EPSRC Industrial CDT in Offshore Renewable Energy

Idcore

Alumni Project Case Studies









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Idcore



Introduction

The Industrial CDT in Offshore Renewable Energy (IDCORE) is a collaboration between the Universities of Edinburgh, Strathclyde and Exeter: a Centre for Doctoral Training, that delivers a unique training model – one year of in-depth courses that prepare all the students to deliver a three-year company-based research project, working directly for the offshore renewable industry partners who sponsor them.



This document brings together a series of individual case studies of alumni of the IDCORE programme spanning the full life of the Centre. This follows on from similar documents providing case studies for the current cohorts but takes a more long-term view of how the centre's training has impacted the careers of research engineers after completing their studies.

Why IDCORE?

These alumni chose to pursue an EngD with IDCORE for a host of reasons, in large part thanks to the unique opportunities the programme offered. Many of the interviewees had extensive skillsets before beginning their time at the Centre, and IDCORE was well set up to accommodate these skills and support the engineers in applying them to their research.

One of the questions tested at interview for all researchers applying to the programme is whether they have a specific interest in the offshore renewable industry. The programme of training and support delivered through IDCORE has allowed many of them to transition into successful careers in the sector. One alumnus described this as allowing them to make a 'sideways step' into the offshore renewables sector where they have found far greater career fulfilment.

For others, a driving influence was the progressive approach to research adopted by IDCORE. This is unlike a classical PhD programme, allowing them to pursue research outside of a purely academic context. The promise of 'hands on experience' and a sense of impact were often strong incentives. Some interviewees were also attracted by the cohort teaching model, feeling it allowed for a less individualistic learning approach with many additional benefits.

The training

For some alumni, the first year of training provided them with an entirely new skillset, for others, this was a period of knowledge consolidation. However, the emphasis on the cohort teaching model meant that students with different prior knowledge could support one another. Individuals with a wide range of skillsets found that this period gave them a greater understanding of how to apply these skills in the sector thanks to the comprehensive knowledge they gained. The training was valued both by the alumni, their sponsors and their subsequent employers for equipping them with the skills they would need within the industry.

How is IDCORE different?

The unique success of IDCORE has been in the highly contextualised research and training it provides. The training is impactful and instantly applicable to the industry partners and projects the researchers undertake. Many of the alumni reference how they continue to use the skills they developed through the programme on a day-to-day basis.

Beyond the training, it was the rare and invaluable experiences provided by the centre which were often most praised. These are part of what makes the learning within IDCORE so relevant.

There was also an appreciation for the flexibility within the Centre as students go through the programme. Projects and research can be shaped by the needs and experiences of both the students and the industrial partners, further strengthening their impact.

Long-term impacts

Almost all the alumni highlighted the invaluable relationships they were able to cultivate during their time at IDCORE. Some point to this as having been key to the progression of their careers and their research, with most of them going directly into substantive roles with their subsequent employers upon graduation. These relationships and the approach of the Centre gave many alumni a greater appreciation for the value of collaboration, particularly between industry and academia.

Some described the credibility that graduating from the IDCORE programme gave them, highlighting the recognition of its value within the industry. The variety of careers that IDCORE graduates have gone into demonstrates the adaptability of the knowledge and skills that they gain through their time at the Centre.

Future needs

IDCORE is well placed to meet the future needs of the offshore renewable sector as it fills the technical, research and leadership skills gaps present in industry and beyond. It provides a space for research outside of academia, but also helps foster better relationships between industry, academia, and the public sector.

Partners and alumni see the key role IDCORE will play in the future of the industry, with many organisations continuing to fund and support students, and some alumni even returning as supervisors.



IDCORE also allowed me to take a risk. I didn't know where it might lead, but I saw joining the Centre as a 'no regrets' decision that could open the door to opportunities that I wouldn't otherwise have been able to access.

Andrea Caio, Business Development Manager, Mocean Energy

IDCORE didn't require me to come in as an offshore renewables specialist, instead it provided me comprehensive training and the knowledge I would need to operate effectively in the energy sector. It also gave me a better understanding of the capability and resources available within academia. It was a great opportunity to meet and work with a wide range of people from diverse backgrounds building relationships that are still important to me today.

Anna Stegman, Local Energy Transition Advisor, Energy Systems Catapult

I feel fortunate to have found IDCORE – it allowed me to continue my academic career but in a far more applied context and without having to follow the classical PhD route. It also allowed me to pursue my joint interests in engineering and the environment.

David Young, Senior Cable Specialist, Ørsted

IDCORE allowed me to secure a career in this area - it gave me a broad knowledge of the offshore renewable energy industry, including mechanical and electrical engineering - a good practical background that supports my current role. It taught me how to analyse metocean data, and introduced me to the design and testing of physical devices and the challenges of practical system operation. Perhaps most importantly, it helped me to understand the clients I now work with on a daily basis.

Laurie Wilkinson, Senior Metocean Analyst, JBA Consulting



Alumni Case Study Andrea Caio



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Early post-grad career

Andrea came to IDCORE from a product design company in Cambridge, where he had been focussed on taking products from concept through the early development process for large consumer or medical sector companies. He had been enjoying the work but hadn't felt really invested in it. He came across IDCORE through a chance encounter with a student already on the course and felt it would be a good way to develop an interest he already had in the renewables sector.

