Workers wanted:
The EU wind energy sector skills gap

August 2013

European Wind Energy Technology Platform

European Wind Energy Technology Platform

Workers wanted: The EU wind energy sector skills gap

Author: Oscar Fitch-Roy (GL Garrad Hassan)

Contributing Authors: Carlos Albero, Sarah Barber, Beckie Hill, Paul Gardner, Joseph Phillips (GL Garrad Hassan)
Filippo Gagliardi (European Wind Energy Association, EWEA)
Peter Hjuler (DTU Wind)

Coordination: Filippo Gagliardi (EWEA)

Revision and editing: Sarah Azau, Zoë Casey, Filippo Gagliardi, Angeliki Koulouri, Jacopo Moccia, Julian Scola, Justin Wilkes (EWEA)

External editor: Adrienne Margoyles

Design coordination: Jesús Quesada (EWEA)

Design: Giselinde Van de Velde

Cover photo: Istockphoto

Download the electronic version:

From www.ewea.org: www.ewea.org/report/workers-wanted

From www.windplatform.eu: www.windplatform.eu/report/workers-wanted

Table of contents

EXECUTIVE SUMMARY

The European wind industry has grown rapidly. Installed capacity has increased from around 13 GW in 2000 to more than 100 GW in 2012[1]. A consequence of this has been a failure for skills development to keep pace[2].

In June 2013 the European Council agreed on a comprehensive approach to combat youth unemployment. This report shows that the European wind industry can play a key role in combatting unemployment.

Nearly 50,000 additional trained staff will be needed by the industry by 2030. By that year, operations and maintenance will become the greatest source of new jobs and demand for trained staff.

There is currently a shortage of 7,000 qualified personnel required by the European wind energy sector each year, a figure that could increase to 15,000 by 2030 if the number of graduates taking courses relevant to the industry does not rise. The vast majority (78%) of respondents to the questionnaire found it difficult or very difficult to find suitably trained staff.

This study has found economy wide concern about the low number of graduates from schools and universities opting for science, technology, engineering and mathematics (STEM) courses. This is a particular concern for the wind industry, where availability of adequately trained staff is a problem.

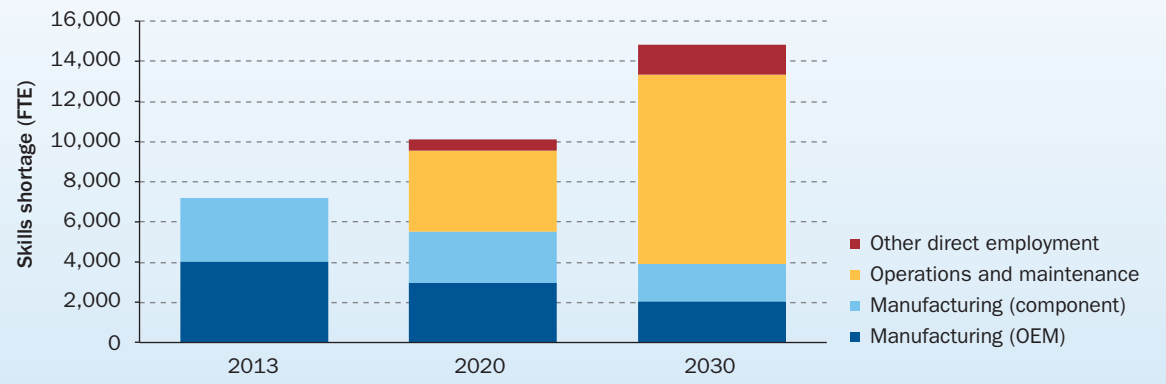
Our study has also revealed industry concerns about an information schism. The education and training on offer lags behind technical developments in the wind energy sector. The current focus on academic rather than practical and problem solving skills means that there is strong industry support for an EU wide standardisation of curricula.

We estimate that the skills shortage is likely to be greatest in operations and maintenance (O&M) roles in the wind energy sector. A minority of the wind energy workforce is engaged in non technical roles but the requirement could double by 2030, exacerbating the existing skills gap.

1 EWEA (2012) EU reaches 100 GW wind power milestone.

2 Windskill project, funded by the EU Intelligent Energy Europe Programme - The Windskill Initiative: Systematic Approach to Wind Energy Qualifications (2009 - http://eaci-projects.eu/iee/page/Page.jsp?op=project_detail&prid=1769).

