Harmonisation of Training for the Offshore Wind Energy Industry

European Collaboration

Harmonisation of Training for the European Offshore Wind Energy Industry

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Content

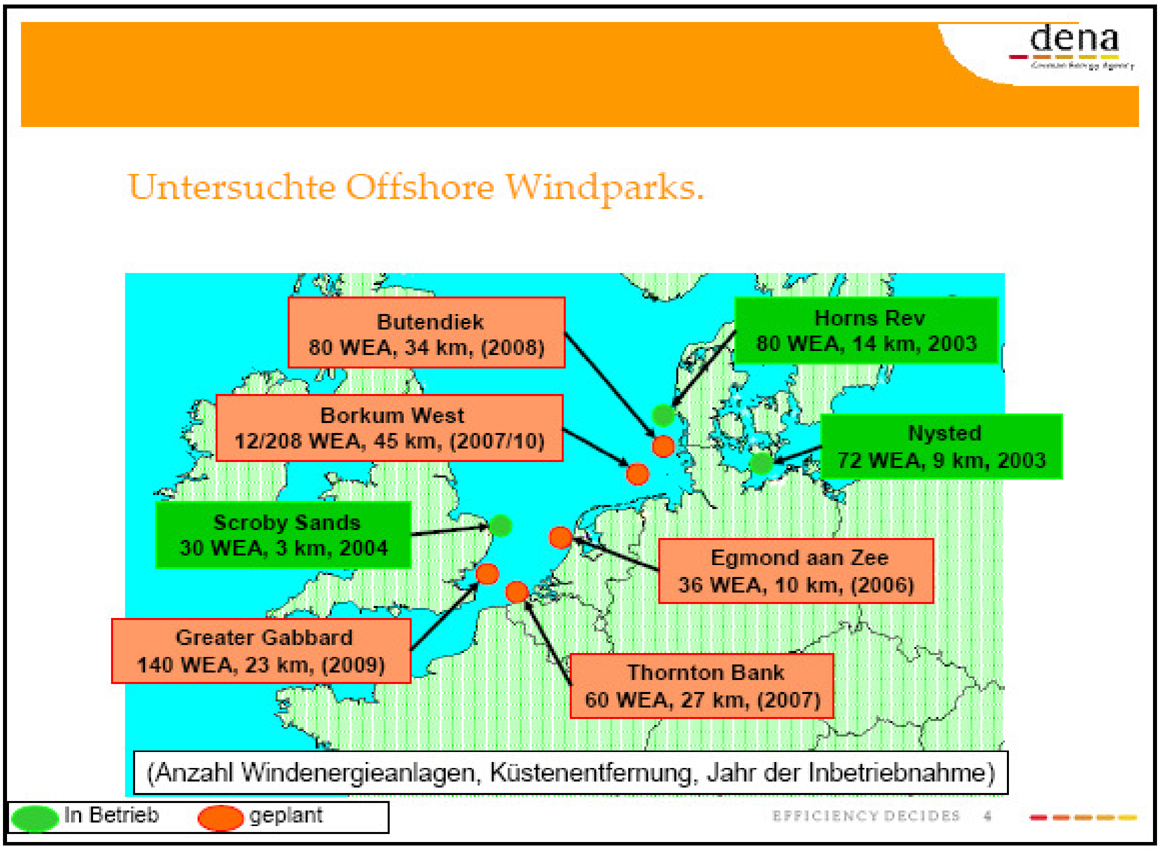
Introduction

In the United Kingdom, Germany and Denmark and other European coastal countries, offshore wind energy deployment is considered to be of particular importance for increasing the amount of renewable energies in electricity production. From the environmental perspective, the use of offshore wind energy could greatly contribute to climate protection and to a sustainable transformation of the energy industry.
In general, annual average offshore wind speeds are considerably higher than on the coast. Measurements show an increase of about 25% at sites 10km offshore over shorelines sites. Two thirds off Europe's offshore wind energy potentials are located in the North Sea.Large parts are characterized with shallow and moderate water depths of only 50m or less.

Plans for Denmark
The first large wind farm was constructed at Horns Rev, between 14-20km from the western coast of Denmark, in 2002. About 80 2 MW turbines produce a capacity of 160 MW, enough to satisfy 2% of the Danish demand. More turbines where build in 2003 on four locations leading to another 200MW capacity. Between 2009 and 2010 a total capacity of 810 MW will be erected .

