

Your career in offshore wind energy



In association with



Rob Hastings, Director of Marine Estates, The Crown Estate
Climate change means that how and where we produce energy is changing. The UK's geographical position puts the UK in a prime location to harness substantial energy from marine renewable energy resulting in new, cleaner, more efficient ways and the offshore wind sector is playing a central part.

This growing and vibrant industry using cutting-edge technology brings career opportunities in a wide range of interesting and challenging jobs as well as helping to safeguard the planet. The Crown Estate is pleased to present this careers guide to help you shape your future.

About The Crown Estate

The Crown Estate manages a unique, diverse property portfolio across the UK comprising assets within four estates, Windsor, urban, rural and marine. Our objectives, that are laid down by Parliament, include enhancing the value of the estate and the revenue it produces for the benefit of the nation. The marine estate includes the entire seabed out to 12 nautical miles and the rights to the natural resources on the UK Continental Shelf, excluding oil, coal and gas.

About RenewableUK

RenewableUK is the UK's leading renewable energy trade association, specialising in wind and marine energy. We develop these sectors by organising industry events, protecting member interests and promoting their industries. Members include independent companies to large international corporations, providing a united representative voice and fantastic networking opportunities.

Our work on skills, education and employment issues has led to new qualifications for entrants to the sector and the development of an online jobs and careers portal found at www.renewable-uk.com. We are pleased to have helped The Crown Estate and BVG Associates with supporting the development of the content of this publication.

About BVG Associates

BVG Associates is a consultancy providing expertise in the design, technology and supply chain for fuel-less renewable electricity generation systems. The team probably has the best independent knowledge of the supply chain and offshore wind market in the UK.

Front cover images courtesy of
Centrica (main image);
Bosch Rexroth; E.ON;
Gardline Marine Sciences

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Image courtesy of DWIA and GWEC

The UK leads the world in offshore wind, with almost half of the world's offshore wind turbines generating electricity off the UK coastline. Wind energy is the key power generation technology being used in the UK to address climate change and energy security issues faced by the UK today. The technology is an attractive choice as it is clean, reliable and quick to install.

The wind industry has grown from almost nothing 20 years ago to a multi-billion pound global industry, and it is still expanding fast, typically by around 20 percent every year.

So the question is: have you ever considered offshore wind energy as a potential career option?

To help you decide, The Crown Estate has teamed up with RenewableUK to produce an authoritative guide to what types of technical careers are awaiting you in the offshore wind industry. We aim to showcase:

- How an offshore wind project is created and who is involved in the different steps;
- Some of the career opportunities there are and what people do in their jobs;
- Entry routes into the industry – showing you where to start;
- Prospects for your career progression.

This careers guide is focused on science, technology, engineering and maths (STEM) related technical careers

Each chapter introduces a range of professionals who have chosen to build very different careers in offshore wind. Some of them are skilled crafts people and technicians; others are scientists, divers, pilots and engineers. Their entry into the industry has been varied – from school leavers to postdoctoral students.



The Robin Rigg Wind Farm in the Solway Firth, Scotland's first commercial offshore wind farm

Image courtesy of E.ON UK/Newscastr

Your future in offshore wind energy

Interested in a career in offshore wind but not sure where you could fit in?

To make a start, here are three key questions to ask yourself.

1. What kind of qualifications do I need ?

There are many roles that you can aim for as soon as you leave education – whether you are more vocationally focused or targeting a graduate level career. Other openings require hands-on experience that you can set your sights on as a longer-term goal.

Craft and technician careers: Are you good with your hands? If so, you may want to focus on the craft and technician careers. With suitable GCSEs or equivalent, you can start training at a further education college, at a firm's training school or on the job as an apprenticeship or working towards NVQs.

Graduate careers: Do you enjoy your studies and want to do a degree before you find a job? Many of the professional positions in companies will require you to hold a graduate or even a postgraduate qualification. Core STEM degrees are respected by companies. Many universities offer renewable energy related modules and specialist qualifications.

2. What kind of working environment am I after?

Looking for adventures off the coast?

If you have the ambition to work at sea, there are many roles for you. It is an exciting environment and you will need good sea legs and be prepared to face the wind, waves and rough weather. Fitness and stamina will be important, especially in the more vocational roles, and working in extreme conditions means that being responsible and safety conscious are crucial parts of the job.

Working in offshore wind energy while keeping your feet dry...

Success offshore comes from doing as much as possible onshore – every activity completed on land saves time and money. This means that there are opportunities to work in the industry even if working at sea does not appeal. Manufacturing and operations sites are usually at ports, while much of the planning, management, R&D and engineering design can be anywhere.

3. What roles am I suited to? What skills do I need?

There is no simple answer, but this guide will help you start investigating. The diagram on the next page shows the life cycle of an offshore wind farm:

- Development and consenting
- Design and manufacture of wind turbines, foundations and electrical systems
- Construction and installation
- Operation and maintenance

Each chapter will give you an overview of what these phases are and what types of jobs are involved.

- The first UK offshore wind farm opened in 2000.
- There are now enough UK offshore wind farm sites built, under construction or in the planning system to power around 5 million homes.
- Industry growth is driving recruitment: the UK wind energy workforce is expected to expand by tenfold in the next decade.
- Around 40% of employees in technical roles hold engineering qualifications.

LIFECYCLE OF AN OFFSHORE WIND FARM

Planes and boats surveying bird and mammal populations and movements

Transferring technicians and equipment to and from the wind farm

DESIGN AND MANUFACTURE

DEVELOPMENT AND CONSENTING

CONSTRUCTION AND INSTALLATION

OPERATIONS AND MAINTENANCE

Analysing conditions of the seabed

Met stations are used to measure weather and sea conditions

Installing turbine foundations

Installing the cable

The substation platform is lifted into place

Installing the turbines onto their foundations

Ploughing the seabed and burying the cable

A remotely operated vehicle used to inspect underwater work

The substation gathers the power from the turbines



Meteorological stations record weather conditions, tides and wave heights at the site.

Image courtesy of Fugro

Before an offshore wind farm can be built, significant preparation is needed, often over five years or more. This includes the engineering design of the wind farm based on the site conditions, assessing the impact it may have on the local environment, getting permission to construct the wind farm (known as consent) and selecting the wide range of companies who will be involved in the project's implementation.

What does it take to start a career in development and consenting?

There are opportunities for both graduates and non-graduates within the development and consenting process. To give you an idea, these are just a selection of the roles required: oceanographers, hydrologists, geologists, marine biologists, environmental and marine scientists, and onsite technicians.

Who does what in development and consenting?

Development manager

A wind farm developer leads the whole process, which is usually one of Europe's large energy utilities. The development work is divided up into packages such as site identification, consenting, licensing, foundations, substations, cables or turbines. There are a number of development managers who will work for the project director. They will usually have an engineering or environmental science degree and will manage (for example) the delivery of specific environmental surveys, analyse the results and help to adapt the project in response.

You can join the team as a project engineer with a relevant engineering degree (it could be mechanical, civil or electrical) and ideally a renewable energy qualification. From there, you can work your way up to be a package manager, coordinating the work in that area and finding the right company to supply the components to the project. Beyond this you can take on more and more responsibility.




Examining and Interpreting survey data.

