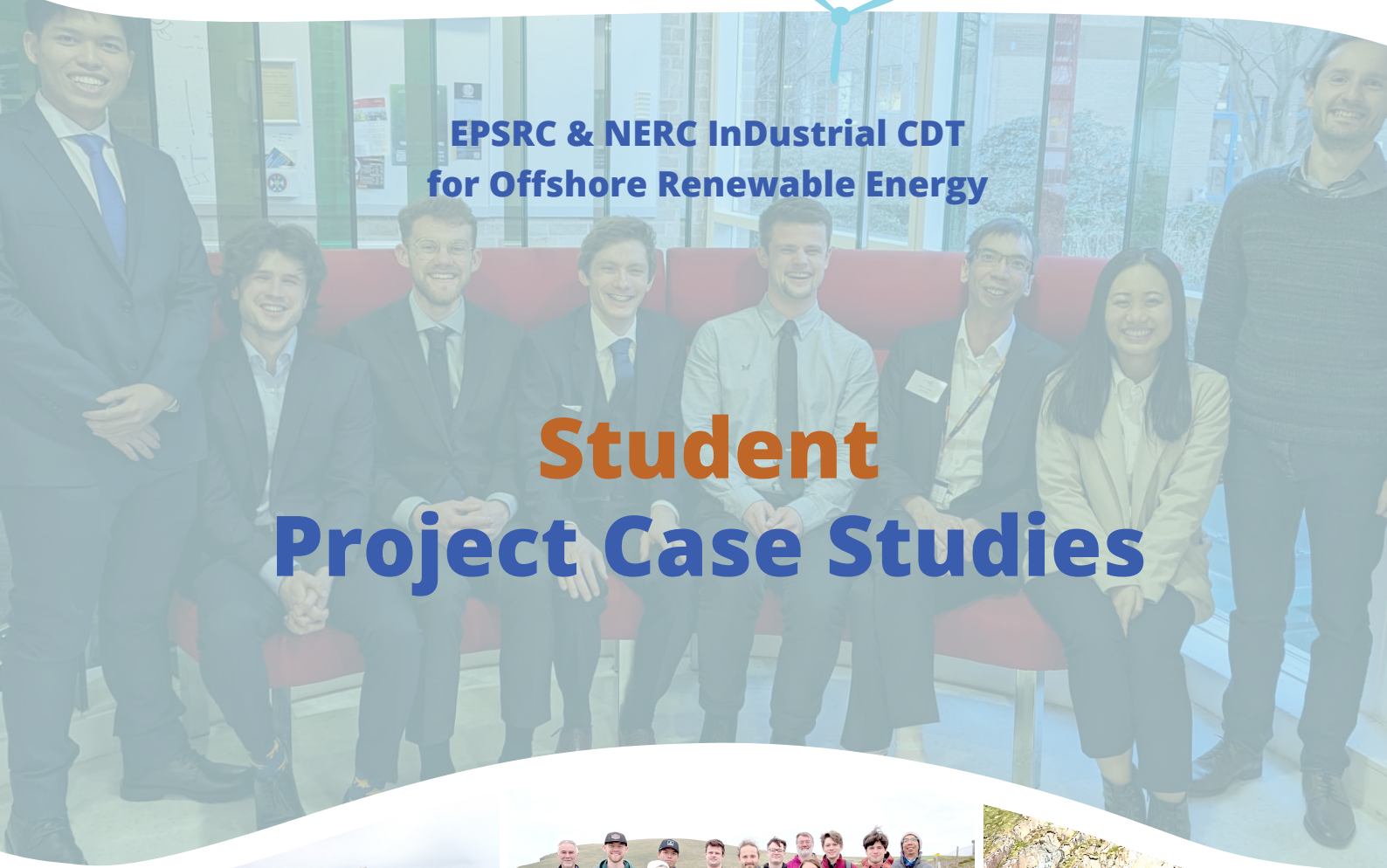




**EPSRC & NERC InDustrial CDT
for Offshore Renewable Energy**

Student Project Case Studies



**THE UNIVERSITY
of EDINBURGH**



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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 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 2023 cohort. It follows on from similar documents produced in previous years covering the 2019, 2020, 2021 and 2022 cohorts and draws on interviews with each of the students and also their industrial sponsors and academic supervisors.

Rationale

A sector with the level of diversity found in offshore renewables really lends itself to commercially focussed research, and IDCORE's unique approach 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 IDCORE 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 delivers.

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 identify a range of other benefits they have 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 speak of being energised and motivated by their relationships with the students. Their aptitude 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.

Future

Many of the industrial supervisors interviewed as part of this case study project have said that they want to see IDCORE continue. There is a recognition, particularly within the academic community, that the Centre 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.

IDCORE delivers focused research on areas prioritised by those working in the industry, ensuring it is targeted and impactful. Much of this work is shared in the public domain and contributes to the wider knowledge base.