FIGURE 1 SKILLS GAP 2013-2030



Source: TPWind survey

It is important to note that the skills gap identified is not necessarily the result of a lack of candidates but a reflection on the skills of those candidates.

The following recommendations are designed to address the current and predicted shortage of skilled workers:

- **Improve core/STEM skills in industry:** in the short to medium term employees' STEM skills can be improved through targeted courses run by external providers.
- **Introduce industry experience into training and education:** access to the experience of the wind industry can be provided through short-term secondments or visiting lecturer roles for senior industry professionals. This would benefit current students and help to shape future curricula. Industry and universities could jointly fund internships or create industrial scholarships.
- **Expand the cohort of graduate level wind energy generalists:** the graduation rate from targeted, EU wide, MSc level courses could be increased. Courses could cover subjects including project management and wind farm development that could help fill the skills gap.
- **Harmonise Vocational Education and Training (VET) at EU level:** this could include disseminating appropriate educational content and techniques to industry or EU level implementation of the Windskill initiative recommendations.
- **Increase the emphasis on O&M training:** more training courses within the wind industry must focus on this critical area.

By taking these steps and ensuring that the European wind energy industry has access to a well trained workforce, wind energy will be able to continue to play a pivotal role in the transition to a renewable energy system. It will also help to boost economic growth and create hundreds of thousands of jobs.

In this fast changing sector skills need to be closely monitored. A regular update to this report - perhaps every five years - would enable resources to be best targeted at identified gaps.

INTRODUCTION

This report fulfils an objective of the European Wind Energy Technology Platform (TPWind) within the EU's Seventh Framework Programme. It reviews existing wind energy training opportunities, quanitifies the skills gap and identifies areas for action through targeted EU policy.

- **Section 1** estimates the gap in available training courses and forecasts trends up to 2030.
- **Section 2** presents the findings of surveys and interviews with industry stakeholders.
- **Section 3** analyses research by skills area.
- **Section 4** identifies areas for action and proposes policy initiatives.

The study draws on two main sources:

Literature review and database. A review of existing literature and work carried out in other EU projects - including the Upwind project and Windskill initiative. Publicly available information on courses and initiatives contributed to the analysis.

Primary research. In order for findings to be compared, two research methods were used. A questionnaire sought feedback from several dozen industry stakeholders on skills and training. It was used to gain an overview and generate data for analysis. In parallel, a series of interviews were conducted to provide further insight into the important issues and to validate the findings of the questionnaire.

The methodology used is described in detail in the annexes to this report.

Training and education: existing opportunities and initiatives

Educational initiatives

In addition to the Windskill and Upwind projects, there are several other educational initiatives relevant to the wind energy industry. The European Institute of Innovation and Technology (EIT) has introduced Knowledge and Innovation Centres (KIC) such as KIC Innoenergy, an alliance of European education and research institutions focused on sustainable energy, including wind energy.

Apprenticeships and technical courses

A number of apprenticeships and vocational training courses are available from employers. They tend to focus on technical skills.

Dedicated training centres

In addition to courses, dedicated education facilities can be provided by industry-run training centres which offer technical courses to wind energy industry employees. Some centres are run by employers such as Siemens in the, UK, others are run by specialist training providers such as BZEE in Germany.

Tailored university courses

There are numerous university courses that offer degrees specifically tailored for students wishing to pursue a career in the wind energy sector. Other courses include wind energy relevant modules. Universities all over Europe are promoting renewable energy degrees as a way of linking education to industry.

Knowledge sharing networks

Member States and regions play an important coordination role through initiatives enabling collaboration in training and education. At international level, the International Renewable Energy Agency (IRENA) disseminates information about renewable energy training resources though its Renewable Energy Learning Partnership (IRELP)[3].