Image courtesy of Fugro

PROFILE

Offshore renewables developer



Name	Gemma Couzens
Who do you work for?	Npower Renewables
What do you do?	I'm responsible for getting the necessary environmental information for consents and licensing of offshore wind farms in the UK.
What does your typical day involve?	A great thing about working in offshore development is that there is no typical day. Most days I am in touch with consultants or interested organisations via email or phone regarding the work needed to lift a restriction in the licence or how should we engage with the public and key stakeholders. This often leads to further tasks such as preparing scopes of work, letting contracts and reviewing reports.
What gives you the most job satisfaction?	With so many organisations involved, the process is never straightforward and I like tackling the issues that need to be solved. I really enjoyed visiting an offshore wind farm in North Wales. It's good to see what you are working towards and know that it is achievable.
What do your friends think about your job?	People are always very impressed and interested when they hear about the job. It is a relatively new industry and it is not something many people usually know a lot about.
What other jobs have you done?	After completing my MSc at university, I did voluntary work for 6 months for the International Union for Conservation of Nature Shark Specialist Group. I then got into offshore wind when I became the Programme Manager for COWRIE (Collaborative Offshore Wind Research Into the Environment). After two years, I got my current job where I have worked on various projects in the UK and am just about to start working on a project based in Germany.
What qualifications do you have?	BSc Marine Biology and Zoology, MSc Biological Diversity
Which STEM subject was most relevant to your career path?	Science, especially biology
What attracted you to this job?	I believe that renewable technology can help to combat climate change and I want to be in a job where I feel that I can make a difference and contribute.
Where do you see your career heading?	I would like to expand my knowledge to other renewable technologies and other countries. I am also very interested in sustainable fisheries and the idea of co-existence between wind farms and marine protected areas. I hope that during my career I am able to contribute to such areas.
What advice would you give others?	Don't give up! I found it really difficult to get into the environmental industry after university but I knew it was where I wanted to work so I just kept trying to get a break. Doing voluntary work to get some relevant experience can help a lot and in my case, it led to a paid job. There is also lots of information out there on planning regulations, marine licenses, EIA's, public consultation etc. Get to know what is involved in offshore wind and that knowledge could prove invaluable to a potential employer.

Environmental surveys

Developers need to understand the effect that a wind farm may have on the plants and animals that live in and around, or use, the wind farm area. Birds, fish, sea mammals and sea bed life are surveyed by specialist companies using a range of boats and aircraft. Data is collected on the distribution, density, diversity and number of different species.

Onshore surveying work also has to take place to establish what impact cable laying and substations may have on the environment. It is also important to understand how people and companies will be affected by the wind farm. Generally, these roles will require environmental and ecology degrees, though some may have more specialist masters or PhD qualifications.

Marine ornithologist

Among the most important wildlife studies is the survey of bird populations and movements. It is often the first survey work to be done at a wind farm site because the work has to cover all seasons and needs to run for more than one year. Specialist companies can survey the birds from boats but aeroplanes have big advantages as they can cover large areas by taking high definition images for analysis. Bird surveying companies need graduates in marine biology, zoology and environmental science.



Image courtesy of HlDef Aerial Surveying

The Crown Estate has embarked on the world's largest aerial bird survey area as part of its offshore wind projects.



Wildlife surveys can cover everything from whales to seahorses.

Image courtesy of Fugro



Survey samples may be analysed onboard but some are taken back to onshore laboratories.

Image courtesy of Gardline Marine Sciences

PROFILE

Marine data manager

Name Rachel Helsby
Who do you work for? Partrac



What do you do? I am responsible for making sure that all of our data and reports are good quality. My job is very varied and I can be found out on survey, managing individual projects or processing data.

What does your typical day involve? If I am in the office then I am usually managing one of my projects, planning survey work, processing data or writing reports once data processing is complete. I spend about a week out on a survey each month. No day is the same, and usually a few surprises occur, so my plans for the day are always evolving!

What gives you the most job satisfaction? Nothing can beat the experience of being out on the water. This year I have seen minke whales, dolphins, seals, puffins, and gannets to name a few, and I've seen some spectacular sunrises and sunsets which seem all the more beautiful for being on a boat. It feels very satisfying when a client returns to us with further work because they are happy with what we have done for them before.

What do your friends think about your job? They are happy that I've found a career which is much more of a lifestyle than a 9 'til 5 job (they are happy that I am happy!). They have had to be very understanding as I am away sometimes for weeks on end and the days can be very long.

Brief career history I went to Southampton University to study oceanology with geology in 2000. After this started work on my PhD (on sediment transport in tidal inlets). Partrac was only four years old when I applied for a job with them, although I had heard of them before having undertaken some laboratory analysis for them. I was the 2nd scientist that they had ever employed, and have seen them grow out of two offices in the three years I've been here!

Which STEM subject was most relevant to your career path? Geography and biology

What attracted you to this job? The job specification looked as if it had been written for me! The job provided a complete variety of tasks within the office and out on survey and no day would be the same, which sounded perfect to me.

Where do you see your career heading? I have only worked for Partrac for a few years, but the knowledge I have now and the skills that I have gained are a world away from what they were when I began. Long-term, I would like to manage larger teams of people and work on bigger projects, both of which will come as the company continues to grow.

What advice would you give others? A masters or PhD will definitely be an advantage. Get some experience if you can (ask your tutor if you can help with fieldwork or find a PhD student who is willing to have an assistant), but the ability to show that you are proactive and are able to cope well when the unexpected occurs are all useful.

Environmental consultant

The data collected by surveyors is used by an environmental consultant to write the Environmental Impact Assessment or EIA. The EIA is an extremely important document which looks at the effects on nature conservation sites deemed to be of importance under European Union law.

This work is largely office based and involves people with environmental degrees with good analytical and writing skills. There is often a variety of career paths within environmental consultancies with plenty of scope to take on more responsible roles involving looking after a number of projects.



Examining maps of the wind farm site.

Image courtesy of Gardline Marine Sciences

Sea bed surveys

It's vital that developers know as much as possible about the site where they want to build a wind farm so they know where to place the turbines and cables, and how to choose the best foundation design to secure the turbines to the sea bed.

Two sorts of geological studies take place. Geophysical surveying uses acoustic techniques to look at the sea bed and sub-bottom geology, while geotechnical surveying gathers and analyses sea bed core samples and sediments. This data is combined to produce a detailed understanding of the wind farm site. Often the work is undertaken 24 hours a day, on ships equipped with accommodation and recreation facilities, laboratories and testing facilities. Personnel work on 12-hour a day shifts and they can expect to work one month offshore followed by one month on leave.

Geotechnical and geophysical engineers and surveyors

Geotechnical surveyors gather geological data by testing the properties of the sea bed and taking samples, and geophysical surveyors use acoustic techniques to map larger areas of the sea bed.

Geological surveyors design the surveys and analyse the data, and they have degrees in geography, geology or environmental science as well as more specialist geophysical and hydrographical surveying qualifications. Geotechnical or geophysical technicians have an HND as a minimum and will usually set up and operate the surveying equipment, and collect the data.

PROFILE

Hydrographic surveyor

Name Alastair McKie
Who do you work for? Fugro Survey Ltd



What do you do? I am responsible for the positioning of the vessel and the subsurface equipment. My main responsibilities include ensuring that all survey equipment is operational and correctly calibrated, and all survey data suitably logged.

What does your typical day involve? Currently, I am offshore on a cable lay vessel installing an export cable from a wind farm sub-station to the beach. I work 12 hours a day, 7 days a week for four or five weeks. I am responsible for the acoustic positioning of the subsea plough, used to bury the cable and for positioning the lay vessel along a pre-defined route.

What gives you the most job satisfaction? I enjoy the fact that I get to visit different countries whilst working. It is satisfying being involved in the construction of an offshore wind farm and then seeing the finished product.

What do your friends and family think about your job? My family and friends are used to me being away from home for extended periods of time. I typically spend around 180 days a year offshore, usually in four or five week blocks. I get used to it very quickly and I do get around 180 days holiday a year!