Jason Buchan, Project Engineer, ORE Catapult

IDCORE enables us to tap into a collaborative research environment, drawing on the combined expertise of three universities, while supporting efficient and effective research delivery through embedding the research student within the team.

*Alyona Naberezhnykh, Metocean Engineer, SSE Renewables
(and IDCORE Alumni)*

Being involved with IDCORE has allowed me to expand my academic network as well. I've made contacts in other departments and other universities, and I think that's much the same for the industry partners.

Tim Stratford, Academic Supervisor

I believe the sector needs greater understanding of how to scale up and commercialise technologies. In practice, this means selecting technologies to focus on reducing costs and removing barriers to deployment. This is an area where I believe IDCORE has an opportunity to help progress in the sector.

Jeremy Smith, Founder and Managing Director, QED Naval

In the long run, I'm not just hoping, I think it's going to happen that IDCORE students take important, leading roles in the sector.

David Dai, Academic Supervisor





Case Study

Ariff Alzakri



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Broadening horizons

IDCORE is helping shape the futures of both researchers and the offshore renewable sector alike. For students such as Ariff, IDCORE is broadening horizons, giving him new skills and opportunities, and preparing him for a variety of careers in the sector. For the industry more broadly, IDCORE is connecting companies to new talent, and shaping its future leaders.

Ariff came into IDCORE wanting to delve deep into the technical details of a project. Originally, he was considering a project in the wind industry, having worked on wind projects during his undergraduate degree. However, through IDCORE he was introduced to the tidal energy sector, finding this offered him a greater opportunity for engaging with such technical details. The benefits of IDCORE's matching process flow towards industry as well, bringing new talent into this relatively nascent sector. As David Dai, one of Ariff's three academic supervisors, noted, IDCORE attracts a large number of highly motivated and capable students, engaging them across the offshore renewables sector.

Project

Ariff's project involves analysing the transient loads on tidal turbine blades. It has evolved into a modelling-based project, comparing fluid-structure interaction simulations of different fidelities. It is hoped that this research will help his sponsor organisation, QED Naval, to reduce costs while ensuring the accuracy of their modelling. David has been impressed with the speed at which Ariff has progressed, learning how to use challenging tools in a very short space of time, and delivering well on his planned

tasks and aims. The allocation of three academic supervisors with complementary expertise, along with one industrial supervisor for each IDCORE student, has greatly contributed to Ariff's development, alongside his own talent and enthusiasm.

IDCORE is also helping Ariff develop skills and knowledge beyond the purely technical. A highlight of his IDCORE experience so far was the environmental and societal impact module delivered during the first year of his IDCORE training. This module, delivered near Oban in Scotland, allowed him to engage with different knowledge and ways of thinking beyond his highly technical background. His time working with QED Naval has also exposed him to many different aspects of commercial delivery in the sector. As QED Naval is a relatively small organisation, Ariff has become involved in several parts of day-to-day operation, making his time with the company invaluable.



New career path

All of this new knowledge and skills development has prepared Ariff for an entirely different career than he had originally imagined. He came into IDCORE aiming to become a research engineer, knowing he found the research process rewarding. However, his experiences and training have led to him considering new avenues such as project management and leadership at larger scales.

I think I have a lot more ambitions than I had before taking this role. I think it's broadened my horizons in terms of what I want to do in my career. The options are there, and I'm looking on my path to see what I can do.

Ariff Alzakri

This broadening of his horizons has helped to fuel Ariff's future aspirations. He speaks of his desire to take the skills and knowledge he's developing through IDCORE and apply them overseas. Originally Ariff comes from Malaysia and wants to contribute towards the development of international collaboration and energy-sharing in the south-east Asia region. He credits IDCORE with helping him develop the stakeholder management skills which will be essential for such an endeavour.

These kinds of big-picture impacts are also what his supervisor, David, hopes will arise from the IDCORE programme at large. David is already seeing several IDCORE alumni starting to shape the offshore renewables industry, and celebrates this fact. He wants to see IDCORE alumni taking on more leadership roles and applying their diverse training to create further progress in offshore renewables.

In the long run, I'm not just hoping, I think it's going to happen that IDCORE students take important, leading roles in the sector.

David Dai, Senior Lecturer,
Naval Architecture, Ocean and Marine
Engineering, University of Strathclyde





Case Study

Josh Mitchell



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THE CROWN ESTATE

Josh Mitchell is an IDCORE researcher who has broad and interdisciplinary understanding of the offshore renewables sector. He is bringing this ability and knowledge to deliver value to The Crown Estate, his sponsor organisation, which will have a wider benefit to the offshore renewables industry.

As a big-picture thinker, Josh is drawn to different facets of a subject or challenge and the wider impact of solutions. This developed over the course of his studies – particularly during his masters degree in renewable energy. Simultaneously, Josh is a pragmatic learner – preferring to have a tangible application of theory to build upon. IDCORE and his placement with The Crown Estate have allowed him to combine both of these elements – providing real-world experience of big picture decision making.

