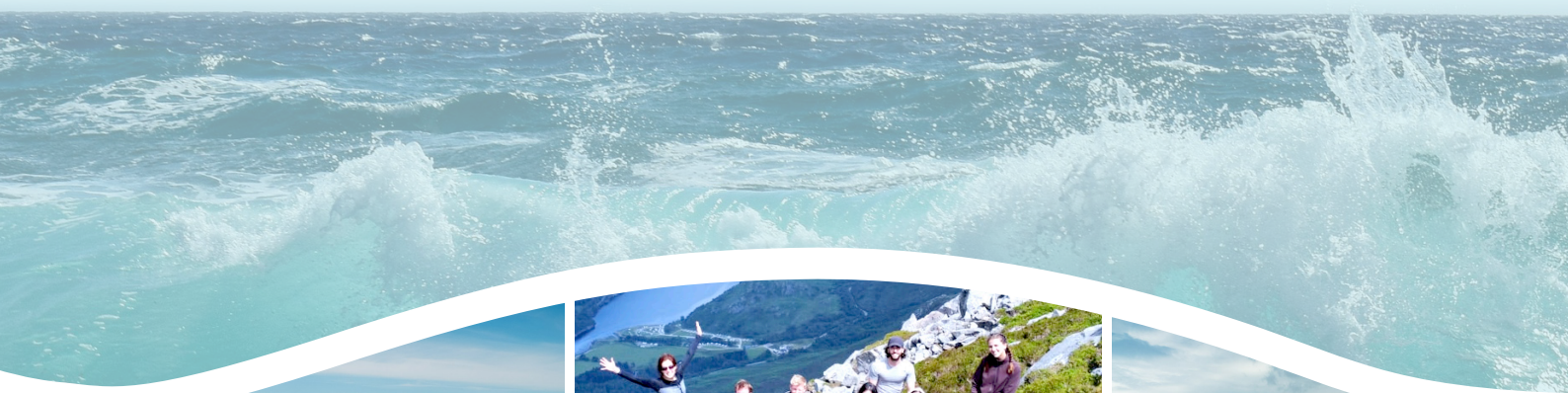




**EPSRC & NERC InDustrial CDT
for Offshore Renewable Energy**

Project Case Studies



**THE UNIVERSITY
of EDINBURGH**

UNIVERSITY OF
EXETER

University of
Strathclyde
Glasgow



Natural
Environment
Research Council



SAMS
Scottish Association
for Marine Science



Engineering and
Physical Sciences
Research Council

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Introduction

The InDustrial CDT for 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 directly for the offshore renewable industry partners who sponsor them.



This document brings together a series of individual case studies of the students in IDCORE's 2019 and 2020 cohorts. It draws on interviews with each of the students but also with a wide cross-section of their academic and industrial sponsors.

Rationale

There are now very few pure EngD programmes like IDCORE in the UK. However, a sector with the level of diversity found in offshore renewables really lends itself to commercially focussed research, and IDCORE has been shown to deliver significant industry-relevant outcomes.

The fast-moving nature of the sector puts the students on the 'cutting edge' of developments. They can exploit opportunities, taking advantage of the freedom and flexibility offered by a research project, whilst delivering outputs that add considerable value to their sponsors by responding to their needs. Seeing the results of their work implemented in a commercial environment is an object lesson in how to achieve impact. It also exposes the students to the commercial risk in the sector but in a way that keeps them safe – having first-hand experience of a sponsoring company failing (as has happened to more than one student) is invaluable life experience.

Training

Students, sponsors and academic supervisors alike all emphasise the value delivered by the initial training that the students receive. It is an intense experience, but the breadth and depth of knowledge the students gain is unrivalled. It is undertaken before the students are matched with their sponsoring company, and for many this has led to very different decisions about the project they have ultimately undertaken. The risk with more standard approaches to PhD level training is that they provide detailed skill but lack context or impact and do not provide the educational experience that IDCORE most definitely does deliver.

Support

IDCORE is a team effort with a clear emphasis on care and nurture. The initial training is designed to create strong bonds between the members of each student cohort, building a mutual support network that is seen as vital by the students as they join their sponsoring companies and throughout their research projects. This approach is valued by the sponsoring companies, who benefit from the knowledge and experience the students share with each other.

The sponsors also benefit from the joint approach to supervision between the three academic institutions involved, as do the students and the supervisors themselves. This multi-disciplinary approach to the provision of academic support ensures that the students and their sponsors can access a wide range of research competencies. It builds networks, supports the development of new supervisors, and is a very effective route for increasing engagement and knowledge exchange between the industrial and academic partners in IDCORE.

Destinations

The success of IDCORE means that it has been able to recruit a high calibre of students from diverse backgrounds. Because they undertake their research whilst also being actively engaged in the day-to-day processes within a company, they learn more than just the subject area, and graduate ready to take on more and greater challenges. They also graduate with a strong network of industry contacts developed through their projects and their work together as IDCORE cohorts. Many have gone straight into roles within their sponsoring companies, and most have gone on to have successful careers in the sector. Some have even come back to IDCORE as industrial or academic supervisors.

Benefits

Both the academic supervisors and the industry sponsors identified a range of other benefits they had derived from their engagements with IDCORE. In many cases the projects themselves have initiated new relationships and led to larger collaborations. They have demonstrated the industrial relevance of certain areas of research and in some cases have even kicked off whole new areas of application.

For some sponsors the relationship with IDCORE is being used to promote internal engagement with low carbon energy solutions. For others the engagement with IDCORE is a crucial part of their business strategy. The projects are seen as effective ways of filling knowledge gaps, using research to solve problems, and providing flexibility that enables new industry questions to be answered. In a number of cases IDCORE students have built models and developed tools that have proved invaluable and have even become new commercial products. IDCORE provides high calibre students who can come into the business, ring-fenced from day-to-day operations, allowing them to focus on delivering innovation.

There are also personal benefits. Supervisors from both academia and industry spoke of being energised and motivated by their relationships with the students. Their confidence and enthusiasm is inspiring, and it brings a lot of job satisfaction to watch their journey to becoming research engineers and everything that goes with this – management capability, decision making, confidence, results and recognition.



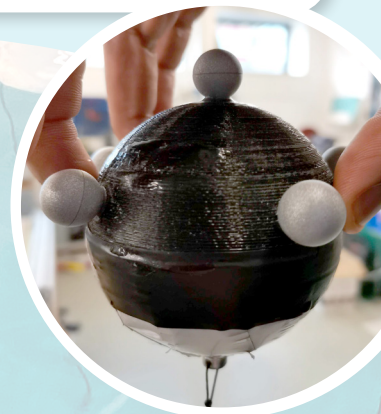
Case Study

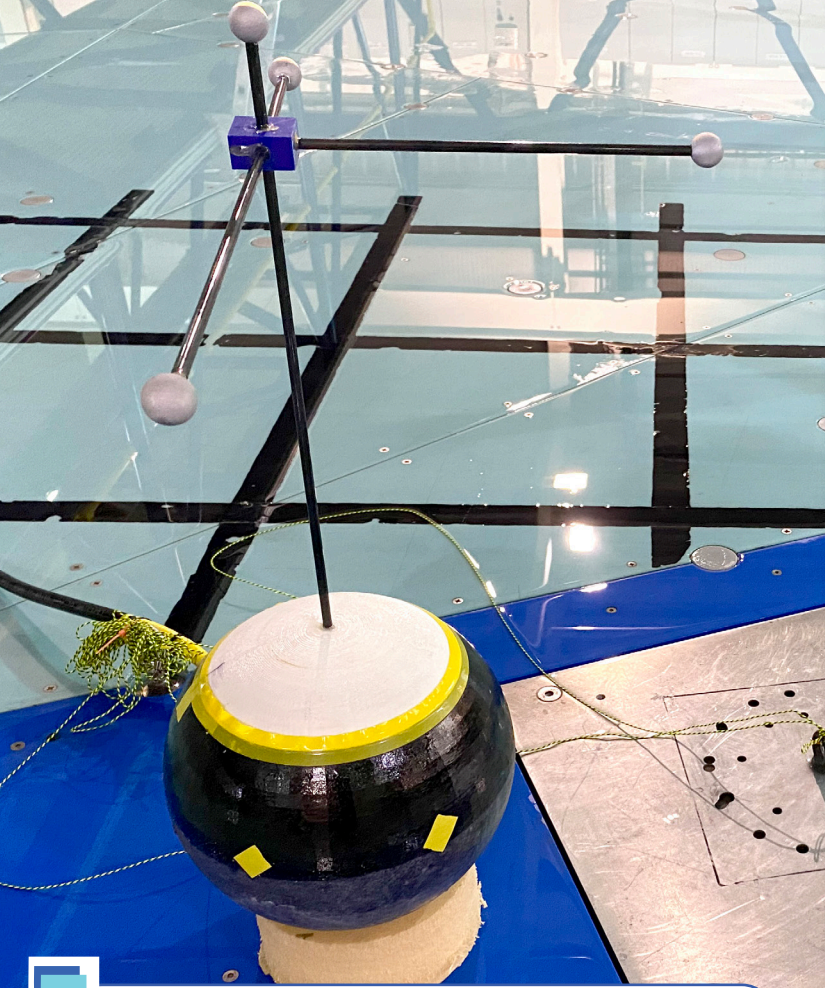
Ajit Pillai

About Ajit

Ajit, a former IDCORE student, is now a Senior Lecturer in Autonomous Systems and Robotics at the University of Exeter. He teaches on modules provided as part of the IDCORE training and is currently on the supervision teams for five different IDCORE projects.