It was the unique structure of the IDCORE programme that appealed to Andrea, particularly given the background he was coming from, which included a first degree in Engineering Science from the University of Oxford.

I can't think of a time when I haven't recommended IDCORE to others. I have always found that saying I've been part of IDCORE has given me credibility. It is a very well respected programme.

The initial training year was a great introduction to the sector, providing a taste of lots of different aspects of offshore renewable design, and delivering a baseline understanding of the fundamentals that ultimately helps you shape your own project. Importantly for me, this provided a way into the sector without me needing to have any specific knowledge.

IDCORE also allowed me to take a risk. I didn't know where it might lead, but I saw joining the Centre as a 'no regrets' decision that could open the door to opportunities that I wouldn't otherwise have been able to access.

I finished up delivering an exciting project for Mocean Energy, a start-up wave energy technology developer, and I've never left.

> *Quote: Andrea Caio, Business Development Manager, Mocean Energy*

Why Mocean Energy?

Andrea was a member of one of the smaller cohorts that have gone through the IDCORE programme. At the point of project allocation there were only five researchers in his cohort and, other than Mocean, all of the potential project sponsors were large organisations.

He wanted to be involved in wave energy and, at the interview, he got on well with Mocean's co-founders. It seemed like a flexible project that he would be able to shape, and joining a smaller organisation allowed him to make the most of the IDCORE opportunity – there are plenty of other routes into large organisations. Geography also played a part in his decision.

Mocean's relationship with IDCORE has been an important part of their growth strategy - they are still sponsoring projects in current cohorts. In Andrea's case, his development has become entwined with this growth story. When he completed his project, Mocean was at a point where they wanted to build their commercial team with someone from a technical background – it was a natural fit for Andrea.

However, being part of a small company means that his work is varied. He still gets involved in R&D, for example linking commercial drivers to evaluation criteria and physical testing, using approaches he developed as part of his EngD project.

EngD Project

Initially, Andrea's IDCORE project was going to provide numerical modelling support for a novel wave energy converter concept that Mocean was developing. However, the start of the project overlapped with some testing that they were undertaking at FloWave and Andrea was asked to support those tests.

He quickly discovered that there was a need within the programme for skills in computer-aided design, ideation and physical modelling that he had developed in the work he was doing before joining IDCORE. Consequently, his project changed focus, becoming an exploration and optimisation of physical modelling techniques, while linking these to emerging evaluation criteria.

Generally, from a developer's perspective, the ability to undertake tank testing is limited by constraints of time, cost and facility availability. When test slots are available, the developer will want to gather data as efficiently and accurately as possible; getting the scale of the model right and using the most appropriate facilities for each type of testing are key to this. For example, there is a difference between the physical modelling scales needed to test performance and that needed to test survival of a device in different sea states. Typically, as a developer advances the maturity of their technology, so too the scale of model that they need to test increases, but there is room to challenge this norm.

Andrea's EngD project helped to define some of these parameters for Mocean, in order to accelerate their test programmes and reduce the costs involved. It is not surprising that they didn't want to lose him.



Alumni Case Study Anna Stegman



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Anna applied to join IDCORE when she was working with a commercial diving contractor, undertaking structural inspections in a marine environment. She had been involved in the deployment of the Oyster wave energy device at the European Marine Energy Centre on Orkney and this got her interested in the potential for offshore renewables.

Her first degree was an MEng in Civil Engineering from the University of Warwick and she had used this in a number of structural engineering consultancy roles prior to joining the diving contractor. She saw IDCORE as an opportunity to extend her skills in a new sector on the cutting edge of the technology solutions needed to decarbonise the economy.

Sponsor

Anna's IDCORE project was sponsored by the Energy Technologies Institute (ETI), a public-private partnership set up to fund and support the delivery of innovative low carbon energy solutions. She continued to focus on wave energy devices exploring the potential for innovation in the sector to reduce costs and improve performance, work that was subsequently taken forward by Wave Energy Scotland.

Anna started her project at a difficult time for the wave energy sector, just as a number of leading proponents for the technology went out of business. Whilst she successfully delivered her project, it left her questioning the future role for wave energy. The ETI had exposed her to the range of solutions available and made her question where the greatest value could be delivered. She was, however, convinced by the collaborative approach to innovation adopted within the ETI, the support it received from its funders, and the potential this had for creating impact. I have never regretted the time I spent at IDCORE. As I had already been working in industry for some time, the EngD model suited me, giving me the time and space to learn research techniques and develop my critical thinking, without becoming disconnected from the more commercial context in which I wanted to apply these skills.

IDCORE didn't require me to come in as an offshore renewables specialist, instead it provided me comprehensive training and the knowledge I would need to operate effectively in the energy sector. It also gave me a better understanding of the capability and resources available within academia. It was a great opportunity to meet and work with a wide range of people from diverse backgrounds building relationships that are still important to me today.

