



The European offshore wind industry 2010

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- 2010 annual offshore wind power market
- 1991 2010 cumulative offshore wind power market
- Market outlook: 2011 and beyond
- Main trends 1991 2010
- Financing highlights and developments
- Industry highlights and developments
- Offshore grid developments



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2010 Annual offshore wind power market

- 308 new offshore wind turbines installed and connected
- 883 MW in total increased by 51% on the previous year
- During 2010, work was carried on 18 offshore wind farms among which
 - Eight wind farms were fully completed and grid connected
 - One wind farm partially completed and grid connected
 - One wind farm completed but not grid connected



INSTALLED CAPACITY: SHARE OF 2010 INSTALLATIONS (MW) BY COUNTRY





WT MANUFACTURERS: SHARE OF 2010 INSTALLATIONS (MW)





DEVELOPERS: SHARE OF 2010 OFFSHORE MARKET IN MW





FOUNDATION TYPE IN 2010 OFFSHORE WIND FARMS





AVERAGE WATER DEPTH AND DISTANCE TO SHORE - 2010



- Average water depth: 17.4 m in 2010
- Average distance to shore: 27.1km



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Cumulative Market

- 1,136 turbines installed and grid connected
- 2,946 MW in total
- 45 wind farms in nine European countries
- Produces 11.5 TWh of electricity in a normal year
- Average wind turbine size 3.2 MW



CUMULATIVE AND ANNUAL OFFSHORE WIND INSTALLATIONS (MW)





INSTALLED CAPACITY: CUMULATIVE SHARE BY COUNTRY AT END 2010 (MW)





WT MANUFACTURERS: CUMULATIVE MARKET SHARE IN MW - END 2010





OWNERS / DEVELOPERS: CUMULATIVE MARKET SHARE IN MW - END 2010





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Market outlook: 2011 and beyond

- EWEA forecasts that between 1,000 and 1,500 MW of new offshore wind capacity will be fully grid connected in Europe during 2011
- 10 wind farms, totalling 3,000 MW, are currently under construction. When completed, Europe's installed offshore capacity will increase to 6,200 MW
- 19,000 MW are currently fully consented
- 150,000 MW announced projects



SHARE OF CONSENTED OFFSHORE CAPACITY BY COUNTRY (MW)





AVERAGE WIND FARM SIZE (IN MW)



The average offshore wind farm size in 2010 was 155.3 MW, up from 72.1 MW the previous year



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Trends: water depth and distance to shore

- Average water depth in 2010 was 17.4m, a 5.2m increase on 2009, with projects under construction in water depth averaging 25.5m
- Average distance to shore increased in 2010 by 12.7 km to 27.1 km substantially less, however, than the 35.7 km average for projects currently under construction





Depth



- 2010 annual offshore wind power market
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Financing highlights and developments

- Two major deals came to financial close, using turbines of 5MW or more
- Arrival of new financial investors pension funds into the sector
- Flow of investments from utilities which have continued to increase their balance sheet commitments
- National and international finance institutions such as the EIB and export credit agencies provided critical liquidity at low cost



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Industry highlights and developments

- In 2010, 29 new offshore turbine models were announced by 21 manufacturers – record year
- 44 new turbine models have been announced by 33 manufacturers over the last two years
- European manufacturers are developing 6 and 7 MW prototypes, including dedicated offshore concepts
- Foreign companies are mainly developing 5MW turbines







Future technology developments and research projects (1)

- In the future, larger turbines will enter the European market:
 - 7 MW (Vestas)
 - 10 MW concepts (Clipper, Sway, AMSC SeaTitan, WindPower Limited) - push through NER300 call
 - Results from the Upwind project (20MW)
- The move towards larger and more efficient turbines should be supported by the development of testing facilities, assessing reliability
- This is a crucial point for lowering the risks of offshore financing and investment