As a mechanical engineer, Ajit has specialised in sustainable engineering, applying machine learning and optimisation across the marine sector, with a current focus on optimising the design of offshore wind turbines and improving access models for their operation and maintenance.





IDCORE Legacy

Ajit still works with colleagues from his IDCORE cohort, project partners who now work across the industry. These relationships were built by 'going through the crucible of IDCORE together' – an invaluable network.



His IDCORE project was sponsored by EDF, and he was based with their Research & Development team in London. There have been a lot of changes in that team since Ajit graduated, but one consistent feature has been their on-going engagement with IDCORE, providing continuity and leading to co-design of research projects which continue to address the specific needs of the organisation.

The code and tools Ajit developed as part of his IDCORE project are still being used by EDF in windfarm design, impacting major development decisions. He is seeing similar impacts from the projects and students he is now supervising.

Not many IDCORE graduates are in academia but most of them work closely with universities. It is the only programme of its kind, and Ajit hopes it will become a case study for other sectors, showing how academia and industry can work together.

I was first drawn to IDCORE as a student when I was unsure whether I wanted a career in industry or academia. IDCORE allowed me to continue pursuing both options. I have now chosen, but as an academic my interest is in industrially applicable research. IDCORE has been, and continues to be, a key part of my professional career. It continues to help me build relationships with project partners, keeping me more fully aware of the challenges facing the sector and the specific research needs these create. In a busy research landscape the IDCORE model is unique, delivering benefits which are highly valued by project sponsors.

Future

All the academic and industrial supervisors interviewed as part of this case study project said that they wanted to see IDCORE continue. There is a recognition, particularly within the academic community, that it will need to evolve and change to reflect the massive changes that are going on in the industry. However, it is making a difference - the needs within the industry that led to its creation haven't gone away. By breaking down barriers between industry and academia and demonstrating the value of academic led research focussed on industry needs, IDCORE is helping to accelerate progress towards the UK's net zero target.

It has been a fantastic privilege and a great pleasure to lead IDCORE. I have had many wonderful opportunities throughout my career to work on projects that have made a significant contribution to the development of offshore renewable energy. However, IDCORE is the one of which I am most proud. I really believe that the sector needs a centre with the breadth of training we offer in IDCORE and one which is working to deliver the level of impact that only comes from industry led projects.

*David Ingram, Director of IDCORE and Academic Supervisor,
The University of Edinburgh*

PhDs are a long-established pathway for training academics. A fast-changing industrial sector like offshore renewable energy needs something different – a training programme that is nimble, flexible and responsive to industry needs. IDCORE has proven the benefit of EngDs to the students, the sponsoring companies and the academic institutions involved. I don't understand why more centres aren't using this model.

*Tom Bruce, Convener of IDCORE's Board of Examiners
and Academic Supervisor, The University of Edinburgh*

The quality of the students from IDCORE is very high – that's why we keep coming back for more. The training they receive prepares them really well, there is very little that they don't know about delivering renewables in the marine environment. This means that they can hit the ground running and they have made a significant contribution to our activities. The state-of-the-art research they undertake builds our internal capability, knowledge we would otherwise have to buy in commercially.

Christophe Peyrard, EDF

As a small and dynamic company, working with IDCORE is a best of both worlds. The researcher working within our company gains valuable insights and knowledge to apply to their studies and we benefit from an extra pair of hands, something that enhances the experience gained by the researcher. The IDCORE project working with companies like ours, creates an invaluable pipeline of highly skilled engineers who are needed within the marine renewable sector.

Joe Lee, Sustainable Marine





Case Study

Alyona Nabarezhnykh

2019 Cohort

ORBITAL
MARINE POWER

EMEC
THE EUROPEAN MARINE ENERGY CENTRE LTD

About Alyona

Alyona came to IDCORE to pursue an interest in offshore renewables, after having spent a period in banking following the completion of a Civil Engineering degree. She was attracted to IDCORE by the nature of the EngD qualification and the training it offered, alongside the opportunity to undertake an industry-based research project.

It was the opportunity to work at EMEC that first attracted Alyona to this project, an organisation devoted to the development of offshore renewable energy. It has taken time to get on top of the literature and to establish a detailed specification for the work, but she is finding the work enjoyable and her analysis of turbulence in tidal flows is already delivering value to both organisations.

Alyona's Project

Her project involves two organisations, the European Marine Energy Centre (EMEC) on Orkney and Orbital Marine Power, developers of a unique floating tidal turbine. It is allowing her to practically apply her knowledge of fluid dynamics to explore what turbulence in tidal flows might do to marine energy devices.

She is using hydrodynamic modelling to investigate how turbulence measured across the EMEC test site might affect Orbital's turbine. In this way, the team are gaining knowledge of the structural loads that the device is likely to experience during deployment at sea, the fatigue this may cause and the impact this could have on the life of the device.

I am really enjoying the research project. It is allowing me to apply my engineering skills, which have been supplemented by the knowledge I gained from the IDCORE training, in a very practical way. This experience has been enhanced by the people I am working with and the diverse cohort of students who are studying at IDCORE alongside me. We have become an effective and mutually supportive network.



The approach IDCORE offers has brought with it a number of benefits for Alyona. Undertaking the training prior to selecting a project opened her eyes to the research opportunities working with wave and tidal energy devices. She is now realising these opportunities in a project that is giving her time to explore the engineering detail in an area that she knows is relevant to the offshore renewables industry.



The project is also benefitting both of Alyona's sponsors. They seem very happy with her work and want to be involved in the publication of the papers Alyona is aiming to write before the end of her project. It gives them access to leading academic capability and support, allowing them to explore important topics for the industry that they wouldn't otherwise have the time or resource to investigate. It is proving highly cost effective, and EMEC's sponsorship of multiple IDCORE students is also delivering continuity of benefit.





Case Study

Ben Moverley-Smith

2019 Cohort



XODUS

Ben's Sponsor

Ben's project is with Xodus, a global energy consultancy with its head office in Aberdeen. Xodus have been expanding into the renewables space for the last seven years, especially in relation to floating wind. They were offering an open-ended project and the opportunity to work in multiple locations where they have offices, including Edinburgh, Glasgow, and London. It gave Ben the opportunity to enter the space in his interest area of materials science and data analytics without requiring a heavy engineering background.

About Ben

Ben's background in natural sciences, chemistry and physics had ignited his interest in materials science, especially for renewable energy applications. He was drawn to IDCORE as a way to transition his skills into offshore renewables and gain new skills in engineering. Delivering practical research for an industry partner was also an exciting opportunity.

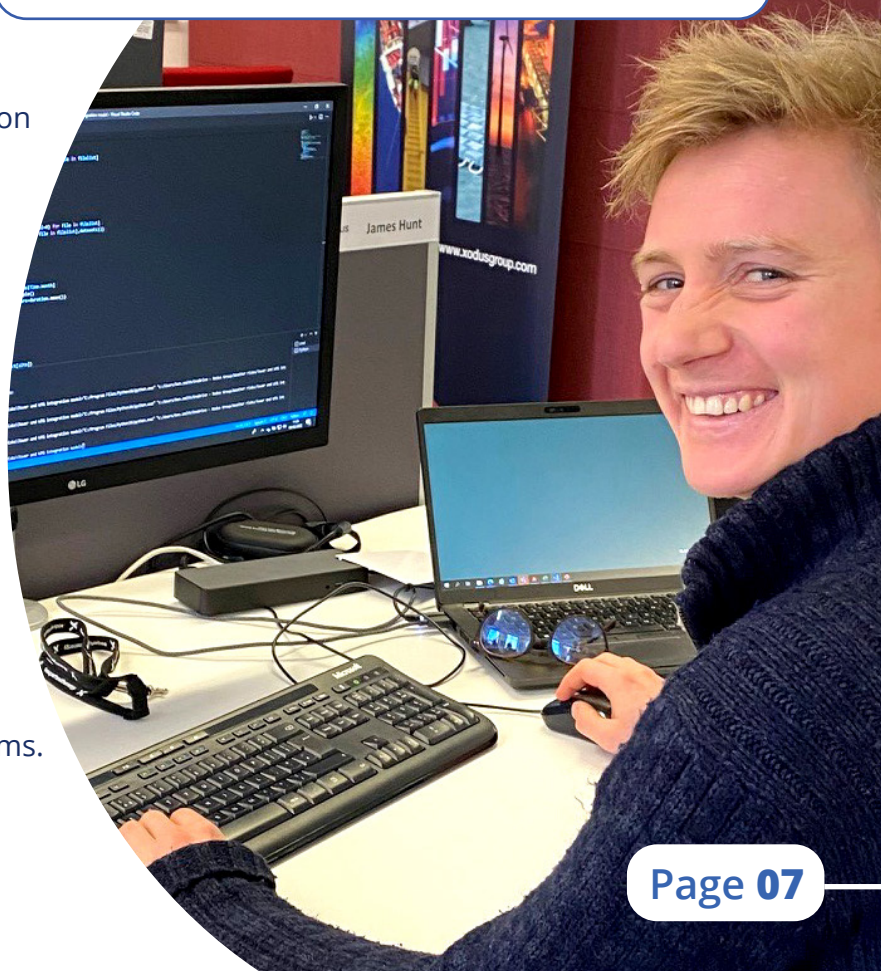
Since he started working with Xodus in May 2020, Ben has undertaken several studies that have built his portfolio of work and helped inform the direction of his overarching project. This has included conducting an industry engagement survey, which explored industry professionals' projections about the costs and challenges of floating offshore wind and researching the maintenance accessibility of floating offshore wind platforms. These outputs have formed the basis of an academic paper and important results that will be presented at an industry conference.