Project details

Josh is conducting a research project looking at spatial optimisation of UK Seabed for Net Zero. This involves developing tools and methods for decision-makers at The Crown Estate – who plan the future location of offshore renewable projects around England, Wales and Northern Ireland. The research has evolved to focus on tidal energy deployment.

The industrial supervisor for the project, Anthony, believes that the research evidence will be essential for future leasing activity and will be a key indicator of the project's success. Josh is enthusiastic about the widespread impact the project could deliver and hopes that these project locations come to fruition.

Big-Picture Thinking: A Different Type of Engineering

The work of The Crown Estate requires 'big-picture' thinking: the research project focusses on the highly influential early stage of a project's development (its location) and requires a broad and systems level view of the issue. Anthony Chu, Josh's industrial supervisor, believes this is what makes IDCORE engineers stand out: the ability to take a systems level view of an issue which he sees Josh exemplifying.

Josh recognises that technological research is important to the sector but that research to inform decisions around the economic, social and environmental impact of the sector is vital for the future of the sector. An application of his work includes deconflicting tidal projects to minimise impact on ecology, shipping or other seabed users.

IDCORE has helped Josh to prepare to investigate and address these issues through the broad scope of teaching on the programme.



As an engineer, the Marine Renewables and Society, and Marine Energy and the Environment modules really make you think quite differently. Really taking a holistic, total view that these things are out in the environment, there's not some kind of forcefield keeping them separate. They're also part of society and have an impact on communities, and people's views can be very different.

Josh Mitchell

Beneficial Partnership

The Crown Estate has been an excellent organisation for Josh to work with – professionally and personally. In return they have been benefiting from the research capacity Josh brings to the organisation and access to the wider IDCORE network.

Josh has engaged with senior managers in different departments across The Crown Estate and brought them together through the research project. He has presented and discussed his work with different teams and specialists. Josh has also had the opportunity to work with several external organisations, expanding his professional network and broadening his understanding of the sector.

Josh has consistently felt supported by the organisation; appreciating that they want him to do well and he attributes this to The Crown Estate's positive work culture. This project was the first IDCORE project for The Crown Estate. The success of Josh's project is evidence by The Crown Estate returning to IDCORE for another research student the following year.

IDCORE is a pragmatic and effective programme – partnering with them is a good way to bring in capable talent early in their careers.

Anthony Chu, Engineering Manager – Digital Products, The Crown Estate





Case Study

Kieran Budgell



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CATAPULT

Offshore Renewable Energy

A core aim of IDCORE is to aid progress for the whole offshore renewables sector, tackling pervasive issues for companies and organisations across the industry. They share this aim with Kieran's project sponsor, the Offshore Renewable Energy (ORE) Catapult. Kieran is playing an important role in this regard, providing a key node in the network of actors driving development in the sector.

Networks and exchange

Kieran's work with IDCORE and the ORE Catapult demonstrates the power of effective industry networks and knowledge exchange in the offshore renewables sector. He believes that his work has greatly benefitted from the good will accumulated by the ORE Catapult, allowing him to draw on the expertise of specialists from multiple companies. Thanks to the ORE Catapult's position as an enabler for the whole sector, he believes these stakeholders had a real desire to see him succeed.

Simultaneously, according to Kieran's industrial supervisor, Jason Buchan (Project Engineer), the ORE Catapult benefits by accessing IDCORE's extensive academic network and expertise. Kieran believes this access has become fundamental to the way the ORE Catapult operates, with many employees at the Catapult being IDCORE alumni themselves. The knowledge exchange this affords allows the Catapult to stay abreast of fundamental research taking place across academia, as well as developments amongst other IDCORE project sponsors.

Kieran describes how such a networking approach is built into the IDCORE model from the beginning of its cohort-based teaching. The entire cohort are mutually supportive, helping each other to answer questions and building their understanding. Due to the healthy mix of expertise and backgrounds within the group, Kieran feels his communication and collaboration skills were enhanced, preparing him for working with others in the industry. The relationships he's built within his cohort are continuing to help him now, allowing him to maintain his awareness of developments across the sector.

Through his work with ORE Catapult, he's also been able to expand his professional network. By being involved in commercial work delivered by the ORE Catapult, he's been able to build relationships with external stakeholders, something he hopes will be useful in his future. In this way, he will be taking the legacy of IDCORE forwards into whichever role he enters.

It was the industry links that really appealed about IDCORE, and to have the challenge of putting my own project together while maintaining that industry focus. I'd have the option to go into academia or industry depending on what I enjoyed the most.

Kieran Budgell



Project details

Kieran wanted the opportunity to shape his own project rather than working on something predefined. This is what drew him towards the ORE Catapult as a project sponsor, feeling they gave him scope to take the project in several different directions. This self-directed model of research has been a learning curve for him, but he feels he's starting to make good progress.