Examples of developments over 2010

- In the UK, four demonstration areas were awarded. A competition on offshore transfer technologies was launched and seven foundation designs were shortlisted
- In DK, Lindoe shipyard should host component manufacturers and a large test bench for drive trains (10-12MW range)
- In DE, the research at Alpha Ventus test site demonstrates 5MW turbines on different types of substructures
- In NO, licenses provided to perform floating turbine tests (20MW test infrastructure established)
- In the NL, the FLOW programme received funding



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Offshore grid developments

- The future of the offshore grid was put at the centre of EU energy policy:
 - Signing of the Memorandum of Understanding by the North Seas Countries' Offshore Grid Initiative
 - Communication on energy infrastructure
- Significant steps were taken on planning, financing and constructing offshore cables



Thank you very much for your attention



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The state of the offshore wind industry

Lessons Learnt in the First Decade

Frank Wiersma, Anthony Crockford, Jean Grassin, Anna Ritzen, Thomas Winkel

Powercluster Conference, Bremerhaven, 1 June 2011

The Interreg IVB North Sea Region Programme

A SUSTAINABLE ENERGY SUPPLY FOR EVERYONE

Outline

The state of offshore wind industry

Situation

- Lessons learnt offshore wind projects
- Growing supply chain

Opportunities

- Economic value added
- Employment effects

Enablers

- Effective stakeholder engagement
- Stable drivers









ECO**FYS**

Situation

- Lessons learnt
- Supply chain

Opportunities

- Value added
- Employment

Enablers

- Stakeholders
- Drivers



Lessons learnt offshore wind projects

Situation

Lessons learnt

Supply chain

Opportunities

- Value added
- Employment

Enablers

- Stakeholders
- Drivers

- 12 Case studies, pointing to:
- Relevance pro-active approach Governments
- Key role experience and technology risks



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Growing supply chain

Situation

Lessons learnt

Supply chain

Opportunities

- Value added
- Employment

- Stakeholders
- Drivers

- Rapid growth, large investments
- Incumbents and new entrants
- Reliability essential for feasibility and financing



Situation

- Lessons learnt
- Supply chain

Opportunities

- Value added
- Employment

- Stakeholders
- Drivers



Economic opportunities

Situation

- Lessons learnt
- Supply chain

Opportunities

- Value added
- Employment

- Stakeholders
- Drivers

- Opportunities increasingly acknowledged
- Examples successful investments both private and public
 - Early mover advantage



Employment effects

Situation

Lessons learnt

Supply chain

Opportunities

- Value added
- Employment

- Stakeholders
- Drivers

- Scarcity qualified and experienced staff
- Focus on education and training
- International business and competing regions



Situation

- Lessons learnt
- Supply chain

Opportunities

- Value added
- Employment

- Stakeholders
- Drivers



Effective stakeholder engagement

Situation

Lessons learnt

Supply chain

Opportunities

- Value added
- Employment

Enablers

- **Stakeholders**
- Drivers

- Clear permitting process essential
- Scope for optimisation
 - Aligning
 - Streamlining

UK	DK	NL	BE	DE	NO	SE
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National authority

ECOFYS

Local authority





Stable drivers

Situation

- Lessons learnt
- Supply chain

Opportunities

- Value added
- Employment

Enablers

- Stakeholders
- Drivers

- Governments
 - EU 2020 target
 - National policies and support schemes

- Financing
 - Access to funds
 - Mature risk return profile key





- Challenges sector
 - Efficient project delivery
 - Proven track record incl. new technologies



The Interreg IVB North Sea Region

Program

ECO**FYS**





Conclusions

The state of the offshore wind industry

Situation

- Lessons learnt
- Supply chain

Opportunities

- Value added
- Employment

Enablers

- Stakeholders
- Drivers

Essential ingredients for future:

- Confidence policy outlook
- Reliable technologies and track record
- Experience and lessons learnt