Ben's Project

More recently, Ben has been working with Xodus to develop a final project idea that will bring real value to the industry. This will involve looking at the impact of weather conditions during the construction phase of a floating windfarm. At present, changes in weather pose a large risk to the construction, with delays caused by heavy winds and other adverse conditions meaning that currently work only takes place between April and August.



IDCORE has given me a lot of freedom while enabling me to focus on the things I find interesting and that will make me more employable. The opportunity to be involved in commercial projects has really enabled me to build my experience



Ben's research will simulate the construction conditions of one turbine to understand how risk can best be managed, insights which can then be extended to a whole farm. This will help improve the bankability of commercial scale floating wind.

Ben has also had the opportunity to work with multiple teams and contribute to other areas of Xodus. This included working on a project conducting a cost comparison for a new design of climbing crane, providing greater understanding of how these projects and client facing interactions work in a consultancy.

The broader IDCORE experience has also been beneficial. The initial courses were interesting and enabled him to understand multiple facets of the offshore industry. In particular, the fieldtrips to offshore renewables projects and testing infrastructure have helped bring the industry to life and created opportunities to engage with top academics in the field. This knowledge means that Ben is viewed as a competent employee by Xodus, bringing value especially in relation to working on data sets.

The diversity and breadth of experience of his IDCORE cohort has also been beneficial, creating a dynamic learning environment.





Case Study

Elie Ronge

2019 Cohort



Choosing a Sponsor

Being a native French speaker, a project with EDF in Paris was an obvious choice for Elie, especially when they were offering a project oriented towards civil engineering, the subject of his first degree.

EDF's research laboratories at Chatou have a strong culture of engagement with academia and

he is working alongside a number of other PhD students. However, he is finding that through IDCORE he has received far more practical engineering training than many of them. Also, the EngD places a lot more value on the practical work Elie is doing for EDF than a normal PhD would.

IDCORE has been a really positive experience. Working as a team with the rest of my cohort has been a great way to gain knowledge – we were not competing for grades we were just all there to learn. This knowledge is already paying off with my sponsor, EDF. They have given me the freedom to take the initiative. This was not comfortable at first, but it has enhanced the experience.

Why IDCORE?

After graduating from UCL with an MEng in Civil Engineering, Elie joined the coastal engineering team at Mott McDonald, hoping to pursue interests that he had developed during his undergraduate studies. Working on projects like a tidal barrage started to shape his desire to gain deeper technical knowledge of tidal energy. He found IDCORE while looking for PhD opportunities.

The first year of training at IDCORE helped him to “catch-up” on a broad range of offshore renewables knowledge and led to him re-focussing on floating wind as an area offering greater opportunity.

IDCORE isn't just about engineering knowledge. Like many of the students, Elie really enjoyed the residential course at the Scottish Association for Marine Science in Oban, and his experience of all the IDCORE training has been enhanced by being part of a mutually supportive cohort.



Elie's Project

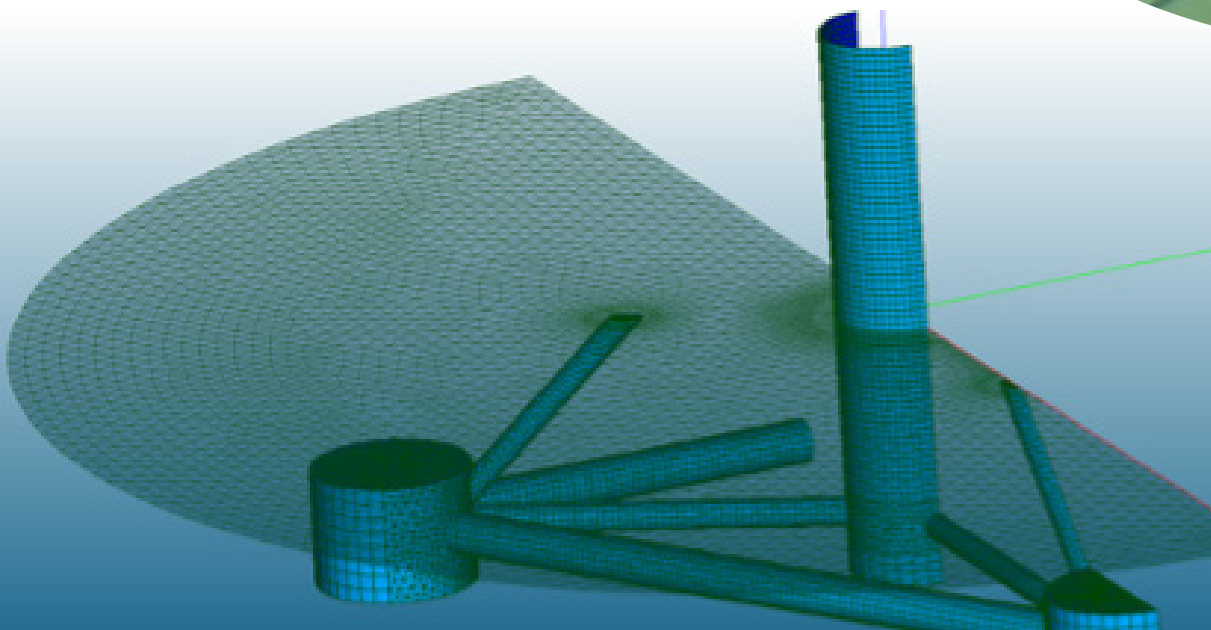
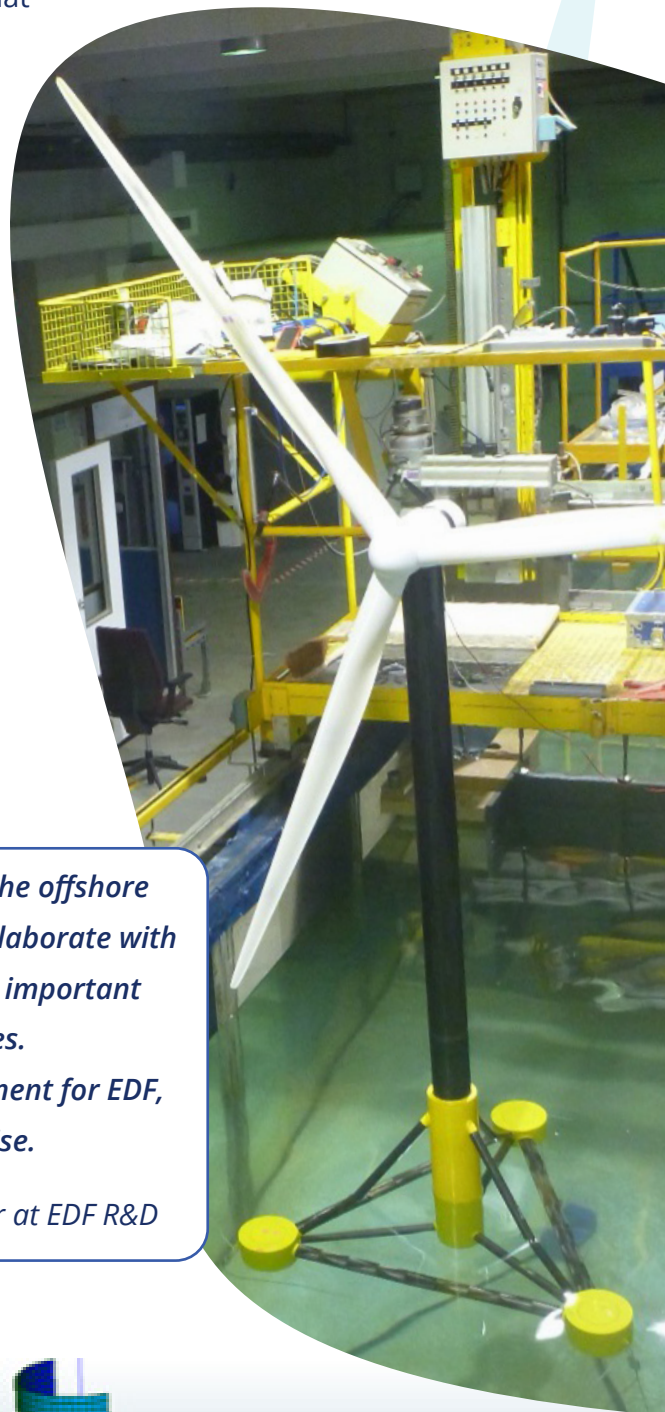
Elie's project builds on the work of a previous IDCORE student, Daniel Milano, modelling the impact of waves on floating offshore wind turbines constructed using tension leg platforms. He is exploring how to model extreme tensions in the moorings more accurately, analysing the non-linear modelling approaches that have been used previously and validating them with tank testing, creating the capability needed by EDF to undertake further tank testing of floating offshore wind platforms. He is currently working on a paper that he will be presenting at a conference and is hoping that he will also be able to publish a journal paper based on his work.

The pandemic has had an impact on Elie's progress, restricting access to the labs and making communication with the experimental team difficult. He is concerned about gathering all the data he needs to complete his project, but the work is now progressing well and the team at EDF are very supportive. He has a great industrial supervisor and EDF have unparalleled in-house facilities.