Brief career history After graduating from university I worked for a company called L&M Survey Services. After two years I joined Fugro Survey and moved to Australia to work offshore. I now work offshore for Fugro Survey in the UK.

Relevant qualifications BSc Geographic Information and Mapping Sciences, Hydrographic Survey Course, Graduate Member of the Chartered Institution of Civil Engineering Surveyors (GCInstCES).

What attracted you to this job? The dynamic environment attracted me to the job; I enjoy the varied work and I have enjoyed working all over the world, such as in Australia, Singapore and Germany. The industry is fast paced and constantly evolving; there is always opportunity to progress quickly.

Where do you see your career heading? I hope to become a senior surveyor within Fugro. Then I plan to get involved in project/operations management.

What advice would you give others? Be pro-active and seek work with a company that provides good training and the opportunity to gain experience on a wide variety of projects.

- The first UK wind farm was built just one mile off the coast. Today, projects are being planned to be located over 50 miles out.

- Projects are being developed in water depths of up to 45 meters.

- The largest offshore wind farm in the world is found at Thanet with 100 turbines.

- Wind turbine foundations can act as artificial reefs and enhance biodiversity.



Geotechnical surveys take cores of the seabed for analysis.

Image courtesy of GEO



Offshore nacelle assembly line.

Image courtesy of Stiftung Offshore Windenergie/DOI/2008



Siemens Press Picture

There are a number of companies who specialise in the design and manufacture of wind turbines and the components that make up these complex machines. The good news is that UK-based businesses and research centres are among international leaders in offshore wind technology research and development and it is likely that soon wind turbines will be manufactured in the UK.

The key elements of a wind turbine are:

- The rotor (including the blades.)
- The nacelle, which houses the equipment that turns the mechanical energy from the turning rotor into electrical power.
- The tower, which supports the nacelle and contains ladders, a lift and various electrical panels.

What does it take to start a career in wind turbine design and manufacture?

Research and development (R&D) and design is carried out by people with degrees in subjects such as physics, electrical and mechanical engineering, and mathematics. In manufacturing and assembly there is a big demand for craft and technician level engineers.

Some of the largest wind turbine manufacturers have teams of over 1000 technicians and engineers worldwide and they will also call on specialist engineering consultancies to help them.

Wind turbine manufacturers also have significant planning and purchasing departments, which spend many millions of pounds getting the right components delivered to the right place at the right time.

Routes into offshore wind manufacturing roles can be either through vocational qualifications such as HNDs or HNCs, or through specialist engineering degrees. There is always extra on-the-job training needed in the specialist areas.

The most important thing if you want to go into a craft career is that you have good GCSEs in science and maths, you can think spatially and you have good mechanical hand skills.

Wind turbine manufacturers

The next generation of offshore wind turbines will be significantly larger than today, so there is much cutting-edge technology development in many different areas of engineering to do in the years ahead. Typically, it can take a team up to five years to get from a clean sheet of paper to a new wind turbine ready for sale in big quantities. During that time, engineers get involved with overall concept development work to optimise the size and characteristics of the turbine, in calculating the loads on the structure as it generates electricity, and how it will be assembled and maintained during its life. Part of the development involves testing components, sometimes all the way to failure.

Technical sales manager

The technical sales manager for a turbine manufacturer is an important role for someone with experience which may have come from working in another industry. They will often be dealing with hundreds of millions of pounds worth of technical equipment, and will need to have a strong technical background and probably an engineering degree.

Blade production team leader

Each wind turbine blade takes a few days to be moulded, assembled and finished ready for transportation to site. Generally, a production team will work together on each of these stages. The production team leader is responsible for making sure that the blade is delivered safely and on time but also meet strict quality standards.

Many team leaders will have started off learning basic skills as a junior member of the production team or may have developed their skills in other industries where composites are used, such as aircraft or boat building.



Siemens Press Picture

Blades can be made in different ways with a range of materials, but all use a mould to give the blade its smooth aerodynamic shape.

PROFILE

Control systems specialist

Name	Robert Bowyer
Who do you work for?	Vestas Technology R&D UK

What are your main responsibilities/tasks?	To research and develop methodologies and systems for controlling future designs of wind turbines. I am responsible for the specification of new technologies and developing project plans to deliver new technologies to the rest of the company.
What does your typical day involve?	Project meeting to catch up with latest progress. Continuing with control system development and simulations to quantify the potential benefits of control technology in terms of loads, power and cost of energy of adding new features and concepts to wind turbine designs.
How much of your job is involved in offshore wind?	A large part as we are designing future turbines optimised for offshore operation, and all the challenges this presents.
What gives you the most job satisfaction?	Successfully delivering technology solutions which reduce the cost of energy. Seeing general interest in wind energy grow over the last few years.
What do your friends and family think about your job?	They are very interested in the value proposition of wind energy.
Brief career history	Before I joined Vestas, I was the team leader for control systems at Red Bull Racing F1 team.
What attracted you to this job?	Green energy, and working on multidisciplinary systems engineering projects in a growing and highly competitive field. Working for a global company such as Vestas.
Where do you see your career heading?	Strategic technology management.
What advice would you give others wishing to pursue such a career?	Be curious – there is so much we still have to learn. Do your homework – wind energy is now an established field. Go sailing, you learn so much about wind!

Image Courtesy of Stiftung Offshore Windenergie/DOI/2008



These technicians are working inside the central core of the blade to seal the joints.



Assembly of the pitch system into the rotor hub

Image courtesy of EWE AG/Meyer-Bergfeld, 2008



Assembly of a wind turbine gearbox.

Image courtesy of Bosch Rexroth AG

Turbine assembly

All wind turbine manufacturers assemble the nacelle, bolting together the components and completing all of the wiring before final test and preparation for transport to the wind farm site. Soon wind turbines will be so large that work will need to be carried out at ports to avoid the limitations of road or rail transport.

Turbine components

Wind turbines are made up of hundreds of components, large and small, mostly assembled into the nacelle. Examples of components include gearboxes, generators, brakes, heating and cooling systems, control systems and large structural items which support and transfer the huge loads from the rotor down into the tower.

Some wind turbine manufacturers make many of the large components themselves, while others buy them from a wide range of suppliers. Some components are 'standard', used in other industries; others are designed specifically for a given type of wind turbine.

Engineering roles

Development engineering combines both pure research and product development. A lot of the work involves mathematical modelling, computer design tools and a wide range of different engineering skills.

The big challenge with wind turbines is that large numbers of components are needed, and therefore the manufacturing sector needs to adapt to make the increasing quantities. This means that process development engineers with product engineering or advanced manufacturing qualifications are needed.

Research is carried out by wind turbine manufacturers, component suppliers and also in universities and research institutes, often in partnership with industry. Wind energy companies will work with researchers all over the world.

Big components such as gearboxes and generators need to work reliably for many years in the harsh offshore environment. Applications engineers work to develop the component so that it can be easily made in large quantities to a high standard while keeping a close eye on costs.

There is also plenty of detailed design of specific subcomponents carried out by engineers. Design draftsmen, usually graduate mechanical and electrical engineers, produce the drawings that enable all the parts to be manufactured correctly.

Production engineers are also needed to develop better methods of manufacture and make sure that quality is kept high.

There is a wide range of skills needed to produce turbines, especially in technical and engineering areas. You could join the engineering team at technician level, having completed a modern craft or technician apprenticeship. New engineering graduates can join graduate engineering schemes to develop expertise in various roles and then progress to holding responsibility for design work and managing a team.