Get your copy! The state of the offshore wind industry



or Download from

www.ecofys.com/com/publications/offshorewindreport.htm



for more information W: www.ecofys.com contact Frank Wiersma

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Raising Social Acceptance Offshore Wind Energy



By Andreas Wagner

CEO, German Offshore Wind Energy Foundation

Partners:

- University of Oldenburg, Germany
- German Offshore Wind Energy Foundation, Germany (Stiftung OFFSHORE-WINDENERGIE)
- Ministry of Science, Economic Affairs and Transport of Land Schleswig-Holstein, Germany
- The Senator for Environment, Construction, Transport and European Affairs of the Free Hanseatic City of Bremen, DE
- Greater Stavanger Economic Development, Norway
- Municipality of Öckerö, Sweden
- Technical University Delft, The Netherlands
- South Denmark European Office, Denmark (Work Package Responsible)





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Background



The EU directive on renewable energy sets ambitious targets for all Member States, such that the EU will reach a 20% share of energy from renewable sources by 2020.

The National targets of North Sea Countries for offshore wind energy have been set accordingly, exceeding **35 GW by 2020** compared to **2,9 GW installed capacity in 2010**.

Lack of social acceptance can present a serious challenge to such a massive expansion of offshore wind energy in the North Sea Region.

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Point of departure



- Offshore wind energy generally has a good public reception,
- However, a massive expansion of OWE calls for:
 - Provision of information to the public about pros and cons,
 - Intensified dialogue between key stakeholders to raise social acceptance.

POWER cluster has addressed this by a series of awareness raising activities targeted at:

- The general public,
- Politicians and public authorities,
- Industry and Business representatives.



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Main activities



During the POWER cluster project the following activities have been carried out under the following headlines:

- Bringing together offshore wind energy communities,
- Enhancing cooperative structures between Offshore Wind Energy test centres,
- Developing a "Joint online information site" as part of project website,
- Launching an **Offshore Wind Energy information** campaign (offshore exhibition).

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Some achievements include

- Social acceptance study for Öckerö Municipality completed,
- Offshore wind farm WebSDSS training tool developed,
- Two offshore wind energy exhibition concepts developed,
- 65.000 visitors attracted to the "Fascination Offshore" exhibition,
- 26 panel debates for local decision makers and press conferences organised as side event to the "Fascination Offshore" exhibition,
- Study visits organised Norway to Germany and Sweden to UK,
- Offshore wind regions round table event co-organised for 70+ regional representatives during Open Days 2010,
- 50+ delegates at German offshore wind energy mayors conference,
- Participation, presentations and events at EWEA, EOW,
 Husum WindEnergy, All-Energy, WAB-conference, etc.



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Some Highlights



- **1. Offshore wind energy exhibition, "Fascination Offshore"** touring along the North Sea and Baltic Sea cost,
- 2. German Offshore Wind Mayors Conference Bremerhaven, 11-12 April 2011,

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3. WebSDSS training tool to display maps reflecting your preferences on where offshore wind farms should be built.









Raising Acceptance for Offshore Wind Energy - Touring Exhibition -

Presented by:

Stiftung OFFSHORE WINDENERGIE



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FASCINATION OFFSHORE – Starting Point

- Lack of public acceptance can be a major obstacle for the expansion of OWE,
- Providing information to the general public is crucial for success,
- Create a new information concept about OWE,
- Reaching out to as many as possible.







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FASCINATION OFFSHORE – Objectives

- Bringing basic information on OWE to the general public,
- <u>Target groups</u>:
 - Tourists and locals,
 - Media, schools and decision makers,
 - General public
- Enhance cooperative structures between wind energy networks and stakeholders, tourist agencies,
- Link to events taking place along the coast, e.g. harbour festivals, etc.





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FASCINATION OFFSHORE – Concept

Interactive concept: Entrance, Information Area, Movie section (AV-shows), Touch&Feel Area, Meet&Greet Area, Feedback Area

Topics covered:

- Why Offshore Wind Climate Change & Renewables,
- Technology and Development of OWE,
- Infrastructure and Grid Integration,
- Economic aspects,
- German test site "alpha ventus".