They also have an excellent relationship with IDCORE. Elie can see that EDF value the contribution of past IDCORE students, access to the software and facilities in the partner universities, and the practical approach to problem solving offered by the British Universities.

Although there are over 2000 people working in R&D for EDF, the offshore wind team is a small group and we need to learn from and collaborate with universities and research centres. The IDCORE students are an important bridge for us to the capabilities in the three partner universities. The completion of Elie's experimental work will be a huge moment for EDF, underpinning a significant step forward in our internal expertise.

Christophe Peyrard, Floating Wind Expert Research Engineer at EDF R&D





Case Study

Susana Torres

2019 Cohort

ForeCoast® Marine
Guiding you through uncertain seas

About Susana

Susana fell in love with Scotland when she was sent to Aberdeen to undertake an MSc in safety and reliability in the oil and gas industry by her then sponsors, the National Hydrocarbons Agency (ANH) of Colombia and the Lloyd's Register Foundation. Her time on this course also made her start to reflect on the implications of climate change and the role she could play in addressing it.

Consequently, IDCORE presented the perfect opportunity – it would be good for her career and the environment, and it would mean that she could spend some more time in Scotland, working on research with direct application to industry.

Susana's Project

As an electrical engineer with 12 years' experience in the oil and gas industry, Susana wanted to find a project sponsor who could make use of this knowledge. She found this in JBA, a consultancy that applies its knowledge of the offshore industry to construction, operations and maintenance in offshore renewable energy. Her project is taking existing generic methodologies and tools used by developers during construction and installation of fixed offshore wind structures and extending these for use on floating installations.


This has not been an easy process. The industry is changing rapidly, and this has been reflected in the challenges Susana has faced in developing a clear specification for the project. However, JBA have been very supportive and working with them has

also allowed her to gain invaluable experience participating in other projects with commercial clients, government agencies and insurers. In this way, she has had the opportunity for involvement in addressing the risks in all elements of the offshore wind development cycle.

IDCORE wasn't the only CDT place I was offered but I came here because of its focus on industry. I am really enjoying my project which is giving me a good understanding of the needs of JBA and their various clients. I am looking forward to being able to take what I have learned here, along with my previous experience in the oil and gas sector, into an on-going career in offshore renewable energy.

Susana Torres





This diversity of experience has been a common thread throughout Susana's IDCORE experience. It started during her training in the first year of the scheme, which was enhanced by the rich mix of backgrounds of colleagues in her cohort, who quickly became an important support network for one another.

Susana has adapted brilliantly to the opportunity and demands of her project. She was able to get involved with cutting edge commercial work, answering practical installation questions. It is never easy to further develop an existing model, but following initial training in coding and strong academic support and guidance, she is now able to tailor JBA's model for floating wind installations.

*Prof Philipp Thies, Associate Professor,
University of Exeter, Primary Supervisor*

JBA also recognise the value of this training and the subject knowledge it gives to the IDCORE students that they have sponsored. Engagement with IDCORE has contributed to their success in the offshore renewable energy sector.

At JBA, we have a long and successful relationship with the IDCORE programme, having hosted three students and employed four graduates. We hugely value the benefits that the IDCORE programme has brought to us, not least the high calibre of students that have worked with us and who have been instrumental in developing and advancing novel new technologies for the offshore wind sector. Having Susana with us has been fantastic. The knowledge that she has gained from the programme, coupled with her previous industry experience, has allowed her to rapidly engage with and advance an important new area for us in floating wind. She is a delight to work with, and we very much look forward to watching her research grow and realising its benefits.

Mark Lawless, Director at JBA

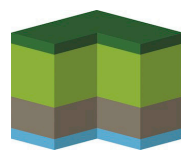




Case Study

Lubica Slabon

2019 Cohort



HyStorPor

Background

Lubica developed her passion for the geosciences while working with the British Geological Survey. She subsequently completed an MSc in Reservoir Evaluation and Management at Heriot Watt and wanted to continue studying in this area. She came across the IDCORE programme at the right time, viewing it as an opportunity to go deeper, building her field of expertise by applying her skills to offshore renewables. In this way she could produce research directly applicable to the industry.

Lubica's project

In partnership with the Universities of Strathclyde and Edinburgh, Lubica's project focuses on the underground storage of hydrogen. The issue of how hydrogen behaves underground is key in this rapidly emerging global industry, which is being seen as a vital element of a net zero energy system.

Lubica's work explores the storage site selection process to inform the secure containment of hydrogen. Her research aims to understand the role of capillary pressure on caprock sealing integrity under different fluid pressure conditions. This is needed to ensure that stored hydrogen remains in the reservoir until it is extracted and used. It involves carrying out experiments on selected samples of prospective caprocks to measure the capillary pressure and understand the factors that control this, and implications for hydrogen containment. She is undertaking experimental measurements at the University of Edinburgh, whilst also using imaging facilities at the University of Strathclyde to understand the structure and composition of selected caprock samples and implications for the flow of hydrogen in the subsurface.



The IDCORE courses give you a great overview of industry, so you can see the whole jigsaw but then be able to think outside the box. With a young family to support, the flexibility and encouragement from the IDCORE team and the other students in my cohort have been really valuable.

Other Benefits

Lubica has also become involved in delivering tutorials for MSc students at the University of Edinburgh, a role that she had not before considered but is deeply enjoying. In addition, she is deriving huge value from opportunities to engage the Faults and Fluid Flow research group at the University of Strathclyde, and the Geoenergy research group at the University of Edinburgh.

The courses delivered in the first year of IDCORE provide a very usefully curated mixture of topics, including business, environment and engineering, which have developed Lubica's ability to understand and talk competently about these topics. Studying these alongside a diverse cohort of students from a mixture of backgrounds meant that they were able to support one another as a community, creating the opportunity to learn from one another as well as the course tutors. The residential courses in Oban and on Orkney were particularly enjoyable.

I enjoy supporting Lubica and the other IDCORE students I am supervising. She has worked closely with a previous IDCORE student to look at hydrogen storage concepts, and their work is having a really positive impact on my own research. The cohort nature of IDCORE and the network it creates between students and supervisors has helped with this. It is a unique and valuable approach.

Dr Julia Race, University of Strathclyde





Case Study

Luke Evans

2019 Cohort

EMEC
THE EUROPEAN MARINE ENERGY CENTRE LTD

Luke's Project

EMEC have had such good experiences with IDCORE students that they agreed to sponsor two students in 2020 despite having only one project specified. Consequently, Luke spent the first part of his project working with EMEC and his academic supervisors to define the work needed.

He is now making great progress in exploring placement and configuration of sensors to monitor tidal turbines, examining potential instrument locations and their impact on measurements of the power curve. Industry standards are currently based on experience from wind turbines. Tidal turbines create very different challenges, particularly the new floating designs.

Luke has just developed and submitted a paper that brings all this work together. He has also provided input to device developers, and his work will form the basis of an uncertainty model that EMEC are looking to develop to more effectively characterise how measurements impact performance estimates.

About Luke

Luke came to IDCORE from a very practical background. After leaving school he did an HND and then a degree in Electrical Engineering. He subsequently worked as a laboratory technician at Caledonian University where colleagues encouraged him to think about doing a PhD.

It was the balance of training and practical work within IDCORE that appealed to Luke. He saw it as a unique opportunity, and he has been using skills gained during the first year throughout his time at EMEC.

Orkney is a wonderful community in a unique place.

I have family up here and I went to school in Wick, so I was delighted when the opportunity arose to deliver a project for EMEC. It is great to be living and working in a place so dedicated to renewables and to feel that I am making a real contribution to the needs of the industry.



Luke has developed experience and ability in handling, processing and understanding large and complex datasets that should feed into discussions around the measurement standards for tidal turbines. His project is another example of the importance of reliable and resilient sensing which is a big focus for my own research. It's a real privilege to be able to supervise IDCORE students, the calibre of the students is outstanding – they keep me energised and motivated.

Brian Sellar, Academic Supervisor, The University of Edinburgh

The understanding of uncertainties created by Luke's work is going to be useful to anyone working in turbine performance. This is already being demonstrated by the work he is doing with equipment manufacturers. All the students we have had from IDCORE have made a significant contribution to our work. They are a high quality resource who can push research ideas, helping us to tap into the knowledge in the academic community.

David Darbinyan, Senior Metocean Engineer, EMEC





Case Study

Macauley Versey

2019 Cohort



Mac's project

Mac is working at the 'sharp end' of device development in the offshore renewable energy sector. He is sponsored by Mocean, where he is exploring a 'hybridisation' concept for their wave energy converter (WEC). This involves the installation of photo-voltaic (PV) panels on the WEC to reduce the need for diesel back-up in off-grid and micro-grid locations, the likely early market for Mocean's products.

Mac has been responsible for the design and installation of a six-panel PV array on the Mocean Blue X WEC that has completed an initial round of sea trials off Orkney. The WEC recently experienced a freak storm, which it withstood extremely well. Unfortunately, this storm removed one of the PV panels and destroyed Mac's data acquisition equipment. He is now re-designing the system for further testing during the next deployment.

Although this is a very practical project, it is not without a need for strong analytical capability. Alongside the practical testing and data collection, Mac is modelling the energy yield from the panels as they move with the WEC.

Why Mocean?