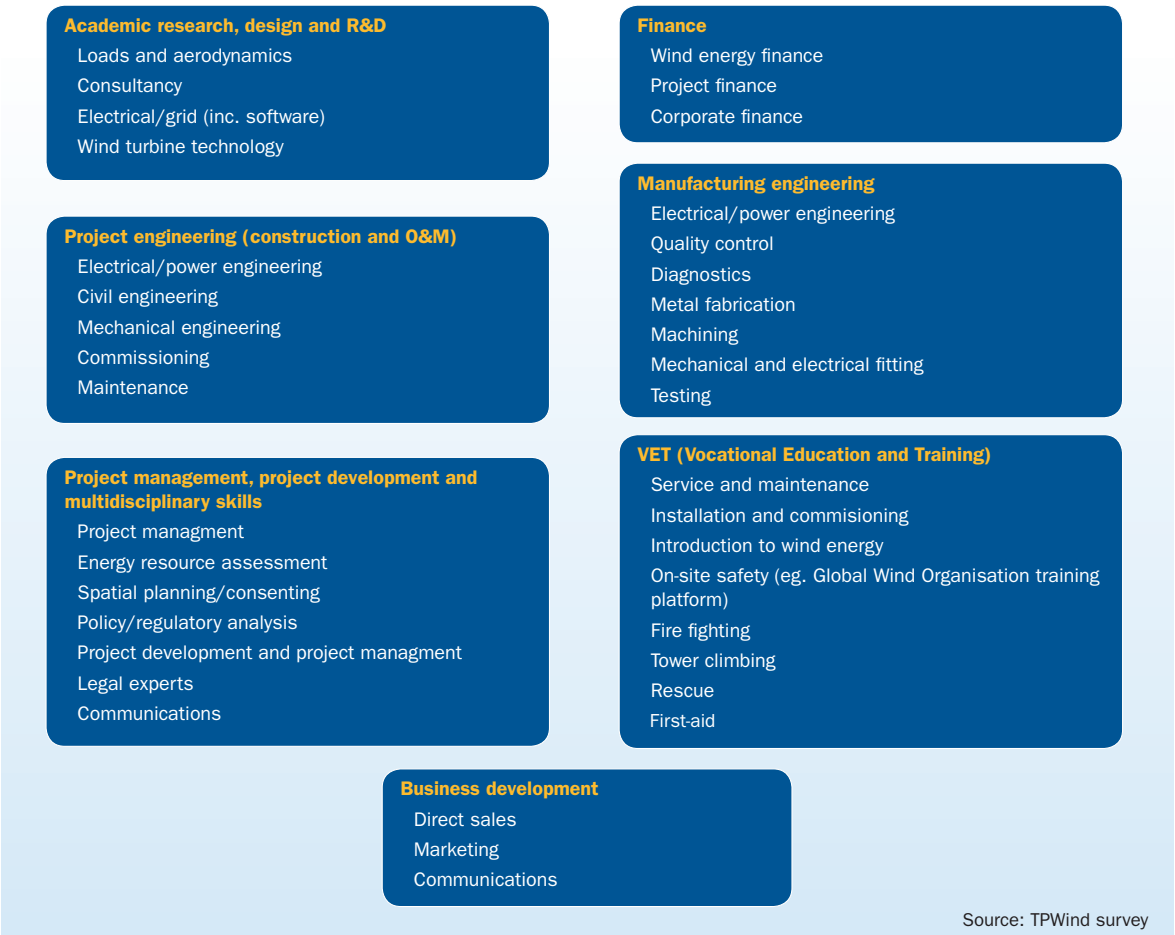
Industry-led Vocational Education and Training (VET)

Many firms across the wind industry in the EU provide on the job training.

Skills areas

The training needs of the wind industry can be categorised into seven skills areas. These are shown in Figure 2:

FIGURE 2 SKILLS AREAS WITHIN THE WIND INDUSTRY[4]



Source: TPWind survey

[3] IRENA (2013) IRENA's Renewable Energy Learning Partnership.

[4] The example roles given are not exhaustive and focus on wind farm development, installation and operation and turbine manufacture. Roles in ancillary industries such as transmission infrastructure are excluded and as they are not considered to be direct wind industry roles.

© Offshore-Stiftung/Jan Oelker

1 ESTIMATING THE SKILLS GAP

This section quantifies the shortfall in wind energy industry skills between 2012 and 2030. It addresses direct employment only and defines one job as the equivalent of a full time position (otherwise known as 'Full-Time Equivalent', or FTE).

Demand for trained staff

Capacity projections

EWEA predicts installed wind energy capacity in Europe growing from 84.3 GW in 2010 to around 400 GW in 2030 in linear trajectory[5]. This represents an average net addition of almost 16 GW per year until 2030. The figure below shows the breakdown of projected deployment on- and offshore to 2030:

Jobs per MW (installation rate and cumulative installations)

'Wind at Work'[6] provides a breakdown of the proportion of wind energy jobs in each sub-sector per Megawatt (MW) for a year's installations, and for total cumulative capacity (MW). The table below describes the proportion of jobs per MW/year and jobs/MW of cumulative capacity attributable to each sub sector.