He is designing and testing a novel anchor system for floating offshore wind turbines. The majority of his work is dealing with geotechnical engineering, understanding how the seabed around the anchor will act under the different forces it will experience. A better understanding of seabed geotechnics will be essential to reducing costs for the floating wind sector, according to Jason. The hope for Kieran's project is that, in the long-term, it will help to reduce the levelised cost of energy for the technology, a core aim for the ORE Catapult. This area of research is especially important for the UK offshore sector given the heterogeneous nature of its seabed soils.

Jason feels that Kieran's work is helping ORE Catapult advance their understanding in the area of offshore geotechnics. While the project is focused on floating wind, he believes it will also be relevant to other offshore renewable sectors, with the potential to reduce costs across multiple technologies. Both Kieran and Jason are looking forward to physically testing the units Kieran has been developing. They are keen to see how well the results of this testing match up to their numerical modelling.

IDCORE delivers focused research on areas prioritised by those working in the industry, ensuring it is targeted and impactful. Much of this work is shared in the public domain and contributes to the wider knowledge base.

*Jason Buchan,
Project Engineer - Floating Wind Systems*





Case Study

Liam McAlister



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Choosing a sponsor

Liam was very keen to work with his project sponsor SSE Renewables, listing them for all three of his project choices during the selection process. The organisation appealed to him due to its large size, with the associated resources and leverage that entails. He is also proudly Scottish and valued the opportunity this would give him to help drive Scotland's renewable energy future.

Having worked with the company for a little over a year now, Liam believes that he made the right decision working with SSE. He's become well integrated within his team in the company, working with a mixture of more experienced staff as well as other early-career colleagues. Having a team around him has reduced the isolation of his research, something he especially values when comparing his experiences with other PhD /EngD candidates. Working at SSE has also given him a host of opportunities, with additional training provided through the company, and many chances to expand his professional network.

Alyona Naberezhnykh, Liam's industrial supervisor and an IDCORE alumni herself, also sees SSE reaping the benefits of Liam's involvement. She describes his project as progressing well and providing important knowledge to the organisation. Importantly, Alyona sees IDCORE research sponsorship as a cost-effective means of conducting R&D within the company. Sponsorship is relatively inexpensive, and it allows the company to utilise academic resources collaboratively, substantially reducing upfront costs.

IDCORE enables SSE to tap into a collaborative research environment, drawing on the combined expertise of three universities, while supporting efficient and effective research delivery through embedding the research student within the team.

*Alyona Naberezhnykh,
Metocean Engineer, SSE Renewables*

Project details

Liam's project involves him conducting a detailed analysis of how variations in metocean conditions can affect loads on the different parts of floating offshore wind structures. It is a largely data and simulation-based project which suits Liam's skills and capabilities well, although he is also developing his understanding of structural design engineering. Part of this work has been to use a machine learning model to help speed up the process of identifying which metocean parameters are most relevant to his simulation.

This research should, in the long run, help to improve structural design and ultimately reduce costs as engineers can be less over-cautious in their construction of these floating units. This end goal is highly valued in the sector as cost reductions are increasingly becoming a priority. However, Liam believes that the smaller problems he is tackling 'along the way' in his research are proving just as valuable as this ultimate goal. This is especially true of his work optimising and running digital models, which could have multiple transferable applications across the company.



Building on strong foundations

Liam has a strong background in data science, beginning with his undergraduate degree in physics. After graduating and working for a time with the NHS, Liam returned to study his masters in sustainable energy, wanting to gain more vocational skills. Following this, he worked in data analysis at Research Data Scotland (RDS), where helping researchers connect with data was a key part of his role. Liam's IDCORE project is allowing him to build upon these experiences and knowledge alongside developing new skills through the broad training he's receiving.

The first year of training in the centre was a highlight for Liam, both in terms of its content but also due to IDCORE's cohort learning model. He felt this really taught him how to work with others, often with very different skillsets, under time constrained conditions. This helped him transition into his work with SSE, where he regularly has to communicate his work to a variety of people from different backgrounds.

Liam will be putting these communication skills to further use as he prepares to publish his first paper and present it at a conference. Presentation and public speaking are key skills he's looking to develop, and he is grateful that IDCORE place such an emphasis on them in their training. He has experienced how important these competencies are in industry and so is keen to make the most of the opportunity, as well as looking forward to seeing his name at the top of a paper.



The good thing about IDCORE is you have to do a lot of presentations. As an engineer in industry you have to be able to present your ideas properly, if you've got a project and you're presenting your results then that's a very important thing to be able to do well. This is especially true when there are people in the audience who might not have the same technical background as you.

Liam McAlister



Case Study

Linus Kemme



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Linus is an excellent example of how IDCORE students can become integral to the work of their sponsor organisation. This can go far beyond just the work of their research project, although this too provides key information for the work of their respective organisations. Linus has contributed to areas of work across his sponsor organisation, Mocean Energy, becoming a versatile and effective member of the team.