Mac picked Mocean because they are a small company with ambitious and interesting goals. He also liked their ethos and working environment. Wave energy is a very challenging area to be in, which was another part of the appeal for Mac, and Mocean are progressing well, with good support for their innovative developments. They also clearly value their relationship with IDCORE. Mac is the second IDCORE student they have sponsored. They describe their first student as their 'first employee'. Additionally, Mocean have just confirmed the hiring of a third IDCORE student, to begin work in summer 2022.



About Mac

Mac grew up in Suffolk, often holidaying in Scotland which attracted him to the University of Edinburgh where his first degree was a joint Masters in Mechanical and Electrical Engineering. He developed an interest in design and innovation and was president of a student society that was part of an international student competition to build a levitating magnet train. IDCORE felt like the perfect place for him to take these interests further, working at the forefront of engineering in the renewables sector.



The day I lost my data acquisition kit during a storm felt like a huge set-back for my project, but I have learnt that this is the reality of testing in the marine environment. Mocean have given me a lot of freedom and I am enjoying the opportunity to apply the knowledge I gained during my first year at IDCORE. I have been taken out of my comfort zone, but I can't think of better place for that to happen. This is a high pressure environment, but the team at Mocean are really supportive and friendly.

Mac is a very able student and his project is progressing well despite the challenges he has faced on the way through. He is gaining first-hand knowledge of developing and constructing devices that can withstand the harsh conditions in the offshore environment. The outputs of his work are going to be valuable to Mocean, and the experience he is gaining will make him very employable at the end of his project.

Lars Johanning, Academic Supervisor, University of Exeter





Case Study

Mujahid Elobeid

2019 Cohort



About Mujahid

Mujahid has a background in Mechanical Engineering, which led to an MSc in thermo-fluids for the petrochemical industry. Following this, he worked as a research engineer at the Centre for Engineering Research, a research institute in Saudi Arabia, focusing on industry-academia projects involving multiphase flows in the oil and gas industry. He was attracted to IDCORE as part of a personal response to the climate crisis, seeking to apply his experience to something new and meaningful. He saw the interaction with industry offered by IDCORE as holding the potential to realise his dream of becoming a research engineer in the burgeoning renewable energy sector.

The IDCORE programme has been an experience that has gone above and beyond my expectations. It is not a standard PhD programme! It has enabled me to access broader networking opportunities across the industry and I am confident that I will be able to secure a position when my time with IDCORE is complete.

Mujahid's project

Mujahid is working with project partner EnerOcean, based in Spain. They are the developers of the world's first twin turbine floating offshore wind solution to be successfully tested on the open sea. His project involves analysing the combined impact of waves and currents on floating offshore wind turbines and their mooring systems. At present, the effect of these combined dynamics is understudied, so this is much needed research as these technologies start to get large market attention, motivated by their advantageous cost-efficiency as floating wind power systems.

To facilitate this research, Mujahid has carried out simulations of various mooring configurations with different mooring line materials. He will utilise the FloWave facilities at Edinburgh to conduct experiments intended to validate these numerical simulations. Mujahid has submitted a paper on his initial findings, presenting these at an international conference in Hamburg, and is currently engaged in further in-depth numerical analysis.



Benefits of IDCORE

IDCORE offers unparalleled training in technical skills that have developed Mujahid's competency in offshore renewables. The first year of taught modules covering all aspects of the offshore industry directly influenced his desire to work in floating wind as opposed to other offshore renewables. He has also enjoyed the flexibility of having multiple supervisors, contributing expertise from the Universities of Strathclyde, Edinburgh and Exeter alongside the team at EnerOcean represented by Pedro Mayorga and Jan Erik Hanssen.

I have been working with Mujahid's sponsor for ten years. They are an innovative company and Mujahid's work is helping them to understand better the hydrodynamics of mixed wave and current environments. This will help to improve their platform designs and identify the most appropriate deployment sites for their future commercial pipeline of projects.

David Ingram, Director of IDCORE and Academic Supervisor, The University of Edinburgh

Mujahid's project is another example of how IDCORE is helping to demolish the divide between academia and industry. Having been an IDCORE student myself, it is a privilege to now be part of the supervision team. All of the projects I have been involved with have increased my awareness of the challenges facing the sector and the role research has in addressing them.

Ajit Pillai, Academic Supervisor, University of Exeter





Case Study

Nadia Avanessova

2019 Cohort

CATAPULT
Offshore Renewable Energy

About Nadia

Nadia recently completed an MSc in Mechanical Engineering at the University of Edinburgh and was seeking to develop her knowledge further with a PhD. IDCORE was appealing as it created a bridge between industrial experience and academic research in the rewarding, rapidly expanding area of offshore renewables.

Nadia's Project

Nadia's project partner is the Offshore Renewable Energy (ORE) Catapult based in Glasgow, the UK's leading technology innovation and research centre for offshore renewables. Her project involves the development of a tool that calculates the combined costs of operation and maintenance on offshore windfarms, called COMPASS (Combined Operations, People, Assets and Systems Simulation). COMPASS incorporates different factors, such as how many people and what vessels need to be involved in each maintenance activity, the infrastructure required, and the weather data at the location of a farm. These inputs enable a cost to be calculated and standardised across multiple projects and so is used by ORE Catapult teams to assess the impact of different innovations.

Prior to working on this, Nadia contributed to another ORE Catapult project during which she learnt how to code using Python. The project was about developing a simple tool that can estimate the weather downtime for a group of tasks depending on their duration and weather data. She has felt integrated into the team, involved in multiple different team meetings and invited to team calls and updates.

From being part of IDCORE and ORE Catapult, I can see that there are so many problems in the expanding offshore renewables industry that need to be solved. It's hard to find people with existing expertise in these areas so we need to build this!



She is now looking forward to working on conference papers and journal articles that model COMPASS case studies using data from ORE Catapult and their broader contacts. She recently had a paper published which explores which operation and maintenance strategy is more economically viable: having an offshore maintenance base with accommodation vs an operational vessel that has less accommodation but is mobile. Understanding these dynamics is essential as practices are developed to service the future wind farms that will be located further offshore and in harsher environments.

Nadia has enjoyed the great mix of IDCORE course mates and the dedicated office and space available to them on campus. A highlight of her experience so far has been the trip to the Scottish Association for Marine Science (SAMS) in Oban, where the cohort counted dolphins from their boat and searched for crustaceans on the sea floor as part of surveying surrounding marine life. Nadia gained a different perspective and learnt the ways to reduce the effects of offshore renewables construction on marine life.





Case Study

Nicholas Kell

2019 Cohort



About Nicholas' Sponsor

The IDCORE training is very broad creating a breadth of knowledge that has been invaluable to Nicholas when working with his project sponsor, EDF, who have been strong supporters of IDCORE since it was first set up. They have sponsored students in most cohorts, and a number of times they have sponsored more than one from their R&D centres in London and in Chatou, France.

artificial intelligence to analyse auction outcomes. This supports development of optimal bidding strategies and allows policy makers to explore the impacts that auction specifications can have on supporting this sector. He is currently looking forward to seeing the model applied in a live auction environment, providing insights as the team develops their bids.

Nicholas has found that EDF always have positive things to say about IDCORE, and they are keen to attract the students, who are recognised as having the capability to explore areas of speculative research. Past IDCORE work is still being used within the company.



IDCORE combines PhD-level training with a strong industry connection and creates graduates who are industry-ready.

It sets you up well, with knowledge that others don't necessarily have. Having spent a year in the finance sector after graduating from my first degree, I am really enjoying the opportunity to apply the skills I developed there, along with the knowledge I have gained from the IDCORE training, to work that has direct application in the renewables sector. This is where I want to be!

Nicholas' Project

Nicholas is hopeful that the same will be true of his project, a study of UK auctions of Contracts for Difference - the renewable energy subsidy mechanism used by the UK Government. He has developed a strategic simulation of the auctions which uses



He chose to go to a large energy company like EDF because of the exposure this would give him to the whole offshore wind industry. Not only is he getting to see the development process that his project focuses on, but he is also getting exposure to operation, maintenance and construction strategies. In addition, he has been using EDF's in-house cost modelling tools to provide analysis for a range of internal stakeholders, including developing its application to floating wind projects. The benefit of an EngD is that it allows all these different experiences to be written up as part of the final thesis.

Nicholas has really enjoyed becoming part of the renewables R&D team at EDF, a transition that has been made even easier by the support he has received from other members of his IDCORE cohort.





Case Study

Andrew Russell

2020 Cohort

wood.