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FASCINATION OFFSHORE – Achievements

More than 65.000 visitors attracted (on board and onshore), •

nologie, die bereits erfolgreich in

Hong Kong angewendet wird, kön-

nen die Schallwellen weitreichend

abgemildert werden. Doch diese

Technologie ist aufwändig und teu-

- 26 side events, press conferences and panel debates organised,
- 26 press releases and more than 120 articles published

Wochenendausgabe, 3/4. Juli 2010 11 STRALSUND UND UMGEBUNG Zukunftstechnologie Windkraft

An Bord des Museumsschiffer "Greundiek" können sich Besucher

bei freiem Eintritt bis Sonntag eine Meinung über die regenerative

Stromerzeugung per Windkraft auf dem Meer bilden und selber einschätzen, ob die Vision des Landesvaters

Wie bei allen neuen Technologien

realistisch ist.

"Faszination Offshore" - noch bis Sonntag ist unter diesem Motto im Hafen, an der Steinernen Fischbrücke, eine Wanderausstellung zu sehen. Der Eintritt ist frei.

Von CHRISTIAN RÖDEL

ΟZ

Straisund, "In zehn Jahren werden wir mit grünem Strom unseren gesamten Energiebedarf decken und einen Teil davon vielleicht sogar bis Blick in die Zukunft.

nach Bayern exportieren*, wagte Mi-nisterpräsident Erwin Sellering gesgibt es auch beim Thema Offshore Refürworter und Germer Der aktueltern zur Eröffnung der Wanderausstellung "Faszination Offshore" an der Steinernen Fischbrücke einen

le Bau des ersten Offshore-Windener-

sich für den Schutz aller Meeresbeempfindlich ist.

den von Rammarbeiten produzierten "Unterwasserlärm" so irritiert werden, dass sie sich verirren und im schlimmsten Fall wegen Nahrungs-Fotos: C. Rö. ne sogenannte Blasenschleier-Tech- schützers zu neutralisieren. Bevor gende berufliche Perspektive haben.

ein neues Windkraft-Anlagenpr jekt geplant und realisiert wird, stehen Aspekte des Naturschutzes immer ganz oben auf der Agenda, versi-

Wir müssen Kompromis damit alle zu ihrem Recht kommen meinte Ministerpräsident Sellering salomonisch. Für die maritime Wirtschaft sei die Offshore-Windenergienutzung eine Zukunftstechnologie in der hoch gualifizierte und sehr gut bezahlte Fachkräfte eine hervorraVisitor opinion polls indicate that exhibition has contributed to a more positive view on **OWE!**



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rgiezukunf

Ministerpräsident Erwin Sellering lässt sich von Andreas Wagner, Chef der Stif- mangel verhungern können. Über ei- müht, die Bedenken des Meerestung Offshore-Windenergie, durch die Ausstellung führen.

gieparks _EnBW Baltic 1* mit Windrädern in der Ostsee nördlich vor der Halbinsel Fischland-DarB-Zingst ist ein Prestigeobjekt des Landes und soll bereits ab Oktober sauberen Strom für etwa 50 000 Haushalte liefern. Kein Gegner, aber ein kritischer Beobachter dieser Entwicklung ist Ozeaneumschef Harald Benke, der Das Museumsschiff Greundiek, auf dem sich unter Deck die Wanderausstellung befindet, liegt bis Sonntag an der Steinernen Fischbrücke. Der Eintritt ist frei.

wohner insbesondere für die Schweinswale in der Ostsee engagiert. Das Rammen zur Vorbereitung der Fundamente für die Windkraftanlagen sieht er sehr kritisch, weil das Gehör der Schweinswale, die sich über Echoortung orientieren, sehr Die Meeressäuger können durch