Germany
The German offshore plans are to develop more than 25.000 MW of offshore capacity This is the equivalent of 25 atomic nuclear reactors. In order to protect coastal conservation zones, many of these are set at distances of up to 60km from the shoreline in water depths of up to 35m. 15% of the country's electricity demand of 1998 could be satisfied this way.

Offshore Windfarms UK
The first round of offshore wind farm proposals involved 18 potential sites, each of $10km^2$ and accommodating a maximum of 30 turbines per site. Of these 11 have received the necessary consents with the rest still under consideration. This equates to a consented generation capacity of approximately 1.5GW from offshore wind in the first round. North Hoyle off the North Wales Coast and Scroby Sands (off Great Yarmouth) are operating since2004 .In the second round it is proposed to raise the power production from offshore wind up to 7 GW.



Green . IN OPERATION **Orange**: under development

As you can see on the map, the sites with the largest numbers of wind turbines are – or will be - located in the United Kingdom, Denmark and Germany. This leads to the conclusion, that employment in this sector will raise in all of the Countries with a costal shore line , but most in these three countries with high number of Offshore wind power. The estimated figures for new jobs for the offshore power production is 45000 jobs in Germany, 40000 in the UK and 20000 in Denmark.
It is obvious , that for this large number of new jobs, new qualification opportunities have to be created.

In the POWER project it became clear that the harmonization of training for the offshore wind industry is a bottleneck for future developments. To overcome that difficulty a consortium of training institutes joint forces:
Hochschule Bremerhaven, Gauss (Ges. f. Angewandten Umweltschutz u. Sicherheit im Seeverkehr mbH) , Wirtschaftsakademie Schleswig-Holstein, bfw, GLA,(all Germany), Northumberland College (UK), Delft University of Technology (NL), DHTC (NL) , Vest Akademi (DK). This consortium was headed by GLA Bremerhaven.

To analyze the training needs of companies in the offshore windenergy sector a Qualification Requirement Study was performed within the POWER project by Gerlinde Hammer and Rolf Röhrig at the “Institut Arbeit und Wirtschaft” of the University of Bremen.
We want to highlight here only some results (the complete study you will find on the POWER website):

Electrical Engineering

Overall, there are the following new **qualification requirements** in this field:

1. For engineers, **windenergy-specific knowledge** of offshore plants is a great advantage.
2. Technicians and electricians need for installation work involving high-voltage components a sound further education in **occupational safety**.
3. As almost all the components in wind power plants are traded on an international market, the use of the corresponding manuals requires knowledge of **technical English**.

Service, Maintanance , Repairs

1. Of course, **offshore training** is obligatory for every service technician.
2. Knowledge of **technical English** is vital due to extensive maintenance literature for individual components.
3. Lastly, a meshing together of the various vocational skills and knowledge into an independent **service qualification** is needed: mechanical engineering, electrical engineering, hydraulics, fibre composite technology – you must have a basic knowledge of these subjects.
4. **IT knowledge** for the operation of the condition monitoring system (CMS) is very useful for service technicians.

Technical English

The demand for technical English in the offshore windenergy sector was taken into account and a lecture series technical English was prepared and delieverd at the GLA Bremerhaven. The „Power Control of Wind Turbines“ is a series of lectures for the final year of the dual learning degree in Bremerhaven leading to „Technicians for electronics and operating technology with specialisation for wind power plants“. This is comparable to NVQ level III in the British system. Content of this course was to teach technical English.
This was partly done by English lectures and by lecturing a content related subject in English. For the content we choose the „Power Control of Wind turbines“. The exit test was a language test. This series of lectures will be used for similar courses in Europe to harmonise training in that subject area and the slides are available on the POWER website.

Safety training

Two of the above named institutes, Gauss and DHTC, are delivering maritime safety training also for the offshore wind energy sector. There is no standard for this kind of safety training in Europe yet and for example, people who received training in marine safety in france with this certificate will not be able to work in the UK. Therefore it is necessary to develop such a standard. The way forward to this standard was discussed and presented at the “Workshop: Harmonisation of Training for the Offshore Wind energy Industry” on 26 April 2007 in Bremen. The standard maritime safety training shall be part of the vocational and academic training possibilities for the offshore wind energy sector. A first trial was given at the **POWER Summer School in Bremen** in September 2006

Vocational training

At the non-university level post-secondary studies (technical/vocational type) there are only limited numbers of training initiatives in Europe for the wind energy sector. The content of these training units and the exit levels awards in the UK and Germany are compared.