What I really like about IDCORE is the combination of industry and academia, so ideally you have the best of both worlds. You have the freedom to research from the academic side, the time to learn things. But also you have the relevance from industry. I didn't just want to research to fill out a basement with documents that are never looked at again.

Linus Kemme

Project details

Mocean Energy is an ocean energy technology development company, currently focused on providing power to offshore locations, by combining wave and solar power with battery storage. A key goal of Linus's research project is to better understand and more accurately and efficiently predict the fatigue life of Mocean's ocean energy converters due to wave loading, providing key information for the design of the units, as well as possibly also feeding into their operations and maintenance. He's building a model to simulate the stresses and forces acting on these units with a view to estimating the life lengths of the different components in the converter's body. His supervisor, Alfred Cotten, feels this work is progressing well,

and should provide the company with much greater capability in the structural design process, allowing for rapid iteration and more detailed analysis.

Going above and beyond

However, this project is far from the limit of what Linus has been accomplishing within the company. Adjacent to the main thread of the project, he helped design a new mooring system for the units he's studying. This aligned well with his personal ambitions of developing greater engineering skills through his time at the company.

He also took significant responsibility in the running of a tank testing programme for Mocean, something neither he nor the team had anticipated in planning his work early on. Linus was also integral in making this testing programme happen in the first place. He provided the connection between Mocean and the academic institutions who owned the tank testing facility. This is just one example of how the company has benefitted from this continued, active engagement with IDCORE through student sponsorship.



Linus has been very proactive. He's a good communicator in the way he interprets information, contributes to discussions, brings his own ideas, etc. This has really developed into something where he's an integral member, giving insights and inputs into both the engineering and modelling discussions.

Alfred Cotten, Head of Modelling & Testing, Mocean Energy

IDCORE skills development

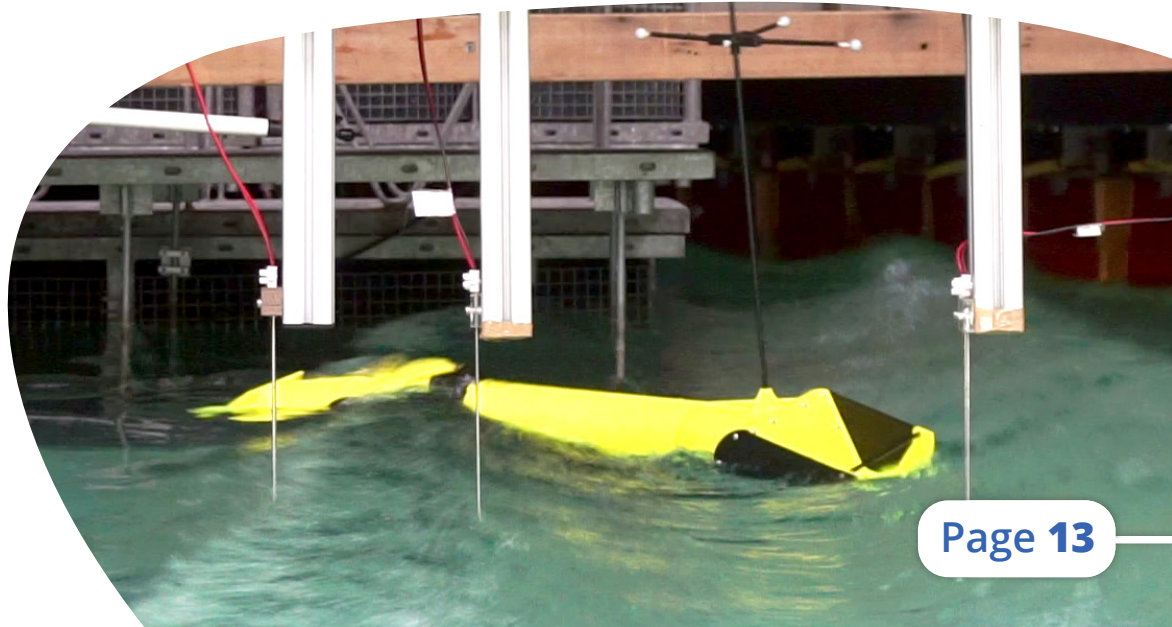
Linus believes that IDCORE helped prepare him for playing such an active role within his sponsor organisation. The programme's cohort learning model is central to the first year of learning for all students. They must work together to complete a series of projects, each bringing their diverse skills and technical knowledge to bear. Linus believes these experiences were key to him honing his communication skills, so valued by his industrial supervisor.

IDCORE also continues to provide modules throughout the four-year research programme. Some of these are concerned with issues of commercialisation and organisational management. Linus has found that these modules have helped him to reflect on practice within Mocean and make useful recommendations about communications between teams within the company. He also received tank-testing training through the centre which helped give him the confidence to play such a significant part in the tank testing programme mentioned above.