Roles in R&D

Many involved in research will have PhDs in a relevant science or engineering discipline, ideally in renewable energy, which they will have taken after their first degree. There is also a big role for mathematical analysts. Designing and testing new components or systems will create enormous amounts of data and it takes special skills to be able to understand what the numbers mean.

R&D needs skilled technicians. For example, to be a blade prototype technician, more than formal qualifications, you need hands-on experience of working with composite materials and modern manufacturing techniques.



At a blade testing facility, a blade is mounted on equipment that simulates the stresses and strains during its lifetime. The blades bend more than 10 metres during such tests.

© Narec (National Renewable Energy Centre), Blade test facility, Blyth, Northumberland.

- The largest offshore turbines are 150m high, with 62m long blades, almost twice that of a single Airbus 380 wing.
- A single turbine blade can weigh 25 tonnes, about the weight of a humpback whale but five times as long.
- The loads on a blade during strong winds are equivalent to placing a mid-sized car at the end of a three-kilometre beam.

PROFILE
Gearbox test and development team manager



Name: Richard Smith
Who do you work for?: Romax technology

- What do you do?** I am the manager and technical lead of the test, measurement and development team.
- What does your typical day involve?** A typical day involves the testing and certification of wind turbine gearboxes, the inspection and assessment of existing wind turbines, and the design of wind turbine gearbox test rigs.
- What gives you the most job satisfaction?** I recently travelled to Taiwan to support a customer during their certification test programme. Romax had designed the test gearbox and my team designed and commissioned the test equipment. Everything performed faultlessly, and the customer was extremely pleased, so much so that we won another contract.
- What do your friends think about your job?** They are very impressed. Particularly when they see photos on me in the North Sea survival suit!
- Brief career history** Before working for Romax, I worked as an engineering consultant in both aerospace and automotive development. Working for Rolls-Royce (and Airbus), I worked on the development of the Trent 900 engine for the Airbus A380, and again with Boeing on the development of the Trent 1000 for the 787. I have also worked with most automotive manufacturers on the development of fuel systems.
- Relevant qualifications** I have a degree in mechanical engineering.
- What attracted you to this job?** Both automotive and aerospace industries are well established and now have low levels of growth. It is great to be involved in a new industry that is growing so quickly.
- Which STEM subject was most relevant to your career path?** Physics.
- Where do you see your career heading?** I expect an increasing amount of work involving offshore inspections and pro-active management of drive train related issues. This will require me to manage a growing team and deliver new technical solutions.
- What advice would you give others?** Anyone interested in such an engineering role needs a real passion for this work. A brilliant CV full of top marks is no use what-so-ever if that person cannot think on their feet and solve problems quickly. Practical engineering experience is just as important as qualifications today.



During manufacture, the cable is wound onto a carousel, stored and loaded onto a cable-laying ship. One turntable can hold 7,000 tonnes of cable.

Photo: ABB

A wind farm is much more than just rows of wind turbines. Each turbine needs to be securely supported to survive the very harsh wind and wave conditions seen around our coast.

The power that the turbines produce needs to be gathered and brought to the onshore electricity grid. This is achieved by using subsea electrical cables linking the “array” of turbines. The cables bring the power to one or more offshore substations. Cables then run from these substations to an onshore substation in order to connect with the electricity transmission system.

Many of the skills and equipment needed to build these systems are also needed by other industries, including other kinds of electricity generation. The companies involved in offshore wind farms are often large, global operations already working in oil and gas, other electricity generation or telecommunications.

What does it take to start a career in the manufacturing of electrical systems and foundations?

As in other areas of manufacturing, both craft and graduate careers can start straight from college, university or school, with many companies running graduate and apprenticeship programmes.

As an example, to build a substation requires welders, platers, pipe fitters, electricians, mechanical fitter and riggers. The starting point for a career in all these trades is similar. Apprentices need strong practical and technical skills with good GCSEs in science and maths. Apprenticeships may involve a first year at college followed by on the job training.



The substation at Sweden's Lillgrund offshore wind farm.

Siemens Press Picture

Foundations

The foundations of an offshore wind turbine are manufactured on land and then transported to the wind farm site. Depending on the design, foundations can rest on the sea bed or reach deep down into it. The foundations end a little above the waterline with a platform to help maintenance staff to access the turbine from a boat. Foundations are usually designed by engineering consultancies.

Substations

The offshore substation collects the electrical power from the turbines and transforms it to a higher voltage for transmission back to shore. Resembling the familiar North Sea oil platform, these giant platforms, known as “topsides”, contain high voltage electrical equipment and all sorts of other facilities and are supported by foundations quite similar to turbine foundations.

Substation electrical components

The main electrical contractor will design the electrical system and may supply the large components such as transformers and switchgear. The company that makes the substation platform will install and wire in these components.



Image Courtesy of Stiftung Offshore Windenergie/DOI/2008

Manufacturing the frame of the substation topside.



Image Courtesy of DOI/2009

Handling the massive jacket foundations.



Image Courtesy of Stiftung Offshore Windenergie/DOI/2008

Welding the foundation structure.



Many foundation designs are based on large diameter steel tubes.

Image Courtesy of Sif Group bv/2008

PROFILE

Welding engineer

Name Steven Rooney
Who do you work for? Heerema Hartlepool



What are your main responsibilities/tasks? I am responsible for deciding what welding is needed on a structure such as an offshore substation, how it should be done and making sure the work is of the highest standard.

What does your typical day involve? I must provide technical oversight for all production welding activities. I also coordinate the quality control inspectors, who carry out regular checks.

What gives you the most job satisfaction? For me, the best moments are usually "sail-away" – that's the end of the manufacturing phase, when the structure is transported to the offshore location ready for installation. You feel very proud watching these large structures sail off into the sunset and you get a great sense of achievement knowing that you've worked hard and made a valuable contribution to the success of the project.

What do your friends and family think about your job? My friends are happy for me; they're pleased I'm earning a good living doing something that I really enjoy.
My family are extremely proud of my academic and professional achievements; so much so, that a number of younger relatives are also planning on studying engineering and following in my footsteps.

Brief career history I joined Heerema to do an advanced modern apprenticeship and continued to work on the shop floor as a multi-coded welder. As well as the standard academic and vocational qualifications i.e. ONC, HNC, NVQ Levels II & III, my apprenticeship also included a comprehensive practical welding training programme applicable to structural steelwork and process piping welding activities for offshore construction projects. It was a very comprehensive training; I couldn't have hoped for better!
During my apprenticeship I studied part-time at the Hartlepool College of Further Education where I achieved numerous qualifications and awards. Due to my hard work, I was given the opportunity to move into the quality control department.
During my welding engineering traineeship I studied part-time at the University of Teesside to do a mechanical engineering degree. I graduated with a first and I was promoted as welding engineer. Since then I have been responsible for all welding engineering activities on many high value, complex projects for the offshore construction industry.

Relevant qualifications MSc (Eng) in project management; BEng in mechanical engineering; HND in manufacturing engineering; advanced modern apprenticeship (including NVQ Level III)

What attracted you to this job? The variety; I wouldn't like a repetitive job doing the same thing over and over again. I face real challenges on a daily basis and finding solutions to engineering problems is very satisfying. Also, the scale of the projects I'm involved in is quite impressive. Some offshore projects are huge; it's really interesting seeing the structure progress towards successful construction completion.

Where do you see your career heading? I'm extremely pleased with my current position. In a relatively short period I've progressed from apprentice, to tradesman, to quality inspector, to engineer!
The next logical step will be to move into management. I've been lucky that the company has given me opportunities that could enable me to progress into senior management.