Problem:

Employees in Europe have the right to be qualified as European skilled workers.

The academic communities have long been internationally organized whereas the vocational occupations are still nationally organized. This hampers the development of a European labour market. And sadly the European VET policy does not supply the legal and political framework. The qualifications of employees within the European labour market need to be defined.

Our Solution:

We did find a similar course to our “Technicians for electronics and operating technology with specialisation for wind power plants“. offered on a College level in the UK (Northumberland College). The grading of exit awards within the European vocational training market with a Chamber of Commerce Certificate and a duration of 36 month or longer is generally a grade 3 (comparable with National Vocational Qualification (NVQ) level 3 in the British system). The content of the British and German modules are given below. We tried to match the content of these courses as good as possible, given the legal framework.

Foundation Degrees

We also studied the advantage of the newly introduced foundation degrees for the wind sector and the transfer to the Power partner countries. Driven by the Bologna process the harmonisation of exit awards will lead to common structures for these training initiatives.

German Background

In relation to Europe and the world the Federal Republic of Germany in a realistic comparison has a low rate of first-year university students. While into comparable OECD countries the student rate per year is 40 per cent of a class, there is in Germany only approx. 30 per cent. That is not promising. A view into the future, the bare expectation of a future development must lead to an inevitable decrease of the absolute student numbers in view of the demographic change. That means competition around qualified specialists on all levels: Companies will be hard looking for a new generation of engineers specialists. The lack of these specialists will continue to limit our international competitive ability.

We would like to present a new programme to make it more attractive for young people to come to an engineering degree via the vocational pathway with a smooth transition of the first dual degree (Gesellenbrief) into a dual study route.

Concept

The dual professional training is a two-year programme, in which theoretical learning phases alternate with practical phases in the enterprises of the energy industry. The advantage of this training consists of the fact that systematic work experience is integrated into theoretical learning.
With this way of dual study the student acquires the employability as technicians with the end of the training. For the enterprises this offers a double advantage: The technicians are already trained for the special requirements, whereby they escape otherwise necessary longer training periods.

A high a number of graduates could be reached when pupils reaching their O-levels would be addressed in schools in Bremen and Bremerhaven

The following model connects the dual basic training with a Technical college training integrated into a bachelor degree. Since the training of the field Mechatronics requires at least O- Levels, the transition to the Technical college is not a problem. Graduates with A - levels could use directly the advantages of a dual study programme.

A condition for the admission into the Technical College for energy engineering is a work contract with an enterprise for energy and offshore wind energy industry. For apprentices, who did their training in such an enterprise, the continuation of the training might be unproblematic to the college, since they can remain usually in their enterprise and an appropriate contract received. Graduates of other enterprises would have to change the enterprise. Beside the graduates, who come directly from the basic vocational training, also ascent-willing skilled workers of the energy enterprises with appropriate training and work practice could be accepted to the dual course of studies.

In the context of the European comparability a Foundation Degree would be the exit award. In England in the academic year 2005/06 47000 students where assigned on Foundation Degrees It applies also here not to miss the development.

Bachelor Degree

After the successful completion of the Technical College it follows the entrance into a higher term of a Bachelors Degree. The location for the Bachelor Degree is at the University of Applied Sciences Bremerhaven.

Joint developments

Although the exit award for the initiative in discussion in Germany would be called "Techniker" we found a similar kind of training called "technical operation " in Denmark. Both are of a foundation degree level. A detailed description of the modules are given below. As the German modules are only in the planning phase, the whole program can be adopted to the already running Danish model.

It is planned between al three institutes to try to use the POWER PLUS project for the joint development of a foundation degree with the same modules in Germany , England and Denmark. One of the problems are the different entry requirements in such a programme. While in Germany and Denmark an A- level equivalent is necessary, in the UK an NVQ level III would be the entry requirement. Also German apprenticeships could go directly to a British University, while they have to do an extra study year after their dual degree in Germany to gain access to a German University. To deal with this injustice, a direct pathway to the university was developed.