Für Harald Benke sind in dieser Frage Kostengründe kein Argument, das Leben der Meeresbewohner zu gefährden. Andreas Wagner, Geschäftsführer der Stiftung Offshore-Windenergie, war sehr be-





"Offshore Wind Energy -Prospects and opportunities for local communities and municipal utilities"

Bremerhaven, 11/12 April 2011





European Union The European Regional Development Fund

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German OWE Mayors Conference – Starting Point

- Local and regional authorities are beginning to recognise OWEs huge potential,
- Some have started investment activities,
- Local utilities are becoming important players/investors for OWP
- 11 April 2011; Bremerhaven Senator Günthner highlighted plans/ achievements and potential of OWE in Bremerhaven







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German OWE Mayors Conference – Objective

- Overview of OWE and energy policy in Germany (post-Fukushima),
- High-light opportunities for local communities and municipal utilities,
- Presented and discussed OWE investment opportunities and shareholder concepts,
- Explored ways to establish local and regional partnerships for OWE projects.

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he European Regional Development

European Union







German OWE Mayors Conference

- High level speakers from
 - Federal Ministry of Environment (Mr. Rid),
 - Senator for the Environment of Bremen (Mr. Loske)
 - Utilities and Business Promotion Organisations
- 50+ participants from local authorities, (municipal) utilities, politics, consultants, lawyers, ports, wind energy companies,

Main conclusions:

- local authorities' growing interest, especially along the coastline ('offshore ports')
- Still some reluctance from municipal utilities, due to:
 Financial risks & challenges, grid connection issues





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Offshore wind farm WebSDSS tool











Web-based OWF site selection tool

• Maritime spatial decision situations are considered as being complex per se.

Objective:

• Develop a user-friendly software solution for (simple) OWF site finding using a standard browser.

Target groups:

- Decision makers and stakeholders,
- The public in general,
- Students.

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Web-based OWF site selection tool – Key elements

- Decision tree tool –
 You create your own decision tree!
- Preference table tool –
 You set your unique preferences with respect to the relative importance of criteria!
- Result map viewer Displays the result map reflecting the users unique preference for siting of offshore wind farms.

The tool will be **launched on June 24** in **Oldenburg,** Germany, at a side event of the Fascination Offshore exhibition.





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Interreg IVB North Sea Programme

POWER Cluster

John Best Chief Executive Officer East of England Energy Group

1 June 2011









Business Work Package

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This presentation concentrates on two key highlights but other achievements include:

- 6 business networking events organised resulting in more than 2300 new contacts and the award of new contracts.
- A Project Development Facility created to guide organisations through the European funding process.



POWER cluster Mapergy: Putting your company on the map





The European Regional Development Fund

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About POWER cluster Mapergy



- Prior to POWER cluster Mapergy there was no single European platform for the supply chain
- The Offshore Wind cluster map shows the locations of companies involved in the offshore wind sector.
- Each company is classified under a common methodology devised by Douglas Westwood in 2009.
- Publically available information on each company is provided to promote European networking
- Launched with 500 companies there are now more than 700, an increase of more than 40%

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The Cluster mapping process





www.power-cluster.net

Main cluster mapping screen





www.power-cluster.net

Search facility by role or category



www.power-cluster.net



Quick locater for Regional clusters





www.power-cluster.net
Company Information





www.power-cluster.net

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Are you on the Map?





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Transnational Study



Overcoming challenges from the offshore wind industry and learning from the oil and gas industry



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for offshore wind energy

Background to the Study



The study was conducted by Natural Power and focused on two key areas:

Challenges facing the offshore wind industry.
 What can be learned from the oil and gas industry.



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Context



Offshore wind energy must be considered in the context of the EU's wider energy policy, which has two principle objectives:

Ensuring security of energy supplies
Reducing greenhouse gas emissions

Offshore wind energy is one possible way of helping to achieve the objectives.