FLOTATION ENERGY

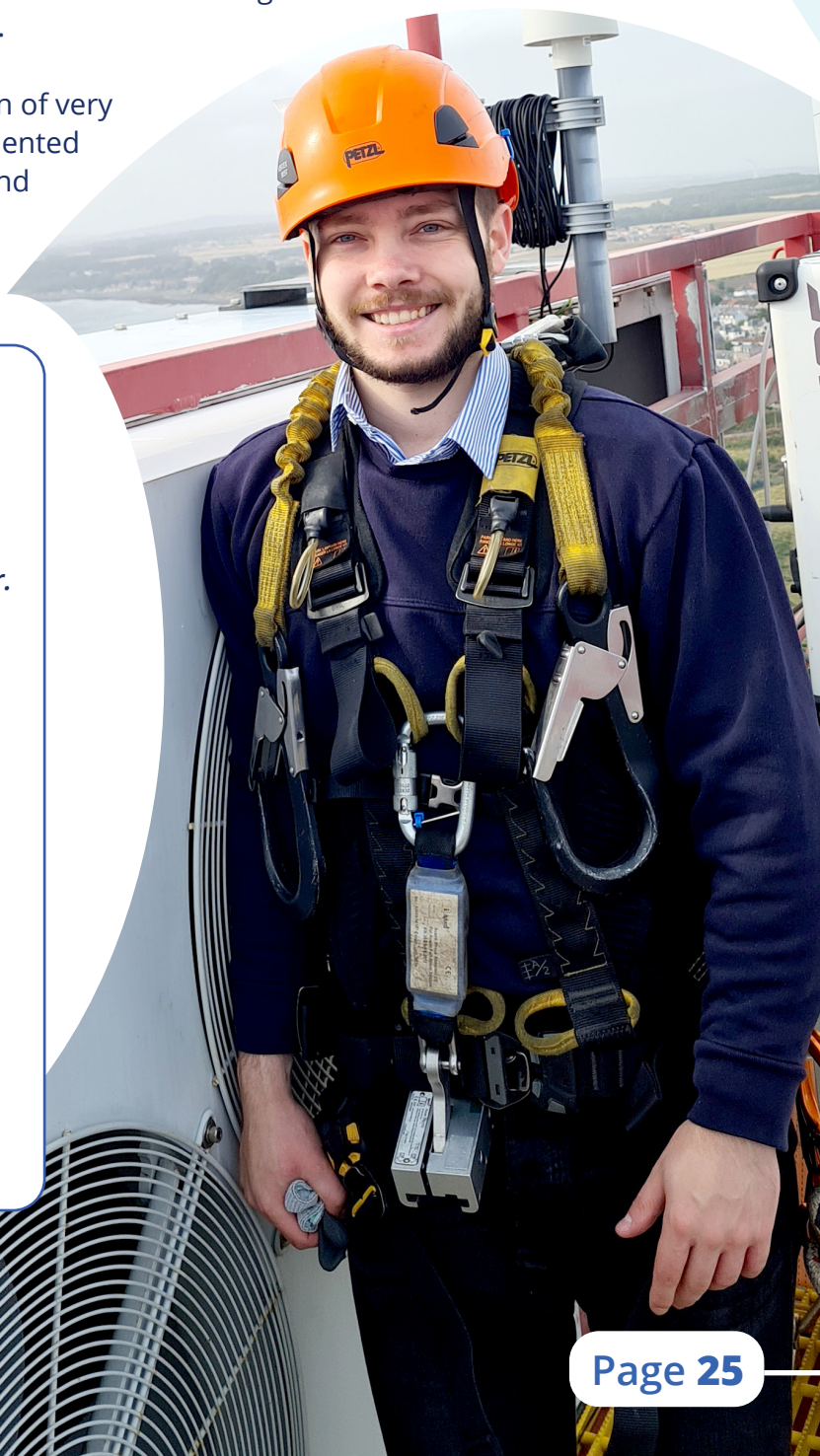
About Andrew

Andrew came to IDCORE from an MEng in Chemical Engineering at Newcastle University, during which he had undertaken a placement year at Siemens Gamesa Renewable Energy. This gave him an insight into renewable energy that made him realise he wanted to pursue a career in the sector. IDCORE is now providing him with the knowledge and experience required to match his ambitions.

IDCORE's taught modules have built a foundation of very relevant knowledge which is now being supplemented by exposure to industrial activity, engagement and projects that would not have been possible through a conventional PhD programme.

My undergraduate experience allowed me to see first-hand how quickly the renewable energy industry is developing, the impact it can have on carbon emissions and the potential for me to contribute and make my own impact in the sector. IDCORE is helping me to realise this ambition.

Overall, IDCORE has already had a significant positive impact upon my life and career. I am developing both academically and industrially relevant skills whilst working on a fascinating research project, all while receiving excellent support from IDCORE's administrative team and my academic and industrial supervisors. I can only thank them for the opportunity and genuinely encourage anyone who has the chance to be involved in the programme to do so.



Andrew's Sponsors

Andrew started his project with Wood Group in May 2021. It is a project focussing on floating offshore wind, involving a start-up offshore wind farm developer, Flotation Energy. This is a unique opportunity to work simultaneously with both a small start-up company and a large multi-national business. Andrew is gaining first-hand experience of the diversity within an exciting industry, where he has already contributed to key project decision making processes. Both companies have been very supportive and see value in being involved with IDCORE and the industrially relevant research it can deliver.

Floating wind technology is developing rapidly and Andrew is gaining an excellent insight into the industry's landscape and direction, along with an invaluable network of connections and relationships with external companies.

Andrew has been a key member of the team for our pioneering Green Volt project, which aims to be the largest floating wind farm in the world by 2026

Alexander Quayle – Project Manager, Flotation

Andrew's Project

At the offset, Wood presented Andrew with a range of possible project topics and gave him the freedom to decide his focus. He has chosen to look at utilising LIDAR to measure incoming winds and assist the control of floating offshore turbines. The project has required a detailed literature review, which Andrew compiled into a research paper and presented at a conference. He has also been working on developing numerical models to simulate wind turbine control algorithms, a steep learning curve which has been very rewarding.

The network of industrial connections Andrew has developed is already delivering benefits, helping him to secure real-life wind turbine deployments of LIDAR for his data collection. So far, this has led to LIDAR deployment on a nearshore turbine where the team are soon to be undertaking a measurement campaign, with plans for further deployments on floating turbines.

As a graduate engineer in a small and ambitious team, Andrew has been able to get involved in a range of tasks alongside his project that create additional value for the business. These have included reviewing floating substructures and turbines, providing guidance on available ports and facilities and exploring some of the complexities of wind turbine control.





Case Study

Anita Nunes Leite

2020 Cohort



Anita's Project

Anita is working with the team at FloWave, a unique ocean energy research facility based at the University of Edinburgh. Conceived as a cutting edge research tool to recreate complex wave and tidal current interactions at model scale, FloWave is being used by commercial developers to de-risk the performance of their technologies before constructing prototype devices for testing at sea.

The project Anita is undertaking is helping to grow the testing capabilities at FloWave by implementing a recently developed methodology for simulating wind loads on floating offshore wind turbine models, Software-in-the-Loop (SIL). The big challenge, highlighted by latest research, is how to apply the dynamic loading in real time while ensuring that the correct loads are being applied to the model.

The project is not just focussed on implementing this additional test capability for FloWave, the unique contribution it will bring is an understanding of the 'best tool for the job' – the level of complexity in test regimes needed to support different stages of floating wind turbine development. In this way, FloWave (and potentially other test facilities) can offer the most appropriate service to their commercial clients, minimising costs while maximising learning as the companies go through the development cycle.

About Anita

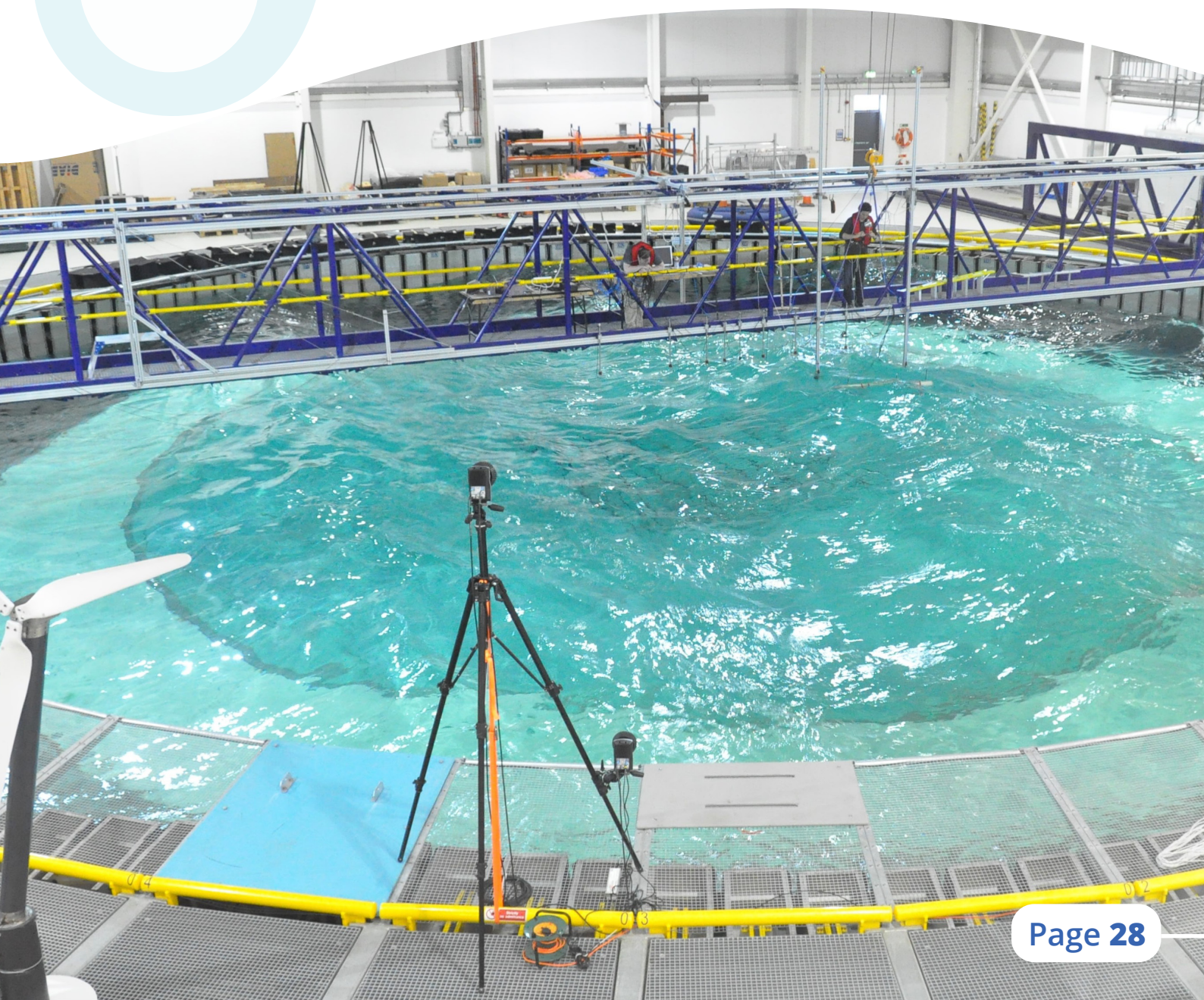
Anita came to IDCORE from a job as an energy and waste manager in the NHS. She grew up in Portugal where she originally trained as an Environmental Engineer before moving to Suffolk on an international internship scheme participating in renewables projects for Suffolk Council, before taking up the management post at Suffolk NHS Trust. These experiences developed her interest in renewable energy and drove her to seek out PhD opportunities.