For this new degree, a core module "Risk Assessment" was developed inclusive some teaching material. a reader, and an introductory lecture. This material was already tested in **the POWER summer school in September 2006.** It was decided, to develop this material , because for all the other units , off the shelf material exists.

Germany

Technicians for electronics and operating technology with specialisation for wind power plants

The career profile for technicians for electronics and operating technology makes high demands against training, which reflects itself in the definition of the conditions for entrance.

Apart from technical authority are health suitability as well as mobility readiness, flexibility and team ability substantial conditions. For an activity within the wind energy sector beyond that elevator fitness as well as neurovegetative and psychological fitness are indispensable. In addition English language abilities are necessary, since English develops increasingly as colloquial language in electro-technology and electronics as well as for the communication language of internationally set up enterprises.

Technicians for electronics and operating technology sketch plant development and extensions, organize the plant mechanism, supervise the work of service personnel and other trades, install wiring systems and power lines including general supply lines, supervise and maintain plants, accomplish regular examinations, analyse disturbances and set plants in conditions, work also with English-language documents and communicate in English language.

Their sphere of activity covers exemplary the assembly of systems and plants of the power supply technology, the measuring and automatic control, the communications, the drive as well as the lighting system. Technicians for electronics and operating technology exercise their activities considering of the relevant regulations and safety regulations independently and co-ordinate their work with pre and stored ranges, are thus involved in the development and/or conversion of complex solutions in the team. The qualifications are process-referred obtained and to promote independent planning, accomplishing and a controlling as well as the acting in the operational context. The training of the technicians for electronics and operating technology contains measures for sensitisation for ergonomic, economic, ecological and social aspects, in order to be able to realize the minimization of negative effects of the working process on the environment by usage of suitable materials, conscious acting and attention of regulations of environmental protection. Their operational area are e.g. energy distribution plants and wet, building installations and wet, equipment and operational equipment, production and process engineering plants, switching and control systems as well as electro technical equipment. In accordance with the regulation on the professional training in the industrialized electrician professions, conditions 06.06.03, (§ 6, Abs. 2) regulated possible adjustment of contents to current requirements is basis for the specification for the range wind energy, integrated into the training.

Possibilities of employment for technicians for electronics and operating technology are opened by this additional qualification for operating technology in wind energy enterprises. Specifications for the wind energy: sector. In accordance with the regulation on the professional training in the industrialized electrician professions, conditions 03.06.03, (§ 10,Abs. 2), a flexible adjustment of course contents is possible to new requirements, if it is ensured that the necessary qualifications are obtained. Specifications for an activity within the range of on and offshore wind energy plants can be integrated into the training. A working process orientation aligned to the wind energy industry is reached by a cooperative co-operation between vocational school and training enterprise. In coordination with the wind energy agency Bremerhaven/Bremen e.V. and the early integration from enterprises the wind energy industry is to be ensured.

Specialisation :Technician for Wind power plants

This specialisation contains the following modules:

IT Technology

GRP components plastics

Hydraulics

Industrial safety

Health protection

PLC

Customer orientation

Lifting technology

Condition monitoring

Wind turbine technology

The United Kingdom

ABC LEVEL 2 CERTIFICATE IN SUSTAINABLE ENERGY

Introduction

In its White Paper of 2003, the UK government acknowledged that over the next 20 years, the implications of reduced UK oil, gas and coal production, which will make the country a net importer of energy, must be addressed. It is envisaged in the report there will be a need for diversification of energy sources, suppliers and supply routes with renewables playing an important role. Across the UK as a whole, renewables account for about 3% of power supply. The government target for 2010 is for 10% of electricity to be from renewables and the aspiration for 2020 is for the figure to be 20%. Having an appropriately skilled workforce will be key to providing for future energy needs at a competitive price.

As a relatively new but expanding industry within the UK, the renewable energy sector suffers skills shortages that are already constraining growth. This is highly problematic for a sector that presents real commercial opportunities for individuals with a broad range of skills and qualifications. There is also an issue across the Energy sector of attracting young people into the sector. This may well relate to there being poor understanding of the career opportunities that the sector can offer and the sector being associated with unattractive working conditions. (East of England Skills for Energy Research Report prepared by IFF Research Ltd for DTI, LSC Norfolk, ECITB, Energy and Utility Skills and SEMTA, November 2004). This qualification aims to develop industry specific skills/knowledge and more generic transferable skills/knowledge to help build capacity to deliver the targets for growth in renewable energy as part of the government strategy for energy in the UK. It is also hoped that it will increase knowledge of employment opportunities in the renewable energy sector.