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Offshore wind must be competitive



- Offshore wind farms are only one of many possible methods of achieving policy objectives.
- Offshore wind farms have the potential to generate a significant proportion of the EU's energy.
- Power generated from offshore wind has no automatic right to be part of the EU's future energy mix.



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The challenge of reducing the cost of offshore wind



To make wind farms viable without support by:

- Adopting offshore methods, practices and procedures developed in the offshore oil and gas industry - particularly during installation
- Locating wind farms in areas of high average wind speed
- Designing turbines with low cut-in and high cut-out wind speeds
- Using geographic diversity
- Developing an interconnecting grid to reduce the periods when no wind energy is available
- The natural upward pressure on global energy prices, will make offshore wind more competitive.



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The offshore oil and gas industry can help



- Many of the engineering and operational principles which the offshore wind industry takes for granted have been developed in the oil and gas industry.
- There are key areas for the both offshore industries to collaborate.
- However, the oil and gas industry will also compete with the offshore wind industry for resources, especially in the period 2015 to 2020.



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Learning from the oil and gas industry



- Many oil and gas companies have transferred their operation and maintenance of offshore facilities to service companies via competitive tender.
- This has reduced their in-house engineering expertise, and their ability to control the technology, equipment and procedures. This was highlighted in the recent oil BP spill disaster.
- This strategy reduces cost but leads to situations where a company has liability but little control.
- Unfortunately some owners of wind farms are taking the same approach. This is a high risk strategy given the immaturity of the offshore wind industry.



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Learning from the oil and gas industry \neg

- POWER
- Major oil and gas companies have taken a collaborative approach to offshore technology. Rather than competing they have worked together to approach problems of working in the North Sea. This is particularly apparent in relation to safety systems.
- Conversely the offshore wind industry is still dominated by wind turbine manufacturers who tend to be secretive and unwilling to share their experience in installing and operating offshore wind turbines. A more open approach may help reduce risks and the perception of risk from an investor's point of view.



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Further information



Direct link to POWER cluster Mapergy: <u>mapping.power-cluster.net</u>

Or access via a link on the POWER cluster website: www.power-cluster.net

Transnational Study available through the POWER cluster website.





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John Best CEO – EEEGR Tel: 01493 445535 Email: jb@eeegr.com W: www.eeegr.com





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Life long learning in off-shore wind

Gerard van Bussel, Stefan Jung, Kersti Karltorp, Moses Kärn and many others

Needs of personnel and education

Training of technicians







Rationale: In a construction of the second s



Need for competences

- Large demand for engineers (all levels):
 - Turbines
 - Foundations
 - Meteorology
 - Grid
 - O&M

Competences:

- Disciplinary: mechanical, electrical, civil, physics etc
- Integrated: project management, group work etc

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Health and Safety

16

Life long learning in off-shore wind

20





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Elements in life long learning

Training of Technicians

- Skills qualification
- Short training modules
- Safety centre

University education

Bachelor and Master modules

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Inspiring the youth Co-presenter: Moses Kärn

Rise awareness among teachers and pupils

Life long learning in off-shore wind

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+ POWER * * * cluster www.power-cluster.net

Co-presenter: Stephan Jung

Co-presenter: Kersti Karltorp

Training of technicians

"We are apprentices of electronics technician for industrial engineering"

- What are the opportunities?
- Where and what can I study?

At start of the Power projects:

- There are <u>no initial</u> vocational training programmes
- There are <u>not enough</u> apprentice positions in wind industry
- Not enough teaching workshops in wind industry

Sarah Schwarting (21) Tino Reinhardt (24)

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Life long learning in off-shore wind

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Traini Three	ng en	of techn tries to in	iciar dust	IS: ry		
Initial training		 entry level: I recognized s specialization 	high sch tandard h in wind	ool profession d energy	 Berufliche Bremerha 	e Bildung aven (BBB)
Certified further training		 entry level: a electrician BZEE-standa for service a 	mechani Ird nd manu	 WAK Husum bfw, Bremen Northumberland Coll. Chalmers University 		
Certified Engineer fo Renewable Energy	or è	 entry level: 2 professional introduction engineering 	2 years experier to scien	 BST, Bremerhaven → national approach: curriculum ready but not in operation 		
Age	10	Life long lear 16	ning in 18	off-shore 20	wind 30	50