Anna Stegman, Local Energy Transition Advisor, Energy Systems Catapult

A Change of Direction

At the end of her EngD, Anna had the opportunity to continue working with her ETI colleagues as they moved to be part of a new organisation, the Energy Systems Catapult (ESC). Here she moved away from offshore renewables, becoming part of the team that was supporting Innovate UK's 'Prospering from the Energy Revolution' Programme. This programme funded fifteen project consortia around the UK focussed on the delivery of 'smart local energy systems'.

The ESC's role was to understand the common challenges and barriers that these projects were experiencing and to find solutions that supported their delivery. As the work progressed, Anna started to work more closely with Local Authorities, exploring potential business models that they could use and helping to develop a common approach to 'Local Area Energy Planning'. This is still a key part of her role.



Alumni Case Study Daniel Milano

Project

Daniel's IDCORE project was sponsored by EDF, where his work focussed on numerical modelling of floating offshore wind turbines. He concentrated on advanced mooring geometries for tension-leg platform designs, tackling the challenges created by different weather events and capturing the underlying physics with existing numerical methods. Where these techniques were insufficient, he also worked with colleagues in EDF to address the shortcomings by developing new tools.

CATAPULT

Offshore Renewable Energy

The project was very successful, and Daniel went on to apply these modelling approaches not only to a single turbine but also to whole wind farms and much wider spatial domains, modelling the impact of climate on turbine performance over long periods. He was able to generate accurate representations of the wind and wave domain with an unprecedented level of detail and use this to virtually deploy turbines in space and time, creating a high fidelity 'numerical prototype'. This allows developers to evaluate potential new sites while also providing a tool that can be used with existing deployments for hindcast wind and wave assessment, identifying life extension opportunities at specific sites.

This work developed Daniel's credibility and profile in the sector and led to him securing a job in the floating offshore wind team at the Offshore Renewable Energy (ORE) Catapult, as a numerical modelling and simulation specialist. ORE Catapult were seeking to building their capabilities in this area and Daniel was able to bring in specific skills that supported this strategic development.

I was part of one of the smallest cohorts IDCORE has run. There were only five in my year and we have all become lifelong friends. IDCORE puts a lot of effort into facilitating the development of these relationships, and it pays off. It has been great to be able to share experiences and learn from each other as our careers keep developing.

For me, this sense of community extends well beyond my cohort – I regularly meet and work with IDCORE alumni and two of the five PhD-level projects I currently supervise are IDCORE EngDs. The network I developed in EDF has also been important to me, and it is great to see the work I started being carried on through other EDF-sponsored IDCORE projects.

Daniel Milano, Floating Wind Senior Engineer, ORE Catapult

IDCORE Legacy

Daniel completed his EngD project during the COVID pandemic, having moved back to Scotland to finish his thesis and for the birth of his twin sons.

He has now been working at ORE Catapult for over four years, and has progressed quickly through the organisation, which he attributes to the expertise and academic rigour he developed whilst on the IDCORE programme. IDCORE developed him as a research engineer at a pace he couldn't have achieved outside of the programme and doing this in an industrial context meant that he was well prepared for his role in the Catapult.

Daniel had been in industry before joining IDCORE, working in an oil and gas company with offices in Italy and Aberdeen. He had gone there after completing a Masters Degree in Mechanical Engineering at the University of Trieste followed by a Masters in Renewable Energy Technology from Cranfield University. Although he was working in marine engineering and developing offshore applications, Daniel was not in the renewables sector that he had been training for and he felt that his career path was heading in the wrong direction. The opportunity to join IDCORE acted as a 'reset' for this, and he has never looked back.



Alumni Case Study David Ogden

Undergraduate Experience

David is one of those characters who engages passionately in anything that he does.

During his undergraduate degree in Mechanical Engineering at the University of Salford, alongside completing a successful research project in bio-mechanics which led to multiple academic publications, he spent a year in Denmark on an ERASMUS scholarship, undertook an internship with a semi-conductor company, volunteered in a community centre teaching maths to the Somali community, and supported several other initiatives on a voluntary basis, including a local entrepreneur who was developing a commercial rocket venture.

He graduated having made the most of the opportunities available as an undergraduate to gain broad experience. As he looked to establish where to go next, he finished up with several offers of PhDs working in nuclear fusion, nuclear fission and neuro-science as well as an offer from IDCORE.

This success gave David the opportunity to reflect on what was driving him. He knew he wanted to be involved in doing something about the climate crisis, and decided that IDCORE would provide the best opportunity to make a difference. He already had some knowledge of the industry, as he had spent his ERASMUS year on a mechanical design course in Aarhus, learning how to design wind turbines for Vestas. He saw offshore renewables as offering an opportunity to be creative, working in a nascent industry on new technologies with the greatest opportunities for impact. He also liked the idea of spending at least the first year in Edinburgh, and the funding available to support this move was higher than for the other options.

Project

David's IDCORE project was sponsored by INNOSEA, a French marine renewables engineering consultancy with offices in Edinburgh. He developed numerical modelling software for them, designed to provide them with advanced wave energy converter (WEC) simulation capability.

The project was challenging but successful, helping INNOSEA to explore a wide range of concepts and systems which will be important if this part of the industry is to move forward. However, it was difficult for INNOSEA to turn the software into a commercial product since an open-source challenger was simultaneously being developed which has now become the industry standard software.