Aims

This qualification aims to:

- develop knowledge and skills related to the development of alternative sustainable, renewable energy in 2 pathways one concentrating on biomass fuels and the other harnessing wind power

- aid the development of a career structure in this new area of employment by providing a nationally recognised qualification.

- raise awareness of the whole sustainability agenda in relation to energy

- develop a working knowledge of the technology used in the production of energy from biomass fuels and wind power

- develop a responsible and informed approach to health and safety issues
- develop knowledge of supply chain management in the sustainable energy industries
- develop an understanding of the importance of establishing and maintaining productive working relationships internally and externally

Target Group

The proposed age range for this qualification is 16+. It is appropriate for those with little or no experience of working in the industry. It is also appropriate for those who have experience of working in the industry and who wish to formalise their experience with a recognised qualification.

Entry Requirements

Candidates should have successfully completed GCSE English and Maths or have experience of working in the renewable energy sector.

Mature students will access the programme by way of an interview.

Progression Opportunities

Candidates who successfully achieve this Level 2 programme could progress onto ABC's Level 3 Certificate in Sustainable Energy programmes or move to related engineering programmes or into employment. The suite of progression from level 2 to level 3 could enable access to related higher education programmes such as a Foundation Degree in Sustainable Energy

Qualification Structure

The ABC Level 2 Certificate in Sustainable Energy has been allocated **210** guided learning hours for completion. It is made up of the following units:

3 Mandatory Units

Unit 1 Safe Working Practices in the Renewables Industry (30glh) * Y/500/2128

Unit 2 Sustainability and the Renewables Industry (30glh) *D/500/2129

Unit 3 Contribute to Positive Working Relationship in the Renewables Industry (30glh) *R/500/2130

3 Option Units

Candidates will need to follow either

Option A The Wood Fuel Pathway

or

Option B Route The Wind Power Pathway

Option A Wood Fuel

Unit 4 Fuel Supply Technology – Biomass Fuel (60glh) *Y/500/2131

Unit 5 Converting Biomass Fuel to energy and power (30glh) *D/500/2132

Unit 6 Maintenance of Biomass Fuel Systems (30glh) *H/500/2133

Option B Wind Power

Unit 7 Fuel Supply Technology – Wind Fuel (30glh) *K/500/2134

Unit 8 Converting Wind to energy and power (60glh) *M/500/2135

Unit 9 Maintenance of Wind Fuel Systems (30glh) *T/500/2136

The LSC definition of ‘guided learning hours’ is “all times when a member of staff is present to give specific guidance towards the learning aim being studied on a programme. This includes lectures, tutorials, and supervised study in, for example, open learning centres and learning workshops. It also includes time spent by staff assessing learners’ achievements. It does not include time spent by staff in the day-to-day marking of assignments or homework where the learner is not present. It does not include hours where supervision or assistance is of a general nature and is not specific to the study of the learners”

Centres should bear this in mind when planning qualification delivery.

Qualification Delivery

Centres should adopt a delivery approach that supports both the vocational nature of the Level 2 qualification and the particular group of candidates. Units in the Level 2 Certificate in Sustainable Energy contain both practical learning outcomes and more theoretical knowledge requirements, so delivery should ensure appropriate association between theory and practice. The aims, aspirations and experience of the candidates should also be considered.

Delivery may be enhanced by:

- Liaising with employers with reference to delivery, work experience and/or resources
- Visits to appropriate places of interest
- The provision of information and guidance to candidates on the availability and type of employment the qualification may lead to and on the progression routes available for further education and training

The unit structure of the qualification will enable candidates to achieve accreditation for units successfully completed, if for some reason they are unable, or do not wish to achieve a full certificate.

It is hoped that opportunities provided by the specification will be fully used to introduce related and general/key skills studies.

Centres must ensure that adequate arrangements are in place for supporting candidates. This could be either through separate tutorial/assessment sessions or through the use of time within structured study sessions.