Training of technicians: Recommendations

- Industry should increase training capacities
- Education centres and industry should agree on standards
- Industry: share more technologies to optimize education
- Development of "dual education system": combined apprenticeship and university education





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Development part-time education

Life long learning in off-shore wind

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University education

" I want to become an offshore wind energy engineer"

- What are the demands for engineering competences?
- What are the opportunities?
- Where and what can I study?

At start of the Power projects:

Some programmes in "wind" or "offshore wind energy"

16

Difficulties in identifying and understanding different character

Life long learning in off-shore wind

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University education

Needed BSc and MSc engineering competences

Disciplinary: mechanical, electrical, civil, physics
Integrated: electrical and mechanical engineering, project management, health and safety, maintenance

Number of engineers needed until 2020

- 7 000 additional engineers at turbine manufacturers
- 2 000 additional engineers at utilities
- ~10 000 in other areas

50

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Life long learning in off-shore wind

e 10

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University education Three career paths:

 Many disciplines integrated Dedicated University of Broad scope of knowledge and programme **Applied Science** methods **Bremerhaven** Target: "systems engineer" **Specialisation** Chalmers University Focused; deep scope of in a knowledge and methods TU Delft, DTU "classical" Aalborg University Specialisation in one discipline programme Target: specalist for R&D Univ. of Oldenburg part-time Continuing Univ. of Oldenburg interdisciplinary studies Target: systematic know-how programme for professionals Life long learning in off-shore wind

10 16 18

50

University education Recommendations:

- Ramp up MSc programmes in Wind Energy
 - Number of researchers/teachers has to expand
 - Initiate international and cooperative programmes
 - Join forces to cover multi-disciplinary field of offshore wind energy
- Wind Energy Modules in established MSc programmes

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- Expand courses for professionals
 - Organise opportunities to develop both deep and integrative competences by offering programmes for professionals

Life long learning in off-shore wind









Inspiring the youth

" Wow, wind energy is cool!"

I like to know more about it."

At start of the Power projects:

- "Energy" is often not a subject in school
- Teachers don't know enough to develop lessons

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- No standard textbooks about wind energy
- Pupils have biased or fragmented knowledge of wind energy
- Lack of interest from young students



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Inspiring the Youth Three steps:

Research and interviews		 pupils' and teachers' views on wind energy identify topics for curriculae need for teacher training 			 Univ. of Appl. Sc. BHV Univ. of Oldenburg WAK, Husum 				
Teacher trainings		 teacher sets teaching material projects with schools 			 Univ. of Appl. Sc. BHV Univ. of Oldenburg Chalmers University 				
Activities with pupils	5	 construction of wind energy turbine and anemometer internships information days 			 Univ. of Appl. Sc. BHV Univ. of Oldenburg Chalmers University 				
Life long learning in off-shore wind									
Age	10	16	18	20	30	50			

POWER

Inspiring the youth Recommendations:

- Rise the awareness of renewable energies
- Establish "energy education" in schools
- Increase teacher trainings in the field of on- and offshore wind energy
- Extend the cooperation between schools, universities and companies
 - provide more internship places for students
- Promote on/offshore wind energy as attractive profession





Life long learning in off-shore wind

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Conclusions

- Wind energy needs promotion as attractive professional area
- More and more intensive Wind Energy educational programmes/courses needed on all levels

Recommendations

- Increase training capacities
- Agree upon one common education standard
- Industry: share more technologies to optimize education
- Development of part-time education and dual education
- Expand courses for professionals
- Ramp up MSc programmes in Wind Energy

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Initiate international and cooperative programmes

Life long learning in off-shore wind