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Since leaving IDCORE I have been working for the National Renewable Energy Laboratory (NREL) in the USA. They are based in Boulder, Colorado, so between handing in my thesis and moving there I also got married.

The work went really well. I was initially working with NASA using my knowledge of numerical modelling in a marine environment to support design work for the return to Earth for the Artemis programme. I was promoted quickly, and was soon leading a wave energy numerical modelling team and acting as the principal investigator on a big research project.

Our work is divided into two main areas. First, we develop simulation software to help WEC technology developers gain new insights. Second, we work directly with developers to create and simulate numerical models of their systems. Soon we'll begin developing a new WEC simulation platform called SEA-Stack, which we hope will enable new breakthroughs in wave energy!

David Ogden, Research Engineer, National Renewable Energy Laboratory, USA

Legacy

David identifies a wide range of benefits from the time he spent with IDCORE and sees the EngD model as a very effective way of developing the skill set needed by organisations like NREL. The training modules delivered by IDCORE and the experience he gained working in a consultancy helped develop a set of skills which he regularly calls upon on NREL projects. He views the experience as invaluable, providing opportunities that even others working in the industry don't get.

NREL conducts advanced research and development programmes and is a world leader in the state-of-the-art for renewable energy technologies, supporting industry and product development. David's IDCORE experience prepared him well for the role he now has with them and he is surprised that no-one has yet tried to replicate the model in the US. Not only has it given him a valuable set of skills, it has also provided him with a ready-made network of former IDCORE colleagues across the industry that he continues to engage with on a regular basis.



Photo by Josh Valcarcel, NASA

Alumni Case Study David Young

When I was younger my two older brothers, my brother-in-law and three of my cousins worked in transmission for Northern Ireland Electricity, so when I was exploring my options at school I was determined not to follow them but instead to go and do something completely different. This is slightly ironic when you consider the role I have now.

After leaving school I studied Chemical Engineering at Queens University Belfast and was exposed to environmental engineering on a summer internship through the IAESTE scheme at the Federal University of Vicosa in Brazil. Then, before starting my Masters year I did a 15-month placement with BP in Aberdeen. I enjoyed being involved in energy production, and BP are a good employer, but I didn't want to go into the oil and gas industry.

I feel fortunate to have found IDCORE – it allowed me to continue my academic career but in a far more applied context and without having to follow the classical PhD route. It also allowed me to pursue my joint interests in engineering and the environment.

Quote: David Young, Senior Cable Specialist, Ørsted

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Benefits of IDCORE

David really enjoyed his time with IDCORE. The first year was very intense, especially for someone who hadn't trained as a mechanical or electrical engineer. However, this is where the cohort training model comes into its own – the students learn from each other and provide a vital mutual support network. David is not the only alumni to have highlighted how important IDCORE has been for his career, emphasising the significance of the first year training programme in preparing him for the roles he has had since.

The wider IDCORE network has also been of huge benefit to David. At each stage in his career he has worked with people who have been part of, or at least know of and respect IDCORE and the role it is playing in the industry. Whilst Ørsted, David's current employer, haven't yet sponsored anyone in IDCORE, David is acting as the industrial supervisor for a PhD at the University of Exeter, working with members of the IDCORE Team.

Project

David's IDCORE project was sponsored by the ORE Catapult and was focussed on predicting insulation degradation and subsequent mechanical and electrical fatigue failures in the dynamic cables that are being used in the wind, wave and tidal sectors, with particular relevance to the burgeoning floating offshore wind industry.

Although David's project was not well defined initially, the modelling tool that he developed and the contribution he was able to make to the wider high voltage test capabilities that the Catapult was developing became so important to the team that they asked for the publication of his thesis to be embargoed.

Career post-IDCORE

David completed his IDCORE project and the associated write-up within the funding period, but he had enjoyed working at the Catapult so much that he stayed on throughout the COVID lockdown, helping to develop their capabilities as a centre of excellence for the floating offshore wind community.

In some ways, IDCORE has become a feeder programme for the Catapult, with the training provided and the active engagement with the organisation's needs and challenges being complimentary to other graduate training schemes that they run.

During this period he was able to continue making a significant contribution to the research team as their cable research engineer continuing develop coding, and test regimes and also supporting other deep machine learning on failure modes for power electronics.

In 2020 David moved to his current role as Senior Cable Specialist at Ørsted, the first time they had employed someone in this role to support the mechanical considerations of subsea cables and applications utilising dynamic cables, particularly for floating offshore wind installations. He found the job through contacts he had made during his time at IDCORE and he is not the only IDCORE alumni working there.

Alumni Case Study Diana Jeleňová



Sponsor Selection

Diana's IDCORE project was sponsored by her employer, Wood, where she works as a Senior Renewables and Hydrogen Consultant delivering onshore and offshore hydrogen production projects. Wood is a global leader in consulting and engineering, delivering critical solutions across energy and materials markets. Employing over 35,000 people, they provide consulting, projects and operations solutions in 60 countries.

At IDCORE, Diana was part of a small cohort - only five researchers started the course in her year. The reputation that the Centre has built means that their researchers are sought after, consequently there were more projects available than researchers to deliver them and she found herself in a 'buyer's market'. She has never regretted her choice.