What advice would you give others wishing to pursue such a career? Go for it! It's a challenging career choice but extremely rewarding.

Trades in substation platform manufacturing and fit-out

Many of the companies manufacturing substations have built up years of experience making North Sea platforms where the skills they needed are similar.

Switchgear is a little like the fuse box in your house only much larger, containing fuses and circuit-breakers.



Photo: ABB

High voltage engineers

High voltage (HV) electrical engineers play an important role in the electrical design team. They design or select electrical components, plan how these should connect together, and work with control systems engineers who will design the control and communication systems.

The team is led by a principal or senior electrical engineer who has specialised in HV systems. Companies recruit a number of new graduates or HNCs every year. There is a high demand for experienced HV engineers. Supporting the engineers are project control technicians, many of whom would have joined the company as apprentices. This is mainly an office based role for those with good numerical skills and familiar with the latest computer systems.

The electrical components are generally engineered and manufactured by large global companies that work across all forms of power generation and electricity distribution.

PROFILE

Electrical design engineer

Name Martin Devine
Who do you work for? Siemens Transmission & Distribution Ltd



What are your main responsibilities/tasks? I provide primary technical input to the design of transmission substations covering the onshore National Grid, distribution network operating and offshore wind farm projects

What does your typical day involve? I am a design engineer for the Lincs offshore wind farm working on the primary design of the offshore platform. I deal directly with the offshore substation fabricator. I am responsible for substation layouts and cross sections, the production of technical specifications for primary plant equipment and verification that the primary design complies with all the necessary technical standards and practices.

What gives you the most job satisfaction? When my design is completed and approved and the drawings reach the final construction stage to become a physical reality. My best moment was when I received an award for my input in the Whitegate 275/132kV conversion project. It gave me great pride and I was very happy to be recognised for my contribution.

What do your friends and family think about your job? My family and friends are really interested in my work, especially since conservation and alternative energy solutions are very topical subjects. My family are particularly proud of my achievements because I successfully overcame dyslexia at school, university and now in my chosen career.

Brief career history At university, I worked with mechanical and electrical building and services consultants where I gained valuable working experience. I also worked for a building and servicing contractor and saw the designs being used to build and complete projects. I started work with Siemens in 2008 as a direct entrant trainee primary design engineer after leaving university. In February 2010, I was promoted to design engineer.

Relevant qualifications HNC in electrical engineering. BEng (Hons) in electrical power engineering with placement (year in industry) and I am full member of the IET.

Which STEM subject was most relevant to your career? Maths

What attracted you to this job? I studied electrical power engineering at university, and my final year thesis was on alternative energy which was of great interest to me. I was introduced to Siemens at a graduate recruitment fair and was very impressed, particularly with the opportunities in alternative energy.

Where do you see your career heading? I want to continue working in the energy sector which I believe has a very bright and exciting future. My next career step is to become lead design engineer on one of the major offshore wind farm projects.

What advice would you give others wishing to pursue such a career? Develop a real interest in alternative energy technologies and get some practical engineering experience while at university. Be prepared to work hard, learn from the experts working with you, and become accepted for your increasing contribution as part of the team. The energy sector is a worldwide industry and a very exciting and challenging working environment.

- Steel turbine foundations can weigh up to 800 tonnes. Concrete "gravity" foundations can weigh around five times more.
- Wind farms usually have one substation for every 100 or so turbines. This means that there could be 100 offshore platforms built around the coast of northern Europe by 2020.
- Each metre of submarine cable weighs around 80kg, the weight of an average man.
- The substation topside weighs around 2,000 tonnes, that's the equivalent of 30 Challenger tanks.

Installing an offshore wind farm is complex and expensive. It involves the final assembly of the wind turbines onshore and the transport of the turbines, foundations and cables to the wind farm site, and the construction of the wind farm.

The developer is in overall control of the installation and construction process and it selects which companies will carry out the work, coordinates the work and ensures that it keeps to budget. Installing a large offshore wind farm can cost hundreds of millions of pounds.



This is the Thanet Offshore Wind Farm being built. Like any construction site, it's a busy place and it is a big challenge to coordinate the many vessels.

Image Courtesy of Vattenfall

What does it take to start a career in wind farm construction and installation?

Many of the skills required are similar to the oil and gas industry and many of the companies involved work in both sectors. Don't be put off it because you have not worked offshore or at heights before: there are number of intensive training courses available covering health and safety and other technical aspects of installation work.

Ports employ electrical and mechanical fitters to carry out some of the offshore work, as well as skilled crane operators and riggers to handle the heavy turbine components. A career in one of these trades is likely start with an apprenticeship.

Onboard the turbine installation vessel, the turbine manufacturer has its own workforce that carries out the final assembly of the turbine. These companies may offer mechanical or electrical apprenticeships and take on trained people who have worked in other industries.



Divers need to be supported by specialist equipment and teams at the surface.

Image Courtesy of Vattenfall

Construction project manager

This is an important job and requires experience. Part of the job is office-based, but it also involves spending time on installation vessels to check the project's progress.

The first step on the ladder is to join the developer as a project engineer. You could be a graduate in a civil, mechanical or electrical engineering subject, which could lead to working in a team that looks after the installation of foundations, cables or turbines. It is a way of making a big difference to an offshore wind farm project if you don't want to spend too much time at sea.

There are a number of mainly onshore jobs in the construction and installation process. The companies that install the different components also have onshore teams that manage the fleet or operations. Often, these will be led by people with experience at sea who have chosen to develop their career onshore.



Image Courtesy of Harland and Wolff

Some of the project team with the yellow transition pieces, which sit on top of the foundation, at the quayside before being installed at the wind farm.

PROFILE

Construction project manager

Name	Juan Lopez Diaz
Who do you work for?	Iberdrola Renovables
What are your main responsibilities/tasks?	I work on the delivery of large-scale offshore wind projects, taking responsibility for some aspects of these projects.
What does your typical day involve?	At the moment, I am carrying out pre-construction works regarding installation of the West of Duddon Sands offshore wind farm.
What gives you the most job satisfaction?	The most satisfying thing is when you see a project finished after all the different, difficult and remarkable challenges you have faced.
What do your friends and family think about your job?	They think I am in the right business at the right moment. They probably do not quite understand the size and the importance of this industry now and its potential in the near future.
Brief career history	I began as an assistant project manager for a civil works. I then became a project manager doing civil works. I joined the renewable business, working as a project manager for onshore wind farms before changing into the offshore business earlier this year.
Relevant qualifications	Civil engineering and economics.
What attracted you to this job?	I could see the future potential of wind technology. I liked the challenge of building a brand new industry, and I wanted to be a part of the development of it.
Where do you see your career heading?	In the short and medium term, I would like to keep on in the business as a project manager, taking more responsibilities as my knowledge grows. In a long run, who knows?
What advice would you give others wishing to pursue such a career?	Work hard and be prepared to work into multidisciplinary teams, be enthusiastic to face challenging goals, be prepared to travel where the business and the knowledge are required, and be open minded because this business is completely new.



The Svanen vessel (here working at Sheringham Shoal) can lift 8,700 tonnes.

Image Courtesy of Scira Offshore Energy



Onboard a cable-laying vessel

Image Courtesy of Global Marine Systems Ltd

Foundation installation

Heavy lift crane vessels are often used to place the foundations into position, where they are secured using steel piles driven into the sea bed. The equipment needed to lift and guide these into position needs skilled technical operators.