FloWave are a small team, but that gives me freedom to explore opportunities, engage with clients and see the immediate impact of my work. I've learned so much. Combining physical testing and numerical modelling, gives me first-hand experience of the practical application of engineering theory. I'm really enjoying the challenge."



IDCORE wasn't the only PhD level training opportunity Anita was offered, but it was the first time she had come across the idea of a centre for doctoral training. With its foundation year in offshore renewable energy fundamentals, it offered a unique training opportunity alongside industrially relevant, high quality research projects. IDCORE's approach to placing all the researchers with their sponsoring organisation also provided the level of industrial experience she was looking for.

It has been a tough journey, not least because the offshore wind industry is developing so quickly. Its changing research needs have already affected Anita's project, despite it only starting last year. The size of turbine planned for floating offshore installations is increasing and her project has had to reflect this. However, the IDCORE training has given her confidence that she can learn and apply new knowledge quickly. It has also given her sponsors confidence in her abilities, that has allowed her to quickly become a fully integrated member of the team.





Case Study

Calum Dunnett



Calum's Sponsor

Calum is working with Sustainable Marine, a tidal energy firm with a demonstration installation in Grand Passage, Nova Scotia, Canada. Headquartered in Edinburgh, it was convenient for Calum to stay close

to the university and work within a small team with greater visibility. The project outline was appealing as it was flexible and offered the opportunity to develop his interest in electrical engineering.



The IDCORE courses were all useful and have given me a whole selection of knowledge on offshore renewables that I can call upon when needed

Calum's Project

Calum has been able to respond to quickly evolving opportunities within the organisation, which can be submitted as part of his final portfolio.

After exploring initial ideas on microgrids, his project is now focused on optimising the balance of plant systems for floating offshore energy platforms.

Calum's research explores the mechanical restraints on offshore electrical design, which is constrained by factors including platform and vessel type, and ocean conditions. For example, a cable in a high current will face different installation and longevity challenges than one located in a more benign environment.

Calum has utilised the FloWave test centre at the University of Edinburgh to collect initial data. This has been used to produce further simulations and provide practical comparisons, with the aim of developing a tool that enables a holistic approach to understanding the performance of cables in different conditions.

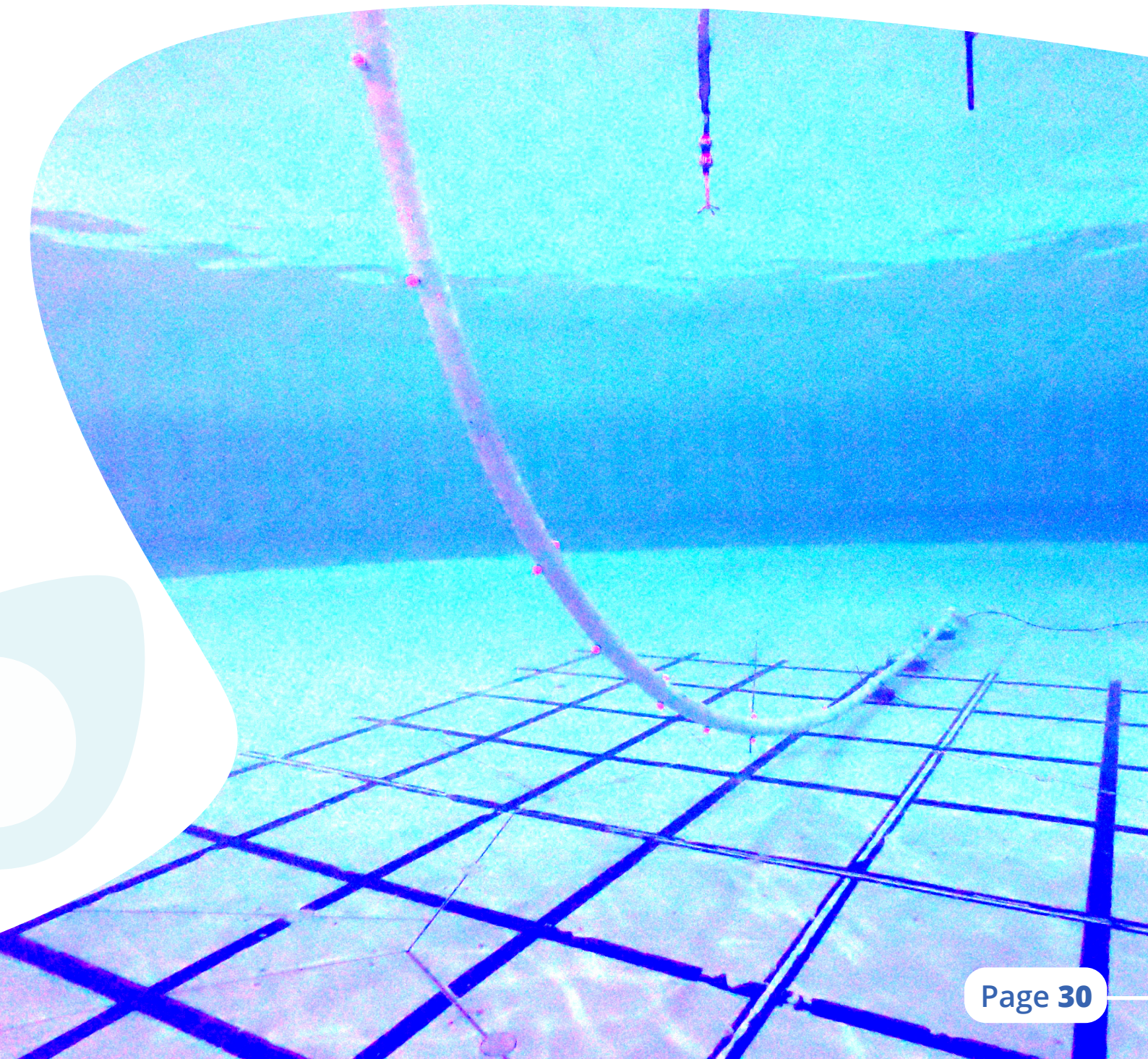


About Calum

Calum had recently completed a 5-year integrated Masters in Physics and wanted to pursue a career in the renewable energy space. IDCORE provided the opportunity to transfer these skills into an engineering role of direct use to the offshore renewables industry. The initial training modules provided a very accessible 'crash course' in multiple facets of the industry, despite having no previous engineering experience.

Being part of IDCORE has enabled Calum to build a big directory of academic contacts alongside some very valuable experience, all of which he is now using in his project. The initial courses have endowed him with a selection of knowledge that he can draw upon when needed and he is able to access facilities like FloWave. He is happy to be part of a supportive, friendly cohort.

Beyond his project, Calum has been involved in training in different software, which has improved his coding skills, as well as generally engaging in Sustainable Marine's ongoing work. A trip to visit the Grand Passage demonstration in Canada is hopefully on the cards soon.





Case Study

Callum Turnbull

2020 Cohort

wood.

About Callum

Prior to joining IDCORE Callum had spent eight years as a physics teacher. He had known he wanted to go back into academia in a research post and had assumed this would be in astrophysics the subject in which he did his first degree. However, he was inspired by the children he was teaching to explore opportunities in energy and its role in addressing climate change. He came across IDCORE whilst exploring low carbon research options centred around renewables.

Project Sponsor

It wasn't just the location that made Callum choose Wood Group as his project sponsor, he relished the opportunity to work with a large multi-national company. They have a huge range of capability and experience from the wide range of locations they operate in, and there are added benefits from working with a company that doesn't just specialise in renewables. The breadth and depth of the IDCORE training have increased Callum's confidence and set him up well for coping with these new experiences.

Why IDCORE?

It was IDCORE's year of training that appealed to Callum. He knew it would help him transition back into academia and give him the time to explore which area of renewable energy he really wanted to focus on. With a baby on the way, the higher stipend was also appealing, along with the potential to stay in Scotland's Central Belt close to the support of family and friends. Although IDCORE's operational model cannot guarantee a particular sponsor or research location, the centre is very committed to inclusive recruitment from diverse backgrounds.