Initially, her project was going to be about the development of floating offshore wind, but early in the process of defining the work programme an opportunity arose to re-focus the work on the potential offshore production of hydrogen and the re-use of oil and gas infrastructure to support this development.

A Role for Hydrogen

One of the challenges in the race to net zero is decarbonisation of sectors that are hard to electrify. Hydrogen can achieve near zero-carbon footprint when produced from renewable feedstocks thus allowing for decarbonisation of these sectors. Hydrogen can also help to balance intermittent renewable energy supply by storing the excess power that would otherwise be curtailed. Wood saw this as a potential commercial opportunity and were keen to understand the implications for them as a business.

Diana's project became a techno-economic study of the potential for re-using existing oil and gas infrastructure to produce hydrogen offshore. She modelled existing pipelines to show what was possible but also to identify where further development would be required and the likely impacts on the 'levelised cost of energy' from such facilities.

There are many issues still to be addressed before such operations can be developed as commercial projects and whilst Wood have seen interest from clients, most of the projects are still early phase with only a few pilots being operational. Diana has, however, continued to work on the development of hydrogen as a solution, focussing instead on on-shore installations. She is seen as a subject matter expert and is now working as a senior consultant, more often than not delivering project management support to hydrogen projects. This illustrates one of the benefits of IDCORE, Diana was able to join Wood in a substantive post rather than on their graduate scheme and she has progressed quickly.

I found IDCORE when I was looking for an industrially focussed PhD in the renewable energy sector. My first degree was an Integrated Masters in Chemistry with Management from Heriot-Watt University, but as I explored the opportunities I could see that there would be more potential to work in areas and industries that I was interested in if I was qualified as an engineer. I also liked the idea of spending three years in industry getting experience to support my future career.

I have been proved right in my decision. I am really enjoying my role within Wood, which has put me at the cutting edge of the world's net zero transition. I have even been given a 'Women in Hydrogen' award this year by the Hydrogen Economist, in recognition of the increasing diversity needed in our industry.

Diana Jeleňová, Senior Consultant, Wood

Benefits of IDCORE

Reflecting on her time in IDCORE, Diana was extremely complimentary. She had clearly enjoyed the experience and was keen to promote the benefits not only for the researchers but also for the companies involved. Her experience at Wood has shown just how difficult it is to recruit talented staff. In a centre like IDCORE, both sides win – not only does the student receive an unrivalled experience but the sponsor gains direct access to skilled staff whose links with academia put them at the forefront of developments in the energy sector. It also creates a network of early career professionals who support each other both as friends and as colleagues as their respective careers develop.

Alumni Case Study Inès Tunga

Early Career Challenges

Inès's journey to IDCORE was driven by her determination to break through the barriers she faced in her career. Despite her extensive education, including two master's degrees from Heriot-Watt University (Energy) and Aberdeen University (Subsea Engineering), as well as a degree in Chemical Engineering from Bangalore University, Inès struggled to find a role that fully utilised her technical skills. Her career path included various positions in India, Rwanda, Belgium, and Scotland, but none provided the fulfilment she sought.

CATAPU

Energy Systems

From a young age, Inès was interested in energy, particularly the impact of energy extraction, generation, and environmental use. She wanted to do something industrially focussed that still allowed her to conduct research driven by industry needs. An EngD seemed a good fit for this, and she liked how the IDCORE course was structured. She thought it would significantly widen her skill set and knowledge within the industry, drawing on her past experience and academic background.

Joining IDCORE marked a turning point. As a mature student and new mother, Inès found an environment that valued her experience and skills. The first year of training allowed her to consolidate her knowledge, and three years of research in an industrial setting helped her build confidence and demonstrate her capabilities.

Advancing Offshore Wind Technology

Inès's project at IDCORE, sponsored by the Energy Technologies Institute (ETI), a public-private partnership set up to deliver low carbon energy innovation, focused on reducing the costs of offshore wind and increasing its commercial deployment. She was attracted by the breadth of knowledge within the ETI and the nature of the project.

At the project's inception, the strike price for offshore wind was around £200/MWh, with the goal of reducing it below £100/MWh. Through her work, Inès contributed to identifying significant potential cost reductions, but these were already being delivered by an industry that was going through a phase of rapid development, and they were achieved much sooner than anyone expected.

Consequently, the project's focus moved to be an exploration of the system and supply chain improvements needed to deliver greater maturity in the sector. This became a study of global markets, not just the UK, and the changes needed in policy and regulation, along with identifying key skills gaps in the industry. The project demonstrated one of the benefits offered by the multi-institution supervision model adopted by IDCORE, bringing together a range of relevant skills to support the project from across IDCORE's academic partners.

Achieving Professional Fulfilment

Upon completing her EngD, Inès transitioned to a full-time role at the ETI and later moved to the Energy Systems (ES) Catapult with her team. As the Catapult's Renewables Practice Manager, she ensures the organisation stays informed about renewable energy technologies within the wider energy system. Her team collaborates with innovators, regulators, government departments, and commercial organisations to understand the techno-economic realities of utility scale deployment for these technologies and the infrastructure needed for the energy system's transition to net zero.

Inès and her team are also seeking to understand the role that hydrogen might have in a future energy system, particularly in the context of long-duration energy storage. To this end, they are currently engaged in several projects demonstrating how hydrogen could be used to unlock offshore wind generation opportunities, particularly in Scotland and Wales.