Subsea cable installation

Cable-laying is performed by specialist companies who employ technicians who may work four weeks at sea (12 hours a day, 7 days a week) followed by four weeks on leave. These have HNDs in mechanical or electrical engineering along with qualifications to handle specific pieces of equipment and to work on wind turbines. They have the job of laying the cable, burying it and connecting it to the turbine and substation.

PROFILE

Cable installation project manager

Name	Gordon Stewart
Who do you work for?	Subocean



What are your main responsibilities/tasks?	I manage a team of engineers - onshore and offshore - during the planning and construction phases of subsea cable installation for offshore wind farm projects.
What does your typical day involve?	Up to three ships may be working offshore on the project and I make daily contact with each of them in turn for progress updates and to help resolve any problems that arise. I also make regular contact with the client by phone or e-mail to keep them informed and to discuss any changes that are needed. Occasionally I travel to the site to see the work first hand and to meet with the construction teams.
What gives you the most job satisfaction?	I get most satisfaction when we have completed a project, and I have the opportunity to express gratitude to my team for the hard work that they have put in to achieve that milestone. We recently finished laying two large cables across a wide beach. This took 18 months of planning but we were successful because of the detailed engineering work we did and our skilled team who were able to preempt any problems before they arose and ensure they had back-up plans in place.
What do your friends and family think about your job?	Many of them assume that I am a crusader for green energy as my work is primarily in offshore wind, although this is slightly removed from the truth. A lot of them are interested in the industry as a whole as wind energy is something that they can relate to as more and more turbines appear around the countryside.
Brief career history	I started in the offshore industry as a geologist in the oil and gas industry before becoming a project engineer. I joined Subocean as a senior engineer and became a project manager two years ago.
Relevant qualifications	BEng in civil engineering with geology
Which STEM subject was most relevant to your career path?	Maths
What attracted you to this job?	After six years working in subsea construction in the oil and gas industry, I was keen to be part of a new and developing sector where I could make use of some of the skills I had gained.
Where do you see your career heading?	I have only recently settled into my current role recently and I plan to develop with experience and further commercial and contractual training.
What advice would you give others wishing to pursue such a career?	Get as much offshore or other site experience as possible. There is no substitute for the experiences gained on the back deck of a ship or on the beach when carrying out construction works at the shore. Learn from the people who have been involved in offshore works for several years, but don't ever be afraid to speak up if you have a good idea, or challenge someone if you think something is not being done right. Always look for opportunities to improve the way that work is done. Be prepared for the unexpected - the industry is young and changes often occur at short notice.

Turbine installation

Turbines are usually taken to sea in sections and a stable platform is needed to erect them. Specialist "jack up" vessels are used with legs that stand on the sea bed to lift the ship off the surface of the water. The vessels' giant cranes assemble the turbine. Crews need to work at the top to bolt the different elements together.



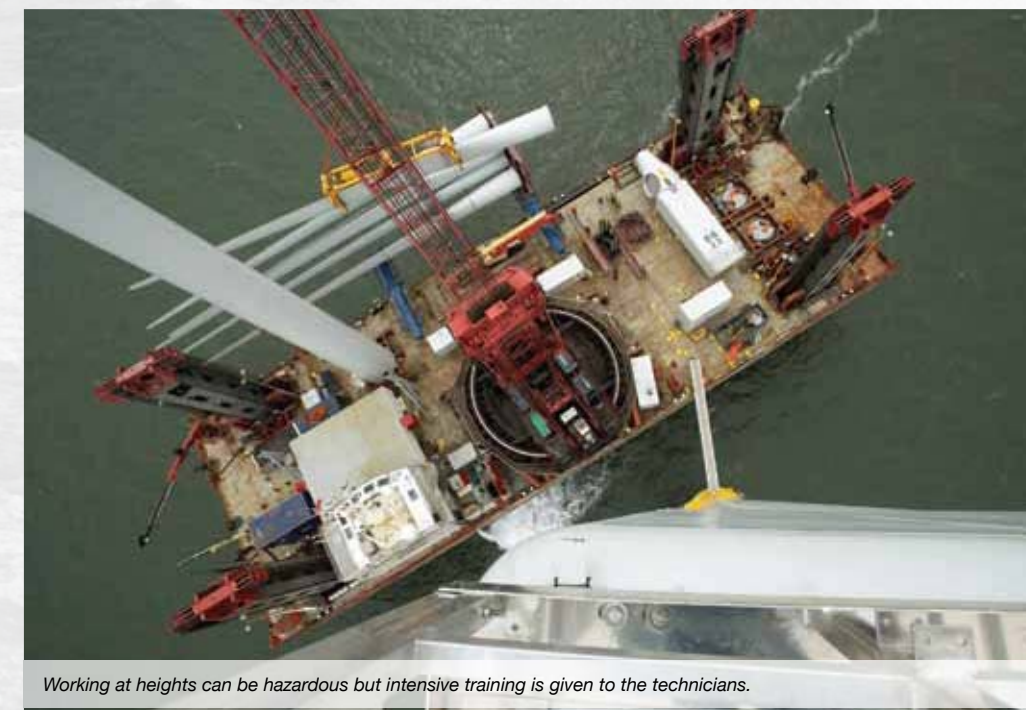
The weather at sea can turn nasty at any time. When conditions are good, work goes on through the night to install the turbines.

Image Courtesy of DCTI 2009



When there is any risk of falling, technicians are clipped onto the turbine structure at all times for safety.

Siemens Press Picture



Working at heights can be hazardous but intensive training is given to the technicians.

Siemens Press Picture

- Around 30 different vessels are used in the construction of a wind farm.
- The largest vessel for installing the turbines can be 150m long with cranes that can lift 1000 tonnes.
- Cable-laying vessels can load up to 70km of cable.
- Substation platforms can weigh over 1000 tonnes and for installation require floating cranes that are among the largest in the world.

After many years of planning, construction and testing, electricity generation can begin.

Operations and maintenance activities are carried out over the entire lifetime of a wind farm. It is vital to keep everything running reliably and efficiently and to fix problems quickly in order to maximise the amount of power generated.

What does it take to start a career in wind farm operations and maintenance?

There are opportunities for both graduates and non-graduates within operations and maintenance. From engineers and technicians, who work on the turbines and other wind farm equipment, to skippers of vessels who ferry people to and from the wind farm site, the wind farm needs a large number of people to ensure it operates well.

Apprenticeship schemes are available for wind turbine technicians and companies also retrain electricians, plumbers and ex-military staff who have transferable skills. Technicians start off as trainees and work their way up to become senior technicians or team leaders. They must have had good GCSEs in core subjects like maths and science.

Skippers, marine engineering technicians and deck hands are required to operate the workboats that transfer technicians and spare components to and from wind farm sites. Deck crew can start their career with a basic maritime qualification while boat skippers will have trained as for a ship's master qualifications, which gives them the skills and experience to be responsible for the boat and its crew.

Back on land, asset managers, who are often graduate engineers, are responsible for looking after the long-term health of the wind farms their company owns. This is a vital role as the assets are worth hundreds of millions of pounds.



Robin Rigg wind farm in the Solway Firth, which started generating power in 2010. The operations base is in Workington about eight miles from the wind farm. Fast boats can get technicians to the wind farm within 30 minutes.

Image courtesy of E.ON UK/NewsCast



Walkways that stay still, even in rough conditions, can help technicians to transfer from the boat to the turbine or – like here – the substation.

Image courtesy of Ampelmann Operations



Image courtesy of E.ON

The operations base

Support is provided throughout the year, which includes monitoring the health of the turbines and responding to unexpected faults and failures. The wind farm's operations base is normally at a port where the team manages crews, spares and maintenance schedules. The base needs to be as close as possible to the site so the crews can get there quickly. As wind farms get further from shore, operations staff will increasingly live on accommodation platforms out at sea.