Level 3 Wind Turbine (Maxi systems)

Core units

1 Safe Working Practices

include 1st Aid

Legislation

Impact on environment

2 Sustainability

Environmental Protection

Introduction to Regenerative & non-regenerative energy

Maintain environmental audit

Application of Agenda 21 and energy initiatives

CO^2 Emissions

Kyoto Agreement

E commerce

3 Supply Chain

Customer care – communications

Service responsibilities and standards

Documentation

Logistics Site Operation

Site Security

Material tracking & identification

Management of inputs and outputs

4 Power Generation Technology Energy and partnerships

Power generation – Nominal output / actual output

Harnessing and Converting sustainable energy to electrical energy

Component parts of energy plants – Heat exchange

- Heat transfer

Function of main components

Materials used in manufacture of power units

Properties and characters of materials used in power generators

National Grid

Electro technology

Electronic data processes

Wind Turbine pathway

5 Erection, Installation, Commissioning

Site evaluation

Hooking & Strapping

Contract Lift Procedure

Method Statement

Erection of Tower

Installation of Nacelle

Rotor assembly

Installation of Rotor

Sign off installation for commissioning

Electrical connection

6 Turbine Technology

Mechanical engineering 1. Mechanics *

2. Mechanical Engineering I: Mechanics

2.1	Recognizing the basic mechanical laws and functioning of wind energy plants	• physical fundamental knowledge • German Industrial Standards for bolts and screws • Grades • Systems of power transmission • Acceleration and torque	Observation
2.2	Recognizing the construction and the functioning of the mechanical components of wind energy plants	• Main shaft of a WEP • Drive shafts (types) • Yaw mechanism • Braking systems • Types of gearing • Auxiliary air filter • Cooling systems (gear oil, generator, transformer)	Manufacturer's presentation
2.3	Assembling and de-assembling the components of a WEP	• Gears, drives and bearings • Alignment of the main shaft • Connecting flanges	Practical Exercises

2.4	Safe use of the customary special tools and pulling devices used in WEP	• oversized tools: torque wrenches, portable power generators	Practical Exercises
2.5	Assessing the wear condition of the mechanical components of WEPs and planning the repairs	• Inspection and servicing of gearing • typical wear and damage conditions • Assessing and managing damage	Damage photographs
2.6	Assessing functional disruptions and taking appropriate action	• Servicing (inspection) • Repair procedures • Shutting down operations of a WEP	
2.7	The correct use, control and correct disposal of lubricants	• Use of lubricants • Checking oil levels • Taking oil samples • Oil changes (main and yaw mechanism bearing) • specialized environmental protection aspects (use of lubricants and gear oils)	Practical Exercises
2.8	Recognizing the procedures for testing materials	• Materials testing	Examples
2.9	Recognizing corrosion conditions; eliminating corrosion	• protection against corrosion • Treating corroded metal material	Damage photographs Practical Exercises
2.10	Carrying out work safety and accident prevention measures in installation work	• Work safety aspects common to WEPs • Application of the appropriate personal safety equipment (PSE) • Safety distance from rotating components • mechanical locking	Practical Exercises

		mechanisms	

Mechanical engineering 2. Hydraulics * (* listed in Bremen Syllabus)

3. Mechanical Engineering II: Hydraulics

3.1	Recognizing units of pressure	• physical fundamental knowledge • hydrostatic pressure	
3.2	Reading and applying hydraulic plans	• Hydraulic schematic plans • Schematic symbols of hydraulic components	
3.3	Familiarity with the construction and functioning of hydraulic components	• Components (proportional valves, closure valves, pressure control valves, reduction valves, pressure valves) • Characteristics of hydraulic systems in comparison to pneumatic systems • hydraulic pressure transfer • hydraulic force transfer • hydraulic systems and components commonly encountered in WEPs • Braking systems (spring brakes, active brakes)	Practical Exercises
3.4	Using testing and measuring procedures	• Measuring and testing hydraulic systems (pressure gauge)	Practical Exercises
3.5	Systematic testing of control systems for malfunctioning	• Comparing measured values with target values	
3.6	Servicing hydraulic elements	• Locating and repairing leaks	Practical Exercises
3.7	Correct disposal of sealing material and hydraulic oils	• Specific environmental aspects of hydraulic oil	
3.8	Estimating the dangers of hydraulic forces	• Work safety and accident prevention in WEPs • Sources of danger in hydraulic systems • appropriate protection measures: safety glasses, determining under pressure	Practical Exercises

