclear decommissioning environments. For example, the higher levels of radiation can damage the electronic equipment required and reinforced concrete wall structures commonly disrupt wireless signals.

During his time at CINDe, Antonio Di Buono, a PhD student from the University of Manchester – now a Research Technologist at NNL – carried out novel research to address this challenge.



#### Through his project, Antonio:

**Designed a prototype system to remotely monitor the temperature of the Special Nuclear Material storage facility at Sellafield Ltd. in real time;**

**Examined the behaviour of radio waves as they travel through nuclear decommissioning environments to help inform the design of an effective wireless transmitter;**

**Explored the effect of radiation on commercial electronic components, confirming that some components are particularly sensitive to gamma radiation.**

The prototype Antonio created, as well as his wider research, are an essential step in the process to develop a WSN which can be deployed as a real industrial application at Sellafield Ltd.



Antonio Di Buono, Research Technologist, NNL



## Quality

**Providing the technical underpinning for our national decommissioning efforts**

“The need for innovation within the nuclear and wider energy sector is greater than ever before as we work to create a clean environment for future generations and realise our national net zero ambitions. CINDe provides a unique solution to help meet this need and make sure we are continuing to push the frontiers of nuclear science.

Forming a critical link between academia and industry, CINDe is developing essential skills and experience in our next generation of nuclear scientists and researchers and, importantly, further strengthening the North West's reputation as a centre of innovation.”



**Lindsay Edmiston**  
Head of Capability for Waste Management and Decommissioning at NNL

### Improving essential Sellafield operations for future benefit

At Sellafield, one of the main priorities is the reprocessing of spent nuclear fuel. The site's Highly Active Liquid Evaporation and Storage department is responsible for safely managing and storing highly active liquid (HAL) waste – an output of reprocessing.

As Sellafield began its transition to Post Operational Clean Out operations and, with a desire to optimise the HAL transfer process, it became clear that we needed to build our understanding of how HAL flows and interacts when being transferred through partially-filled pipes at the site.

Whilst enrolled in CINDe, Chris Cunliffe, a PhD student from the University of Liverpool, carried out essential work to provide this understanding. His research ran in conjunction with existing NNL work, providing data that extended our knowledge of simulated HAL behaviours.

Significantly, Chris' project has directly influenced decisions made at Sellafield to help reduce the risk of pipe blockages and, importantly, to minimise the environmental and commercial costs of HAL transfers for the future. Alongside fellow CINDe graduate Antonio, Chris is now a Research Technologist at NNL.

Chris Cunliffe, Research Technologist, NNL



## Talent

**Building the UK's nuclear skills pipeline**

In total, 9 researchers have now completed their PhDs at CINDe, with a further 11 currently in place at the Hub.

To date, all the postgraduates who have completed the programme have gone on to start technical roles across the science and technology community. This has included at both NNL and Sellafield, as well as at top-tier companies that work in the nuclear supply chain, such as Jacobs, Orano, Mott-McDonald and WSP.

Below are some of our recent CINDe graduates and their destinations since completing the programme.👏



**Chris Cunliffe**  
NNL



**Jessica Hyde**  
WSP



**Antonio Di Buono**  
NNL



**Ed MacNeil**  
Sellafield Ltd



**Kyriacos Hadjidemetriou**  
Orano



**Tomas Fied**  
Siemens Energy

“After completing my Master's degree at the University of Manchester in Uranium Chemistry I was looking for an opportunity in the nuclear sector and came across CINDe – a programme that provides an excellent route into the industry whilst allowing you to complete a PhD at the same time. Being able to learn alongside professionals at NNL with over twenty years of experience has been invaluable throughout my studies so far and is something very few students get the opportunity to do.

As well as providing me with insights that will be crucial to gaining employment in the sector in the future, CINDe has helped to strengthen my communication and presentation skills. From writing short technical reports to delivering elevator pitches, I am able to confidently present my work and communicate its impact to individuals from different backgrounds and with varying expertise. Working as part of the NNL team really has been a highly rewarding experience.”



**Thomas Mccarthy**  
PhD student at the University of Lancaster who is currently enrolled in CINDe