Personal goals

As well as providing valuable inputs to his sponsor organisation, Linus feels he is achieving many of the personal goals he'd aspired to with IDCORE. He'd wanted to work at the cutting edge of technological development, feeling ocean technology was a good place to find this. As such, he's valued the combination of industrial and academic experience IDCORE has provided. It has given him the time to develop knowledge and skills while ensuring they are industry relevant, wanting to avoid researching "just for the sake of things".

In particular, he'd wanted to develop skills in engineering, something both IDCORE and Mocean have supported him in doing. Having studied physics in both his undergraduate and master's degrees, he'd always been interested in the deepest concepts behind things. However, as he was looking to transition his skill into something more applied he felt working in offshore renewables would give him the opportunity to work with more visionary, enthusiastic and innovative people. He selected his current project on the basis that it was highly technical and would allow him to make this transition in a 'hands-on' way. He has also joined the weekly engineering meetings at Mocean, and feels that his IDCORE training has helped give him the confidence to engage with them.





Case Study

Mitch Shields



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Marubeni



Background

Mitch was well acquainted with the offshore energy sector long before he joined the IDCORE programme. After completing an undergraduate degree in geology, he went on to become a diver in the commercial and recreational industries. He took his education further by earning a master's degree in geographical information systems, along with an internship in the offshore surveying industry, which later developed into a full-time role. During his time in this role, he engaged with several offshore renewables projects and realised he wanted to take another step back into education to progress his career. IDCORE seemed to be the ideal opportunity to do this while maintaining his connection with industry, something he was keen not to lose.



While applying for IDCORE, Mitch was conscious of the lack of formal engineering training in his background and wondered whether it might hamper his chances. However, he feels that both IDCORE and his project sponsor, Ossian, highly value his individual skills and experiences. He has been able to bring his own expertise and diverse knowledge to bear on both his project and his wider work with Ossian. Mitch serves as a strong example of the varied pathways which can lead to a career in offshore renewables research through IDCORE.

IDCORE training

Mitch describes how the cohort model within the centre helped him develop his skills and knowledge in several areas. As he puts it, "it's very hard to be an expert in everything", and the students consistently support one another, sharing their particular expertise to help everyone learn. This is essential, as the first year of training within the centre is so broad, covering many key topics for the offshore renewables sector. Alongside this, the cohort are constantly developing skills in stakeholder management, something Mitch now uses on a regular basis within Ossian. This detailed education has benefited Mitch in his project, a highly interdisciplinary undertaking requiring extensive stakeholder engagement.

The highlight of IDCORE for me has been the cohort. Everyone has really diverse backgrounds, but we're all working towards the same goal. You can rely on your colleagues to support you and help you through the things you're struggling with, and vice versa.

Mitch Shields

Project details

The project Mitch is undertaking with Ossian is to create an operations and maintenance development plan for major component exchange on their proposed floating wind farm. This means considering the practical ways the main parts of their floating wind turbine units can be repaired. There are two methods for doing this: in situ exchange (operating on site), and tow-to-port, where the whole unit is transported for repair. This project requires Mitch to consider a range of issues: logistics, economics and technical engineering considerations, as well as engaging stakeholders across the sector. The interdisciplinary nature of this project appealed to Mitch, allowing him to make use of his IDCORE training and industry experience.

Beyond the project

Beyond the core aims and objectives of his project, Mitch has taken on further responsibilities within Ossian. He feels this increased integration with his sponsor organisation has enhanced his understanding of the overall project. José Oliveira (Mitch's industrial supervisor) describes how the team identified key areas where we needed to develop our understanding and felt that Mitch was the "right person for the job" to step in and fill them. He is involved in regular engineering management meetings and has become a valued member of the team, contributing to effective decision-making.

I believe the sector needs greater understanding of how to scale up and commercialise technologies. In practice, this means selecting technologies to focus on reducing costs and removing barriers to deployment. I see Mitch's work as key to achieving this for floating offshore wind, with operations and maintenance representing a significant proportion of costs on such projects. This is an area where I believe IDCORE has an opportunity to help progress in the sector, and that continuing to communicate with developers will be essential for creating effective research.

*José Oliveira, Technical Development Director,
Copenhagen Offshore Partners*





Case Study

Rafe Watson



Research can seem like a long-term investment, developing skills and knowledge that may be applied at some point in the future. Rafe's project is a prime example of how IDCORE and its' researchers act on a much more immediate timescale. Through his EngD, Rafe is not only improving the tools used for offshore renewables project development, but he is directly using those tools with clients. He feels he is building a strong understanding of both the sector's needs and those of the actors within it.