Although my partner and I have had to make some tough choices as I have embarked upon this journey, I have felt supported every step of the way. The IDCORE cohort has been a really important part of this. My colleagues are from such varied backgrounds, with individual stories and differences. Consequently, I have not felt like an outsider, which was a real concern for me as I made such a big change.



Callum's Project

Callum's project is focussing on the use of hydrogen in the energy sector and in particular the routes used for transporting it. The project is still in its early stages, but he has the flexibility and freedom to explore areas of research without the constraints of being an employee. He is currently looking at the possibility of publishing a review of systems for transporting hydrogen alongside having undertaken a review of hydrogen policies across the world, including a summary of the Scottish Government's hydrogen strategy. Ultimately the project should deliver a valuable consultancy tool to his sponsors.

Like many of his colleagues, Callum identifies the residential course at the Scottish Association for Marine Science (SAMS) in Oban as a highlight of the programme, but this is not the only one. The diversity within his cohort, the range of knowledge this brings, and the sharing of experiences in different organisations are all enhancing his journey towards an EngD qualification and an exciting future career.

We really value our engagements with IDCORE and as a result we are currently sponsoring three students including Callum. Callum is very enthusiastic and is gathering invaluable knowledge around the options we have for the use of hydrogen. Personally, I value the opportunity IDCORE gives me to be involved in developing the new talent that our industry so desperately needs.

Alan Mortimer, Director of Innovation, Wood Clean Energy





Case Study

Jan Dillenburger-Keenan
2020 Cohort

ORBITAL
MARINE POWER

About Jan

Jan studied an integrated Masters in aeronautical engineering at the University of Southampton. He wanted to apply this in a renewables focused role but found the sector difficult to access. He was leaning away from an academic, desk-based PhD when he came across IDCORE, which enables you to gain an EngD alongside three years of industry experience.

Jan values the diverse cohort of fellow students in IDCORE, who have become friends especially during the residential courses like the one at Scottish Association for Marine Science (SAMS) in Oban. Learning from some of the best lecturers in the field has also been hugely motivating, which his project sponsor, Orbital Marine Power, is also able to benefit from.

I have tried to be a sponge and draw in as much as possible. In a team of 40 people it's been fun and I have gained a lot of first-hand experience in data analytics across multiple teams

Jan's Sponsor

Orbital is an innovative engineering company headquartered in Orkney. They are developing a floating tidal technology, for which they have a 2MW demonstrator, the O2, which is the world's most powerful tidal turbine in operation.

Jan was with the Orbital team during the installation of the tidal device at the European Marine Energy Centre (EMEC), and has since become involved in ongoing assessment analytics. This has involved working with on-board sensors to understand what data can be collected, which will help optimise the standards of performance analysis for floating devices.





The detail of Jan's final project is still being developed, as the original project brief was quite open. This has created an exciting opportunity to shape something with the team.

Jan has enjoyed being part of a small team of 35-40 people and has become an important member of the company. He is getting a lot of first-hand experience in data analysis and has knowledge of how data is being used across teams.

IDCORE is viewed as a respectable and well-known affiliation amongst colleagues, with the first year of modules providing a good overview on offshore renewables.





Case Study

Tegan Foster

2020 Cohort

Stiesdal®
OFFSHORE TECHNOLOGIES

About Tegan

Tegan had worked in industry for many years, initially working on aircraft before finding herself at Jaguar Land Rover focused on power systems and electric vehicles. Alongside this she undertook a part time MSc, conducting a final project on modelling power losses in electric drive units, which brought her interest in

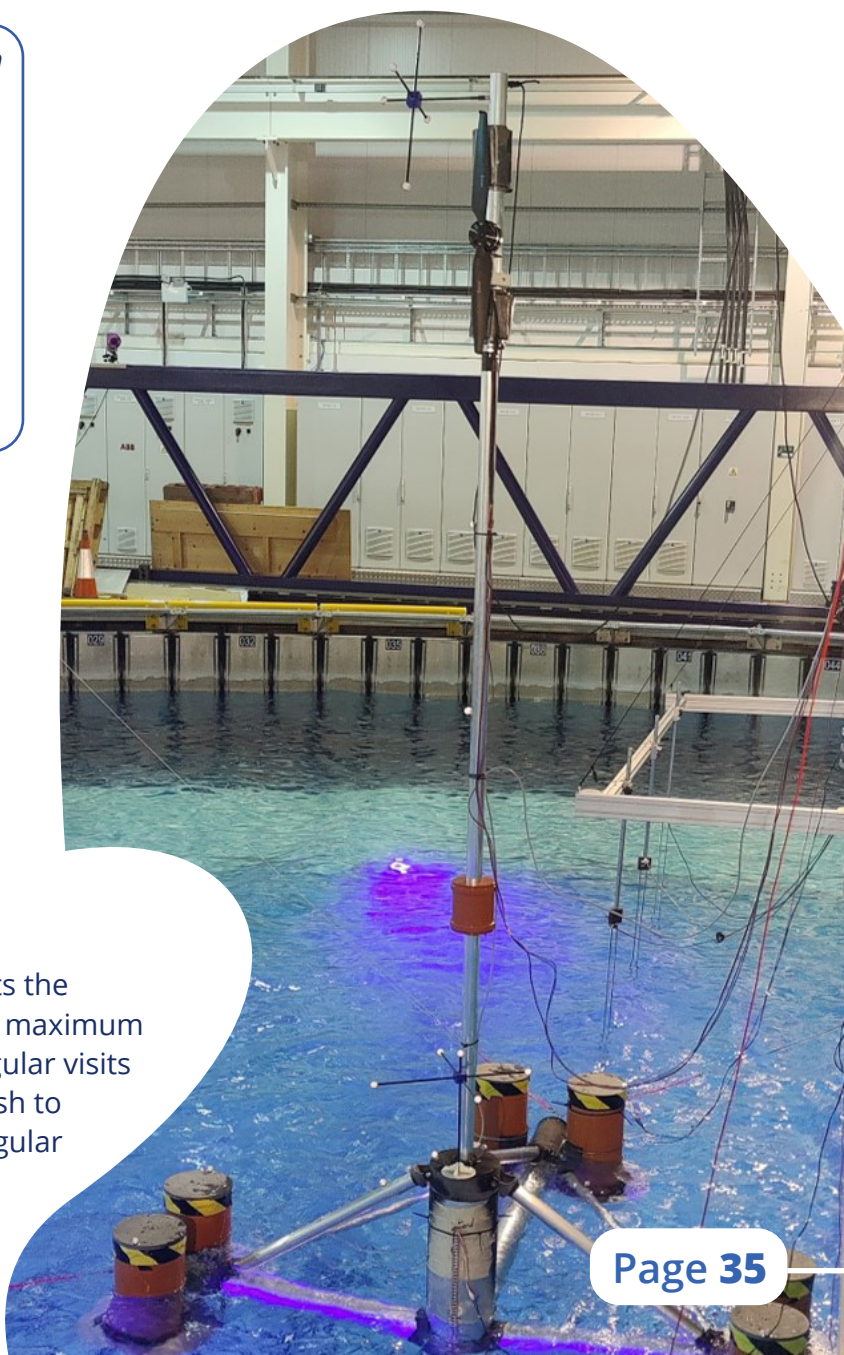
modelling and research to life. The pandemic proved a good opportunity to leave the automotive industry and consider a path that she was more enthusiastic about - energy and renewables. IDCORE presented an opportunity to apply the skills she had developed by contributing to the offshore renewables industry.

Studying at IDCORE has confirmed my passion for working in the offshore renewables sector. I would love to take what I have learned both through the training and my project work and combine it with my other engineering skills to support the development of effective control systems for offshore renewable energy substructures.

Tegan's Sponsor

Tegan's industrial partner is Stiesdal, a climate technology company based in Denmark. They are particularly engaged in offshore technologies, with the aim of providing technology solutions that enable unlimited, low-cost offshore wind energy from floating offshore wind turbine generators. One of Stiesdal's technologies is the modular TetraSpar concept, the world's first full-scale demonstration floating offshore wind platform.

Although the EPSRC funding for IDCORE restricts the amount of time she can spend in Denmark to a maximum of three months each year, Tegan is making regular visits to Stiesdal's headquarters, and is learning Danish to help with this. Alongside these visits she has regular online engagement in company-wide meetings and calls, and is acting as an important link for their research activities in the UK.



Tegan's Project

Stiesdal had a very clear specification for the project they wanted delivering, and this has allowed Tegan to immediately engage in tackling a niche industry problem. The research seeks to determine which hydrodynamic load modelling methods are most suitable when assessing substructure concepts for floating offshore wind turbines. The work is particularly focussed on reliable prediction of wave run-up onto the platforms and in capturing the abnormal effects of wave-structure interaction.

Tegan has completed initial prototype testing and data collection in the FloWave facility at the University of Edinburgh using a 1:50 scale model. She really enjoyed this practical element, which also allowed her to get to know her Danish colleagues better, when they came over to join her at the test centre. The data they collected will now form the basis for ongoing analysis and modelling to characterise the response of floating platforms to extreme weather conditions.

One of the enduring delights of being part of IDCORE is watching the students learn, develop and make a significant difference to the industry, both through their project work and through the roles they subsequently take on. Tegan is no exception to this. Her project is taking her knowledge, practical skills and ability to learn and applying them in a way that meets a clearly defined industry need. I couldn't think of a better way of demonstrating the benefits of IDCORE.

Lars Johanning, Academic Supervisor, University of Exeter





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