Driving the Net Zero Transition

In addition to collaborating on a range of net zero transition projects, Inès proactively engaged in external initiatives, such as Engineers without Borders, awards judging panels, and an Innovate UK Programme. These demonstrate her commitment to driving global collaboration among SMEs and advancing the deployment of renewable energy projects.

Inès has also successfully led initiatives to engage stakeholders and secure funding for various projects. Her experience in fundraising is invaluable when assisting small and medium enterprises with their efforts to secure necessary resources and achieve their strategic goals.

Reflecting on IDCORE's Impact

Inès attributes her success in her current role, at least in part, to the opportunities and support provided by IDCORE. The training this gave her has been invaluable, allowing her to grow in confidence, build her credibility and function effectively in a wide-ranging and demanding post. The network she developed during her time with IDCORE has also proved very useful professionally, and the long-lasting friendships continue to be important to her personally.

Reflecting on the impact of CDTs and my experience within IDCORE, I am very clear on the value delivered by this training model. The whole sector needs well trained systems engineers, and postgraduates who have been through the sort of training offered by IDCORE are excellent candidates for such roles. Many of the Catapult's staff are Chartered Engineers with PhD level qualifications, and throughout the sector, there are skills gaps that CDTs are plugging.

Inès Tunga, Renewables Practice Manager, Energy Systems Catapult



Alumni Case Study

My IDCORE project was sponsored by Sustainable Marine, a small, highly innovative tidal stream device developer. I enjoyed work with them tremendously and stayed with them for four years after completing my EngD.

Originally the plan had been to work on a mooring system optimization for the device that Sustainable Marine had in development, but my initial investigation helped identify a project that ultimately helped steer the company in a new direction. The conventional wisdom was that sites with high tidal flows provide tidal turbines with the highest energy yields and therefore the greatest commercial returns. We were able to show instead that deploying in sheltered, near shore sites could reduce operating costs and improve the through life returns, even with significantly lower tidal flow speeds.

This was a really exciting project to be involved in, with some very tangible outcomes. It led to me moving to Scotland with the company and working in Canada over several months as we delivered our first commercial deployment.

John McDowell, Research Lead – Ocean Engineering, DEEP

Unfortunately, the deployment in Canada was beset with problems which were largely outside of the company's control and full commercial viability remained out of reach. At this point John left Sustainable Marine and began work at DEEP.

DEEP

DEEP (deep.com) is an international design and engineering organisation developing new technologies to enable humans to live, work, and explore underwater. As Research Lead for Ocean Engineering within DEEP, John still uses the knowledge and skills he gained from being part of IDCORE, as well as the contacts.

Background

Prior to joining IDCORE, John's first degree was in Oceanography from the University of Liverpool. After a spell in various green sector jobs, including working for an upcycling company in Canada and some time with Ofgem working on their various renewables funding schemes, he went to the University of Plymouth to complete an engineering focussed MSc in Marine Renewable Energy. As he wasn't from an engineering background this was quite a risk, but it paid off – he enjoyed the course and it set him up well for joining IDCORE in 2015. With hindsight, he wishes that he'd gone into engineering sooner.

Why IDCORE

John was attracted to IDCORE by the industrial focus of the centre. He wanted to take advantage of the practical and theoretical experience it offered to develop tacit knowledge that would hopefully provide a gateway to a career in marine renewables, a sector he had found hard to access.

From the position he is in now, John sees EngD programmes like IDCORE as an excellent way of attracting talented engineers into the industry, allowing someone who has succeeded academically to understand the challenges and get further down their career path. If he could find the right project, he would look to sponsor an IDCORE student himself with DEEP.

Like many others, he found the cohort-based nature of the training extremely valuable, along with the diversity of the group that had been brough onto the programme. They were able to support each other through the intensity of the first year of training and subsequently when they were all out in industry delivering their projects.

However, it is the practical nature of the experience that left the most lasting impression on him – remembering the feeling of sitting on Loch Etive, boiling a kettle to make a cup of tea, using electricity generated by a floating tidal turbine that he had helped to design.





Alumni Case Study

JBA consulting

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ForeCoast[®] Marine

Guiding you through uncertain seas

Current role

After graduating from IDCORE, Laurie joined JBA Consulting, an organisation he had been attracted to by seeing them present at an IDCORE company day. He is now based in Wallingford where he manages the development of their ForeCoast® Marine consultancy tool. It is a tool that is used for assessing project feasibility and weather risk for offshore wind installations.

His time is split roughly equally between product development, consultancy, business development and client support. His clients include one of the current IDCORE research engineers.

Why IDCORE

Laurie originally applied to join IDCORE because he wanted to contribute to the development of renewable energy and in particular nascent technologies like wave power. He liked the idea of research but felt that a PhD was maybe too academic - he wanted a work on something that had a material impact in the sector and thought this was more likely to happen within the context of an engineering doctorate.

I came to IDCORE having completed a BEng in Environmental Engineering along with a number of renewable energy related internships, including some time spent at the Centre for Alternative Technology in Wales and HR Wallingford (not far from where I am now based). Through these experiences I had developed an interest in coastal engineering and programming, which I am still pursuing today.