Wind turbine technician

Most offshore wind turbines are maintained by the turbine manufacturer as part of a service agreement. Technicians are based at the operations port and are responsible for the day-to-day maintenance of the wind farm. Wind turbine technicians travel to offshore wind farms to deal with any problems with the turbines. This may involve replacing parts or making small repairs on site. Safety is paramount when working offshore and all technicians are trained to work at heights and at sea.

Most days will be spent out at sea, though there can be times when bad weather keeps you on land.



Image courtesy of Vatterfall Wind Power, Photographer Henning Raasken

This central control room for a wind farm owner can monitor the performance of each individual turbine and components across the world.

PROFILE

Maintenance and performance engineer

Name: Alejandra Arbelaez Sierra
Who do you work for?: Centrica



What are your main responsibilities/tasks? I provide technical support to the operation teams on the different wind farms and help to decide the best way of maintaining the wind farm.

What does your typical day involve? The first thing I need to do is check that all the turbines are running! I sometimes travel to the wind farms, making sure that the operation teams have all the technical support that they need.

What gives you the most job satisfaction? I am focused on maintaining good communication between the operation team of the offshore wind farms and the technical support staff. This relationship is needed to make the wind farms operate efficiently.

Going home knowing that all the turbines are running. My best moment was a couple of years ago, after the installation of a condition monitoring system in one onshore wind farm; we received an alarm in one of the wind turbines components. I went to inspect the turbine with an endoscope and I found the problem. We could repair the component without a crane and the loss of production was minimal.

What do your friends and family think about your job? They are very proud of me as there are not too many women involved in the operations of offshore wind farms. They always ask me how everything works and if I get sick every time that I am on a boat!

Brief career history I used to work in the maintenance of a chemical and waste incineration plant before moving to work with onshore and offshore wind farms.

Relevant qualifications I have masters degrees in mechanical engineering and in maintenance management.

What attracted you to this job? I love wind turbines. I have always found myself astonished when I am in front of these machines. When you go to the different wind farms, you always discover amazing places and amazing people.

Where do you see your career heading? Plenty of opportunities! I would like to acquire more management experience and Centrica is helping me to take this direction. I would like to be an asset integrity manager for the offshore wind farms.

What advice would you give others wishing to pursue such a career? It is not easy to work in maintenance being a woman. Every day is a challenge and that is what I like. No day is the same. If someone wants to live this experience, you should go for it!



A specially designed access system from a work boat to a turbine.

Image courtesy of Offshore Wind Power Marine Services Ltd

Crew transfer and access

Boats and helicopters are used to transport maintenance crew and equipment from the operations port to the wind farm. Transferring the maintenance crew onto turbines can be a difficult process, especially in rough weather conditions. New methods are being developed to reduce the times when conditions make access to the turbines impossible. This is becoming more important because wind farm sites are increasingly being located further from shore and in rougher seas.



Helicopters transferring crew.

Image courtesy of REpower Systems (Christian Eiche)



Sea conditions can change quickly and handling the boat with high winds and waves is a skilled job.

Image courtesy of Ampelmann Operations

PROFILE

Skipper, wind farm service vessel

Name: Chris Stopford
Who do you work for?: Offshore Wind Power Marine Services



What are your main responsibilities/tasks? I'm the skipper of a 15 metre aluminium catamaran that takes construction and service engineers to the Gunfleet Sands offshore wind farm. I have to navigate the vessel safely to the site and position the boat against the turbines so that the technicians can climb the ladder to gain access to the turbines.

What does your typical day involve? A typical day usually starts at 06.30 where the crews assemble and prepare the vessel for the day's work. The engineers board the vessel with the equipment they need at 07.00 and we make the 45 minute trip to the wind farm. We then distribute the technicians to the turbine they need to work on. It sometimes takes 30 minutes to transfer them and their equipment, which is not easy when the weather is rough. By 16.30 we are usually starting to collect the engineers and return to port. The vessel then has to be refuelled, checked and washed down ready for the next day.

What gives you the most job satisfaction? Arriving on site every day is exciting. Seeing the turbines turning and generating clean energy is very satisfying, knowing that you are part of the team that created it. The best moment was seeing the first turbine constructed and seeing it rotate for the first time.

What do your friends and family think about your job? They are all very interested and even those friends who were sceptical about wind power, seem to change their views when they learn how easily they were constructed and how much power they actually generate. I am lucky to live fairly close to my work place so although a typical day may mean I am away for 14 hours a day, I do get home in the evening so family life can go on without spending days away from home.

Brief career history I started life as a commercial fisherman before I became skipper of large motor yachts in the south of France, then returned to UK and became an RYA sailing instructor before taking on this job.

Relevant qualifications For this job you need to be a RYA Yachtmaster with commercial endorsement. This means that as well as knowing boat handling and navigation you must have sea survival and medical certificates. I also have MCA Master Class 4 (yachts), radar and navigation, fire fighting, ship captains medical, marine business and law and ship stability certificates

What attracted you to this job? It's new a new technology with new working practices which is always interesting. It's a cutting edge industry and it's great to be a part of it.

Where do you see your career heading? It's still a fairly new industry and new vessels and designs are evolving rapidly. I would like to think I can play a part in some way as these new vessels are introduced.

What advice would you give others wishing to pursue such a career? You have to enjoy being at sea first and foremost. Think of your working life as a ladder. Start at the bottom and work your way up. Don't get big ideas too quickly. Learn from others experience. And when you get to the top rung, be prepared to step off onto another ladder and start again!

- Wind farm owners expect their turbines to be operating for at least 350 days a year.
- Workboats travel out to site at 18 knots which is about 21 miles/hour.
- An individual turbine is designed to have a lifetime of over 20 years.

Are you excited by new renewable energy technologies? Do you want to find out more about how to launch your career in the offshore wind energy industry? Here are some useful tips.

Find out more about the offshore wind industry

There are a number of useful websites that provide plenty of additional background information about the technology and businesses behind this exciting industry, and help point you in the right direction. Here are a few examples:

- Aquatic Renewable Energy Technologies (Aqua-RET) is an e-learning tool promoting aquatic renewable technologies. www.aquaret.com
- RenewableUK: www.renewable-uk.com and
- Scottish Renewables: www.scottishrenewables.com

These websites are full of information relating to renewable energy technologies, their history and future.

Research your role

Research the specific role that interests you by using careers advisors, web-resources and recruitment specialists.

Review your CV

Do you already have transferable skills? Your existing experience may prove extremely attractive to employers. And do not be afraid to speak with an employer, or careers advisor, about individual roles before you apply.

Do your research and look at what might be missing from your CV and consider what you can do about this.

Getting the experience

A lack of practical experience need not be a barrier to employment; applications for work placements do succeed, internships do exist, and the skills needed are often acquired through experience in other industries.

Getting the qualifications

Consult a careers advisor about what options for study would be best for reaching your personal career goals. They will also be able to inform you on how you can fund your studies.

Try to think two steps ahead and consider what you want to use your qualifications for.

If you are making decisions about what to study at GCSE, A-level, or the equivalent, bear in mind the diverse set of doors that engineering, technology, science, mathematics related subjects can open for you.

If you are thinking about apprenticeships, vocational courses, foundation degrees or higher education, there are a number of websites to help you:

For vocational courses and professional development: www.renewable-uk.com, www.hotcourses.com

For undergraduate study: www.ucas.com

For postgraduate taught and research programmes: www.findamasters.com, www.findaphd.com

How to get your first offshore wind energy job

The following are useful starting points:

- RenewableUK website (see above) for job listings;
- Individual company websites;
- Specialist recruitment agencies;
- Specialist industry interest press;
- Professional engineering institution;
- National press.