conditions in hydraulic systems

Aerodynamics

The Generator

Power Factor

Power Factor Connection

Controlling

Monitoring

7 Service and Maintenance

Electro technology – wiring diagrams

- testing procedures

Electronic data processing and transfer

Manufacturers Hand Book, Recommendations, Procedures

8 Customised Business Support and Training

Quality Management Systems

Guarantees and Technician support available

Monitoring Processes

Project Management

Economics

Technical drawings

Technical manuals

Service documentation

Foundation Degree Renewable Energy

(Specialisation in Offshore Wind farming)

Foundation Degrees

are innovative degrees, designed and delivered in partnership with employers to equip people with the relevant knowledge and skills for business.

For people already in work a Foundation Degree will give them the skills they need to develop, and for those choosing a full time degree, this is the perfect kick start to a career. Whatever they choose, they will be developing understanding, skill and knowledge that's highly valued in business.

Foundation Degrees are innovative degrees that are designed and delivered in partnership with employers to equip people with the relevant knowledge and skills for business.

Taking on a Foundation Degree graduate means choosing someone prepared for the world of work, able to apply their skills immediately in your business or organisation. For your current employees, Foundation Degrees offer relevant, valuable professional learning and development opportunities.

Employers can even help design their own Foundation Degrees, tailored to their organisation and the needs of their business and staff.

Foundation Degrees are a response to the need for high quality, Higher Education level qualifications that balance academic understanding with vocational experience and career relevance. The concept of the foundation degree is based on work-based-learning ideas.

What is work-based learning?

Work-based learning is the term being used to describe a class of university programmes that bring together universities and work organizations to create new learning opportunities in workplaces. Such programmes meet the needs of learners, contribute to the longer-term development of the organization and are formally accredited as university courses. There is a wide Variation in the mix of elements they include, ranging from little more than a lightly tailored Version of an existing course delivered in the workplace with some work-related assessment activities to programmes which focus more closely on the needs of learning in work. At the more interesting end of the spectrum are those programmes which depart substantially from the disciplinary framework of university study and which develop new pedagogies for learning. It is on these that this book focuses. This is not to suggest that hybrids of work-based learning and conventional study are not possible or appropriate in some circumstances, but before developing them it is necessary to understand the varieties, which can be crossed to form the new hybrids.

Work-based learning programmes typically share the following six characteristics. First, a partnership between an external organization and an educational Institution is specifically established to foster learning. This organization may be in the private, public or community sector of the economy.

Partnerships are required to enable infrastructure to support learning to be established. If learning is to occur in the workplace, then it is necessary to ensure that the conditions which prevail there are suitable and that learning projects are undertaken in cooperation with the given needs of a workplace. It would be a very demanding process to establish afresh for any given learner if a relationship did not already exist between the educational institution and the employer. While independent study courses in which students design their own courses have been available for many years, they are oriented to students who already possess relatively sophisticated learning skills and who are self-starters. Work-based learning requires more formal arrangements, which are overseen by the establishment of partnerships. These partnerships are of benefit to both parties. For the employer they create an ongoing relationship with an educational institution that comes to understand the needs of the organization and provide a flexible approach to the learning needs of employees and the organization itself. For the educational institution they create links with new areas of educational need and diversify their sources of income.

Work-based learning partnerships consist of formal arrangements between educational institutions and other organizations. These take a variety of forms, but often they consist of a contractual arrangement or memorandum of agreement in which the responsibilities of each partner are identified. Typically, they will cover matters such as how many students might be catered for, over how many years, what support for learners will be provided within the organization, how work-based learning links to corporate capabilities and so on.

Foundation Degree Renewable Energy (specialisation in Offshore Wind farming), GLA Bremerhaven , Germany

Renewable energy is produced from sources that are replenished as they are used, such as the wind, water flowing in streams, rivers and seas, the sun and sustainable grown crops. In order to harness these sources and reduce our dependency on finite reserves of oil, coal and gas, renewable energy professionals need to understand the scientific principles of renewable energy technology and have the management skills to ensure that German and international carbon emission reduction targets are met. They must also understand the effect of human activities on the environment and the socio-economic and business issues influencing delivery of the technology.