The cutting edge

Rafe values the feeling of working at the 'cutting edge' through his research. His work is of course academically novel, adding to the collective knowledge, but he also emphasises how he is pushing the boundaries of industry practice. During his placement with industrial sponsor TRIOS Renewables, he has been involved in delivering several commercial projects. This work involves modelling the operating and maintenance requirements for offshore renewable projects, and has led to Rafe utilising the very tools he's helping improve through his research. Consequently, he has attained a first-hand understanding of how his work can answer important questions for the sector. It has also shown him how these issues integrate with the wider concerns of developers and operators in the industry.

Project details

Rafe is investigating the potential for using higher resolution weather modelling to better understand operations and maintenance constraints for offshore wind projects. Organisations, such as his project sponsor, TRIOS, currently use quite low-resolution weather modelling in their Monte Carlo simulations to estimate these constraints. Rafe is trying to determine whether integrating this higher resolution data results in more accurate prediction of key performance indicators for project developers. He's working towards demonstrating his findings through a case study, based on one of TRIOS's partner organisations.

This work could have significant implications for the sector. There are only limited times of year where maintenance can be carried out on these wind farms due to weather-related safety issues. This work requires highly specialised ships, and contracting for these can represent up to 30% of a project's operational costs. A better understanding of these costs could be an important enabler for project development.

Developers are asking you the questions they want to know, which is kind of what I think IDCORE is about: answering the questions that industry want to know. So I try to incorporate that, to shape my research.

Rafe Watson



Personal development

Following his chemical engineering degree, Rafe first went on to work at a 3D printing company. During his time there, he became involved in battery technology projects, sparking a further interest in the energy sector. This ultimately led to him applying for, and being accepted to, IDCORE. Such a change in sector can be challenging, but Rafe feels IDCORE gave him much greater confidence to do so, supporting him personally and through the comprehensive training the programme provides. He highlights his cohort of researchers as being an especially important part of this, easing his transition.

While not directly related, he feels that his engineering background provided him with a strong skillset upon which to build his project. In particular, he sought out a project that would allow him to further develop his highly technical coding skills. Beyond the technical, he feels that IDCORE has introduced him to a range of approaches and ideas, including political, economic and ecological considerations.

Sponsor benefits

TRIOS is a small consultancy, comprising of just three people at the time Rafe joined the organisation. He feels he's become very well integrated into the team, allowing them to achieve more than they otherwise would have. The CEO of the company, David MacMillan, is also an academic, and so is well placed to supervise Rafe in making decisions that benefit both him and the company. One key benefit Rafe finds from being involved with much of the company's commercial work is the contacts he's forming. This exposure through TRIOS is helping him access networks which should help him throughout his planned career in the offshore renewables sector.





Case Study

Tzu-Hsun Lin



EPSRC & NERC Industrial CDT
for Offshore Renewable Energy www.idcore.ac.uk

CATAPULT

Offshore Renewable Energy

Tzu-Hsun's research is highly technical, attempting to unlock key issues for the future of the offshore renewable sector. However, she strongly believes that this research won't be valuable unless it has a real impact on the world, something she is striving for through the development of her communication and presentation skills. She's found both IDCORE and her industrial sponsor, the ORE Catapult, have prepared and supported her well in these aims.

Technical research

Tzu-Hsun undertook her undergraduate and master's degrees in offshore engineering back in her home country of Taiwan. During her master's degree she had a particular focus on floating offshore wind, cultivating her knowledge and appreciation of the key challenges and solutions in the sector. This led to her applying to IDCORE where she is now undertaking research around offshore wind mooring systems.

Her research is examining the potential for synthetic fibre ropes to be used in the mooring systems of the future. These ropes behave quite

differently to conventional metal chains under marine environmental loads and it is these behaviours Tzu-Hsun is characterising. Her examination involves a combination of numerical modelling and physical testing, something she enjoys due to the technical, detail-oriented nature of the work.

This research is highly forward looking. There is a trend in the offshore wind sector towards building larger turbines, which creates a need for newer, larger mooring systems in floating offshore applications. These synthetic ropes could address challenges for these mooring systems, potentially reducing manufacturing and transportation difficulties, as well as improving overall costs and performance. Tzu-Hsun's academic supervisor, Tim Stratford, believes this could be an important technology for the sector and is keen to see the research continued beyond just the present project.

The project has not been without its difficulties, physical testing plans have had to change due to building delays at a new facility in Scotland. However, Tim feels that Tzu-Hsun is navigating these barriers and she will shortly begin her physical testing at the DMaC test facility in Exeter.



Being involved with IDCORE has allowed me to expand my academic network as well. I've made contacts in other departments and other universities, and I think that's much the same for the industry partners.

Tim Stratford, Academic Supervisor, University of Edinburgh

Impact

Both Tzu-Hsun and her supervisors believe this research has good potential to benefit the floating offshore sector. However, as she points out, good potential and good research aren't enough for her work to have a real impact on the sector. To have impact, Tzu-Hsun believes strong presentation skills will be essential, allowing her to communicate the value of her findings to the right people. This desire to deliver real benefits to the whole offshore renewables sector is a core aim she shares with her industrial sponsor the ORE Catapult.