IDCORE allowed me to secure a career in this area - it gave me a broad knowledge of the offshore renewable energy industry, including mechanical and electrical engineering - a good practical background that supports my current role. It taught me how to analyse metocean data, and introduced me to the design and testing of physical devices and the challenges of practical system operation. Perhaps most importantly, it helped me to understand the clients I now work with on a daily basis.

However, my most abiding memory of my time at IDCORE was the satisfaction of getting a physical model of the system I had designed into a wave tank and getting everything working. My work delivered a significant advance in the design of power take off systems and the physical model I developed has subsequently been used by other researchers studying array effects.

Laurie Wilkinson, Senior Metocean Analyst, JBA Consulting

Project

Throughout his project, Laurie worked with Aquamarine Power at their base in Queens University, Belfast. He worked on a new version of their 'Oyster' device, which had a modular design to help reduce physical loads on the flap and foundation and facilitate installation with smaller boats. He chose to work with them because he liked their device. It was a simple, mechanically reliable design that looked efficient, and at the time (2013) they were at the forefront of the industry.

The majority of the project was focussed on physical experimentation in a wave laboratory - designing a scale model of the new device and then gathering data and analysing the outputs of wave tank tests.

Laurie's work compared the modular device with the original 'rigid' design, finding that it led to some reduction in the forces applied to the foundation, but with mixed results on power – it performed better in angled waves than those approaching the device head on.

He learned a lot from the project, not least how easy it is to over-complicate device design.



Alumni Case Study Leah Barker Ewart



Why IDCORE?

Leah describes her move to IDCORE as a 'sideways step' that provided her with some excellent training, specific knowledge about the offshore renewables sector and opportunities to diversify her experience that wouldn't otherwise have been available to her.

Leah came to IDCORE after having already spent ten years working in maritime and coastal engineering. Upon graduating from her first degree in Civil and Environmental Engineering at Imperial College she had joined Peter Fraenkel and Partners before moving on to Black and Veatch, where her work had a marine renewables focus and she started to develop a passion for this area of technology. Joining IDCORE allowed her to pursue this interest and establish a network of contacts across the industry that would allow her to build a successful career in the sector.

Project

At the time there were a number of wave energy device developers looking to reduce the costs of manufacturing their devices. Leah wanted to explore this area of work, particularly since concrete was being considered as a potential low-cost construction material, drawing on knowledge she had developed earlier in her career.

She managed to secure a project with Pelamis who were, at the time, the leading developer of wave energy convertors. Unfortunately, they lost funding and went into administration not long after the project had started, a fate that was also experienced by Albatern, the company who subsequently took on Leah's project. Despite this, Leah managed to complete her project successfully, with the final phase being funded by Quoceant, a marine energy consultancy who were also interested in the application of reinforced concrete to manufacturing processes in marine renewables. The work provided them with valuable knowledge of fabrication techniques and the benefits of different fibre-based reinforcement materials.

Despite the obvious disruption to her research, gaining first-hand experience of the commercial challenges of delivering innovative technologies in the marine environment was invaluable experience for Leah, especially as she gained that experience without her own job being on the line. This is not the only time that IDCORE has experienced these sort of challenges with a project sponsor, and yet their support and connections to the industry have meant that, like Leah, the researcher has always been able to successfully complete their EngD.

Working in wave energy was fascinating and I really enjoyed my time on the IDCORE programme – it confirmed by desire to be working in offshore renewable energy and established my credibility in the community, and this has paid dividends for my career since.

We recently held a ten-year reunion for my cohort and it reminded me what great experiences we had shared especially during the various trips we had together.

Leah Barker Ewart, Principal Engineer, Empire Engineering

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Subsequent Career

After leaving IDCORE, Leah continued to work for Quoceant, but the on-going struggle to make wave energy commercially viable led to her moving into the offshore wind sector, working first for RES and now for Empire Engineering. She is still using the structural engineering skills she learnt in her first degree, but now she is applying them to the design and analysis of a range of offshore renewables projects, including taking on roles such as the owner's engineer

for major offshore wind construction programmes.

Alumni Case Study Mairi Dorward

XODUS

Recent Career

Mairi was an experienced environmental scientist when she joined IDCORE and had already set up her own consultancy business, which she kept running throughout her time on the programme. As she graduated from the scheme in 2020, she continued developing her own business, winning contracts with EMEC and the University of Edinburgh but ultimately decided that she needed the security of a full-time role in a larger organisation.

In 2021, Mairi joined Xodus, an international consultancy that encompasses all aspects of offshore engineering, including renewables, oil and gas, hydrogen and CCUS. They were a company that she knew - she liked what they did and how they did it.

Mairi is a member of their Environmental Impact Assessment team, leading on a range of projects, including the development of carbon and climate assessment for projects. Xodus are seeing an increasing demand for such assessments from their clients, who are looking for standardised approaches, aligning with best practice. This has led Mairi back to IDCORE – Xodus are sponsoring a project that she is supervising. The project seeks to augment a digital carbon assessment tool and to enable incorporation of physical climate change risks, such as changes in wind and sea levels into offshore wind farm site selection.