Resources for the programme include a newly equipped Renewable Energy Laboratory, field stations, and state-of-the-art IT equipment. Local commercial renewables developments are plentiful. **Key features of this programme**

• Renewable energy at degree level is a broad, multidisciplinary subject drawing upon the natural, physical sciences that shape our environment and the human and life sciences that influence the way we live in it.

• It provides a broad-based training appropriate for students who wish to maximise their employment potential as energy professionals.

• Bremen/Bremerhaven has significant and diverse renewable energy resources and has led the nation in the development and exploitation of wind power. The degree has very close contacts with renewable energy businesses in northern Germany.

Year One

Students will develop their IT and mathematical skills and study the diverse range of renewable energy sources, their extents and exploitation methods in detail. In the second semester they will study the physical and engineering sciences governing both natural processes and power conversion technology.

Year Two

Core modules strike a balance between those, which provide a more in-depth training in the physical sciences and technology, and those, which address economic, legal and management issues.

Learning and Teaching

All students have a personal tutor who is available for advice and support throughout their studies. Our teaching is carried out through a number of methods including lectures supported by the latest audio-visual technology, seminars and tutorials, laboratory work, field courses, industry tours and projects.

Larger scale practical exercises are undertaken at our field station, which hosts a small wind generator.

Programme structure Year 1	Year 2	
Communications & IT Foundation Mathematics Risk Assessment (with focus on Offshore Wind farming) Environmental Awareness in Offshore regions Alternative Energy Sources Electrical & Electronic Principles Active electronic control elements (of Wind turbines) Mathematics Engineering Mechanics	Fluid Mechanics Mathematics Environmental Management Project Management Mechanics of Materials The Energy Market and Energy Policy Energy Management Electrical & Microprocessor Engineering Environmental Assessment & Monitoring Applied Thermodynamics Energy Policy Project Summer work placement	

Workshop:
Harmonisation of Training for the Offshore Wind Energy Industry

- **AP Degree Programme in Technical Offshore Operation**
- **West Akademy, Esbjerg, Denmark**

AIM OF PROGRAMME
It is the aim of the technical offshore programme to provide the student with the tools necessary to independently analyse, plan and implement tasks pertaining to operation and maintenance of complex machine technical plants with all kinds of industrial and offshore organizations nationally and internationally.

The student is trained to:

1. Combine knowledge of machine, energy and process technical plants with knowledge of organization, economics, quality and environmental matters.
2. Work with machine technical problems within offshore and industry.
3. Participate in management and cooperation with other professions and cultures.

DURATION AND CONTENTS OF COURSE
The duration of the course is 2 years. These include 4 terms totalling 120 ETCS points.

During the first 3 terms the following subjects are taught:
General
Company 1
Automation and process analysis
Electric technology 1
Machine technology

General trains the student theoretically and practically to solve technical and documentation tasks within operation and maintenance. Moreover the students' personal competences and knowledge of natural science, information technology are enhanced.

Company 1 qualifies the student to analyse and evaluate organizational as well as quality and work environmental problems.

Automation and process analysis trains the student in analysing and evaluating potential solutions for optimizing and developing automatic units and plants.

Electric technology 1 trains to student in analysing electro technical problems and set up possible solutions.

Machine technology 1 trains the student in planning and managing operation and maintenance of technical plants in the best possible way with a minimum of damage to the environment.

The 4th term includes preparation of thesis and a concluding exam project.

The thesis is to provide the student with the possibility of obtaining theoretical and practical competences through specialization and putting into perspective subjects relating to machine, energy and process technical plants within offshore or industry.

Workshop:
Harmonisation of Training for the Offshore Wind Energy Industry

The thesis can be prepared in cooperation with a domestic or a foreign firm. The period during which the thesis is prepared consists of modules. The subject of the thesis is prepared in cooperation with a company.

Example of modules offered:
- Maintenance, Basis offshore, Environmental technique or Work environment offshore. During the concluding exam project, the student is to demonstrate his skills in analytically and methodically processing a complex and realistic issue relating to a defined problem.
The student is to pass the concluding exam project within issues which are pivotal to the course. The thesis should be included. The project can be implemented in cooperation with a domestic or foreign company.