Tzu-Hsun is planning to attend an international conference where she hopes to hone these presentation skills further and share the value of her work. She does not expect this to be a one-sided transmission of information, as she hopes to receive useful feedback to improve her research. Networking with other researchers and industrialists, exchanging ideas and making contacts in the sector will all help both in her present project and future career.

IDCORE emphasises the importance of presentation, networking and impact more broadly. Tzu-Hsun recalls presentation practice being a core part of the IDCORE taught modules, something she especially appreciated given she was learning to present in a second language. The Centre also provides funding for the students to attend multiple conferences and to exhibit their findings in different ways. However, it is the community of students within her cohort that Tzu-Hsun believes helped her most in this regard. She felt supported and encouraged by her fellow researchers, helping her develop her skills and hone her messaging.

The cohort will know what you're doing, they'll support you. We all have an environment where we can share experiences with each other, especially if we're struggling with something.

Tzu-Hsun





Case Study

Wan Yeung



EPSRC & NERC Industrial CDT
for Offshore Renewable Energy www.idcore.ac.uk



AQUALUTION®

Motivations and inspiration

Wan's journey to IDCORE has been interestingly unorthodox. He has previously worked in multiple industries and in several different roles. These diverse experiences have given him a unique perspective which he brings to his research, and his evident adaptability has aided his work. He hopes that, as he transitions to working in the energy sector, his story will help to inspire others seeking to make impactful contributions to tackling climate change.

Background

Wan's varied career saw him managing a small restaurant, running a telemarketing company, and working in an HR consultancy for ten years, all before retraining as an engineer. While he'd enjoyed each of these roles, he found that none of them were his passion and so went back to university to study design engineering. During his studies he had two placements, one of which was working in a design engineering role for a small firm. However, he felt this work was a little too transactional and wanted to work towards something with wider societal impact.

These diverse experiences have given Wan a unique perspective as an IDCORE researcher. His understanding of people and organisations from his HR experience, as well as his understanding of business management, give him a special appreciation of the challenges facing the offshore renewables sector. Given IDCORE's focus on promoting stakeholder engagement skills and an awareness of commercial priorities, this background has been invaluable.

The notable change in Wan's career, from HR to engineering, was motivated by the drive to follow his passions and values. When considering ways forward at the end of his degree, Wan knew that he wanted to tackle 'big-picture' issues. This is ultimately what led him towards IDCORE: it allowed him to help fight climate change, develop his professional skills, and simultaneously maintain his connection with industry.

Wan has received an industrial fellowship from the Royal Commission for the Exhibition 1851 in recognition of both his unique career trajectory and timely research. This funding is partly intended to aid Wan in sharing his story so that he might inspire others in making similar jumps into STEM research and careers. This will be a new challenge for Wan, who is not used to publicising himself, but he plans to make the most of this opportunity and hopes to help others in the process.

I need to learn to see my past as a powerful tool, as something that I can use and something that could help other people in their journeys. Maybe if I tell my story a bit more, it might help others make decisions.

I like my project with Aqualution because it's about being pragmatic and defining your own sense of purpose. Also, appreciating that Nick is running a business, and so serving as a facilitator rather than being a burden.

Wan Yeung



Research details

Aqualution, Wan's project sponsor, is a relatively new company to the energy sector. They are well established in the chemical production and biosciences industry; however, they are beginning to explore if they could use their technologies to produce hydrogen for the wider energy system. Wan's research is helping them to explore this potential, particularly investigating the commercial viability of such a use.

Wan's research is creating a multi-criteria decision making framework, examining hydrogen production from seawater using Aqualution's electrolysis equipment as a case study. This is an important area of research for the offshore renewables sector given the pervasive challenges of intermittent power production but also limited fresh-water resources. If cost competitive hydrogen production from seawater could be achieved, it would represent a significant opportunity for energy storage and decarbonisation more broadly.

Nick Meakin, Wan's industrial supervisor, sees the project as a cost-effective means of accessing high quality research and investigating this new opportunity. He goes so far as to say that without IDCORE it is unlikely Aqualution would have been able to carry out this research at all. Nick is keen to follow the science around this issue and produce fundamental research, believing that a negative result will be just as useful as a positive one.

This project is answering some key questions, important questions that have just been overlooked. Everyone has assumed that there will be plenty of water around, and there isn't. If there's something that's commercially useful for us then that's brilliant, but the whole point is to answer these fundamental questions. To confirm or refute that ultimately hydrogen is or isn't the answer to our energy needs.

For both Wan and Aqualution, IDCORE is acting as a key enabler for their futures. It is providing Wan with the new skills and experiences he needs for an impactful career in the energy sector, and it is allowing me and my team to understand the role they could play

Nick Meakin, CEO, Aqualution





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Compiled by Cultivate Innovation Ltd.



Date of publication: July 2026



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