IDCORE is a unique partnership between academia and industry. It brings the academic rigour that we need but within an industrial context, responsive to a very different set of drivers.

For me personally, it provided the opportunity to acquire formal engineering skills and helped me to make the transition I was looking for from oil and gas to the renewables industry.

My cohort formed some incredibly strong connections - we worked well together and supported one another, indeed we are still in weekly contact.

My current job is a culmination of experience obtained across my whole career. Having been part of IDCORE, I am well connected to an extensive network including, for example, academics working on climate models and engineers working on data science. Access to this network enhances our offering at Xodus.

Quote: Mairi Dorward, Environment Specialist, Xodus



Background

Mairi's first degree was a BSc in Environmental Management from the University of Aberdeen. She then moved to Tanzania where she worked in environmental management and rural development in a school, providing environmental management training. Subsequently, after completing a policy focussed Masters in Environmental Change Management at Oxford, she moved to bp.

During the 10 years that Mairi spent with bp she delivered a range of environmental roles. These took her to Shetland, Aberdeen and London where she worked in major projects, operational roles and mergers and acquisitions. Throughout this period her focus was on the environmental engineering and management of projects across their lifecycle.

IDCORE Project

Joining IDCORE took Mairi to somewhere very different.

She took a portfolio approach to her project, working first with CorPower on the operation and maintenance challenges of a half-scale wave energy converter installed at EMEC on Orkney. She then spent two years supporting a collaboration between the University of Edinburgh and the US Pacific Northwest National Laboratory to develop a field-scale sensor for measuring turbulence around tidal turbines.

Both elements of the project proved to be a good fit to Mairi's skill set and interests, and have contributed to preparing her for the role she is now delivering.



Alumni Case Study Rebecca Williams



Engineering and Physical Sciences Research Council

EPSRC

Rebecca (Becky) is now a Senior Portfolio Manager in the Mathematical Sciences Theme at the Engineering and Physical Sciences Research Council (EPSRC) where her experience in IDCORE and the skills she developed whilst working on her EngD project give her credibility. She understands the academic environment and what's needed to operate effectively in a research context, but she also has a wider perspective of the needs of funding partners because of the time she also spent in industry.

EPSRC provides the funding for IDCORE as part of their support for talent and skills. Consequently, to avoid any conflicts of interest, since working for EPSRC Becky has not been involved in marine renewables. Instead, she has worked on programmes that fund manufacturing, artificial intelligence and robotics, fellowships and now mathematical sciences. Her role has been about moving grant applications through the peer review process, although now that she is a Senior Portfolio Manager she is also becoming more involved in the strategic development of UKRI funding programmes.

Training

One of the benefits of the IDCORE programme, was the focus that they put on data analytics. The training that Becky received in this was vital to the successful completion of her project, but it has also been invaluable since. It solidifed her understanding that there are a range of methods available for understanding complex systems, experience that she still draws on to provide a holistic view when interacting with different disciplines to address the diversity of challenges that she encounters in her day-to-day work.

Becky was a member of the first ever cohort to undertake the IDCORE programme. Consequently, there were more potential sponsors than there were researchers available to take on projects and so there was choice. Becky chose to work for EDF Energy in their UK R&D Centre, where one of the senior managers had previously been a Portfolio Manager for the EPSRC. Discussions with her influenced Becky as she was looking for potential career opportunities after completing her EngD. One of the most enjoyable aspects of working at EPSRC is the support she gives, and engagement with academic researchers.

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I came to IDCORE having completed a foundation degree in Cornwall and then a bachelor's degree in Renewable Energy at the University of Exeter. I had subsequently spent some time with Regen and when the IDCORE opportunity came up I was working as a Research Assistant at Exeter monitoring tidal flows and exploring vortex-induced vibrations in marine structures.

Moving to IDCORE felt like the natural thing to do, as I had been working in a research environment and I was interested offshore renewable energy. At the time there were no other CDTs focused in this area. I have never regretted the decision.

I have realised since that it was the emphasis on the cohort-based approach to training that appealed to me, along with opportunities like the training programme at SAMS and gaining access to the expertise in three of the leading institutions working in the offshore sector.

The experience also showed me that research capability does not just exist in universities – there is a much wider community that organisations like the EPSRC need to draw on in the pursuit of knowledge, and EngD's are a very effective way of helping to build these relationships

Quote: Rebecca Williams, Senior Portfolio Manager, EPSRC

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Project

Becky's project focussed on the application of an operation and maintenance tool for offshore wind farms that had been developed by colleagues in France. It was a stochastic model and Becky used it to carry out a sensitivity analysis of offshore wind operations under different weather, reliability and vessel availability conditions. She benchmarked the results against other similar tools and developed a detailed understanding of this model's handling of risk and uncertainty.

Delivering a project in a pressurised commercial environment, taught Becky influencing skills. EDF Energy had only just started to explore the potential for offshore wind technology in the UK. The capability that had been developed within the company was all situated in Paris, so Becky had to establish effective international relationships as well as the ones within her own business unit. The work resulted in a number of academic papers and Becky led on the development of EDF's involvement in SPARTA, an industry-wide sharing of reliability data from offshore wind installations that EDF still supports.

EPSRC Industrial CDT for Offshore Renewable Energy

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