Image courtesy of REpower Systems (Jan Oelker)



Image courtesy of REpower Systems (Ralf Grömminger)



BARROW
 Number of turbines 30
 Capacity (MW) 90
 Completion 2006

Image courtesy of Centrica



ORMONDE
 Number of turbines 30
 Capacity (MW) 150
 Completion 2011

Image courtesy of Bifab



ROBIN RIGG
 Number of turbines 60
 Capacity (MW) 180
 Completion 2010

Image courtesy of E.ON UK/NewsCast



LYNN & INNER DOWSING
 Number of turbines 54
 Capacity (MW) 194
 Completion 2009

Image courtesy of Centrica



SHERINGHAM SHOAL
 Number of turbines 88
 Capacity (MW) 317
 Completion 2011

Image courtesy of Scira Offshore Energy



WALNEY
 Number of turbines 51
 Capacity (MW) 184
 Completion 2012

Copyright 2010 DONG Energy



BURBO BANK
 Number of turbines 25
 Capacity (MW) 90
 Completion 2007

Image courtesy of DONG Energy



RHYL FLATS
 Number of turbines 25
 Capacity (MW) 90
 Completion 2009

Image courtesy of Mojo Maritime



NORTH HOYLE
 Number of turbines 30
 Capacity (MW) 60
 Completion 2003

Photo by Dan Towers, 2004. Reproduced by kind permission of RWE npower renewables.



KENTISH FLATS
 Number of turbines 30
 Capacity (MW) 90
 Completion 2005

Image courtesy of Vattenfall



THANET
 Number of turbines 100
 Capacity (MW) 300
 Completion 2010

Image courtesy of Vattenfall (Lavernder Blue)



SCROBY SANDS
 Number of turbines 30
 Capacity (MW) 60
 Completion 2004

Image courtesy of E.ON UK/NewsCast



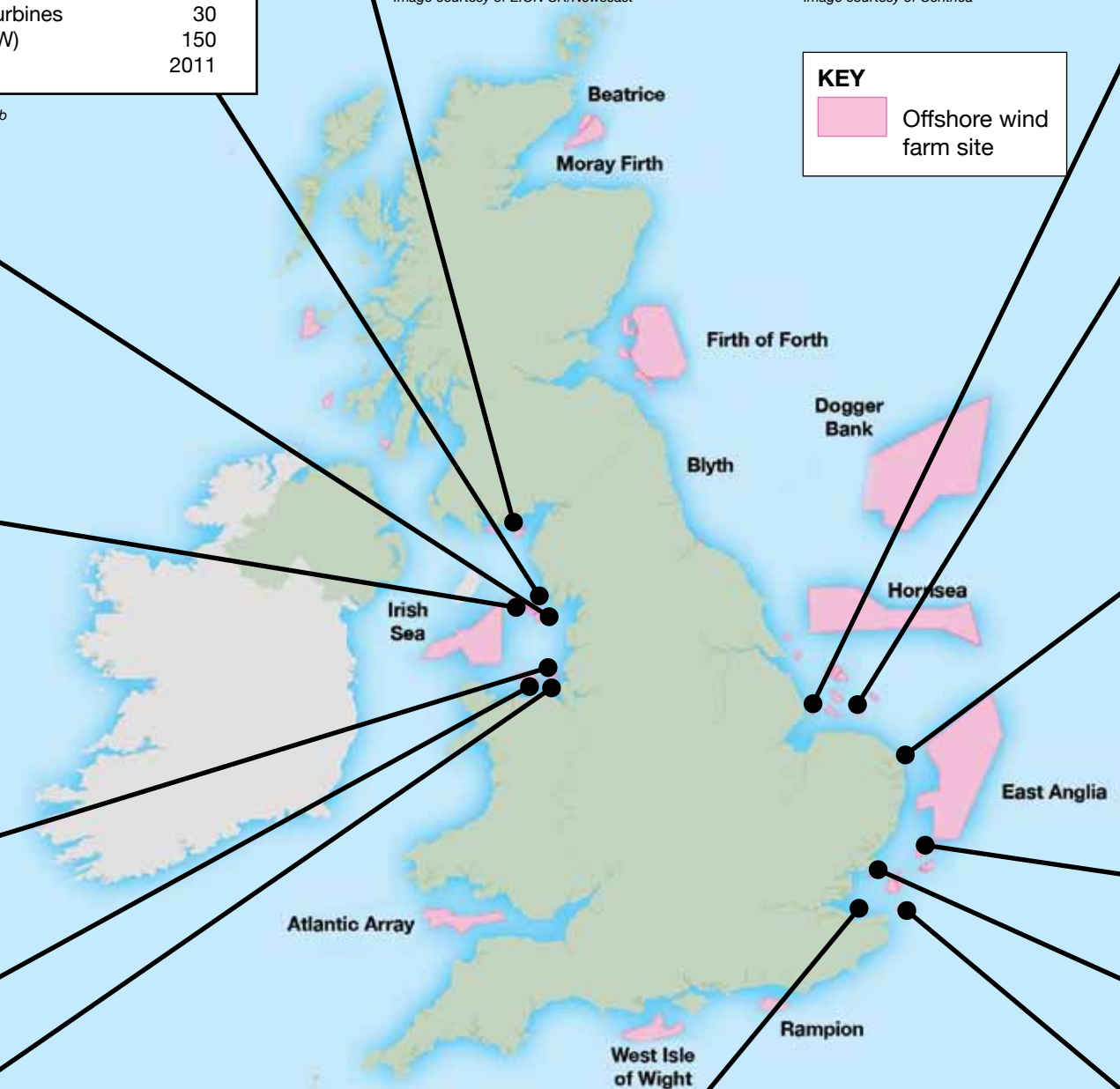
GREATER GABBARD
 Number of turbines 140
 Capacity (MW) 504
 Completion 2011

Image courtesy of RWE/SSE



GUNFLEET SANDS
 Number of turbines 48
 Capacity (MW) 173
 Completion 2010

Image courtesy of DONG Energy



KEY
 Offshore wind farm site

BVG Associates is grateful to the following companies for their help in providing information for this document.

- Areva T&D
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- Garrad Hassan
- Harland & Wolff
- Heerema
- Iberdrola Renewables
- Offshore Marine Academy
- Offshore Wind Power Marine Services
- Osiris Marine Services
- Partrac
- Port Training Services
- Romax
- RPS Energy
- RWE npower renewables
- ScottishPower Renewables
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- Siemens Wind Power
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- DONG Energy A/S
- DOTI Deutsche Offshore-Testfeld- + Infrastruktur-GmbH + Co. KG
- E.ON Climate & Renewables
- E.ON UK / NewsCast
- Fugro Survey
- Gardline Marine Sciences
- GEO
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- Perry Slingsby Systems
- REpower Systems
- RWE npower renewables
- Scira Offshore Energy
- Scottish and Southern Energy
- Siemens
- SLP Energy
- Vattenfall

This guide to careers in offshore wind explains why the UK will need thousands of people with backgrounds in science, technology, engineering and maths to be part of this exciting new industry.

It takes you through the stages of building an offshore wind farm, including its planning, manufacturing, construction and operation.

The guide also describes many of the jobs needed both onshore and offshore, the skills and qualifications needed for each role, and the careers information to help you take the next step.

We also give you an insight into the working lives of today's pioneers in offshore wind, who explain in their own words what excites them about their jobs.

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