TABLE 1 PROPORTION OF JOBS ATTRIBUTABLE TO DEPLOYMENT RATE AND CUMULATIVE CAPACITY

Sub-sector	Jobs/MW/ year	Jobs/cumulative MW
Turbine manufacturing (OEM[7])	50%	-
Turbine manufacturing (component)	33.3%	-
Installation	8%	-
O&M	-	82.5%
Other direct employment[8]	8.7%	17.5%

Source: EWEA, 2009

5 EWEA (2012b) Green Growth: The impact of wind energy on jobs and the economy.
6 EWEA (2009) Wind at Work.
7 OEM: Original Equipment Manufacturers .
8 Plant owners, consultants, researchers, institutions, universities, finance, business development and other.

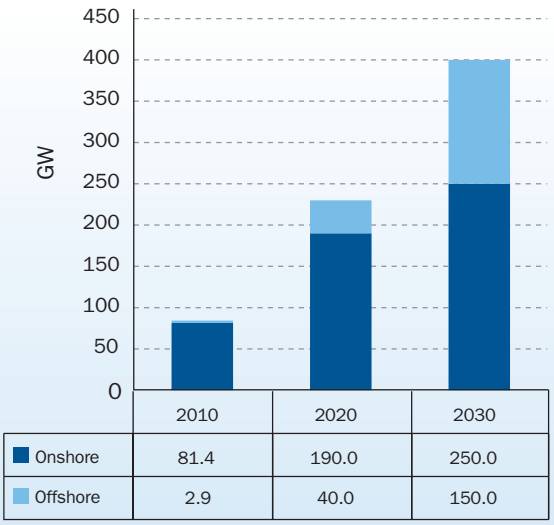
Learning, innovation and increasing turbine size

Factors such as innovation and learning as well as an anticipated increase in average turbine size are expected to reduce both the number of jobs per MW/year and per MW of cumulative capacity between today and 2030. These trends are likely to be different for the onshore and offshore wind energy sectors and different rates[9] have been assumed for each sector.

Distribution of jobs within the wind energy industry

The breakdown of jobs in the wind energy industry from 2012 to 2030 is shown in Figure 4 below:

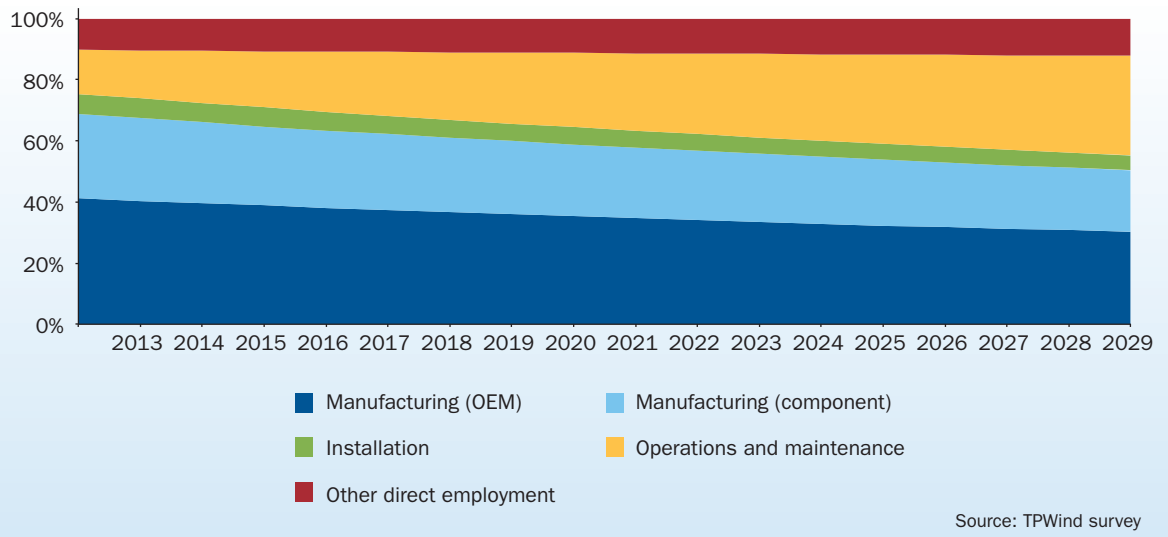
FIGURE 3 WIND ENERGY CAPACITY PROJECTION



	2010	2020	2030
Onshore	81.4	190.0	250.0
Offshore	2.9	40.0	150.0

Source: EWEA, 2012

FIGURE 4 DEVELOPMENT OF EMPLOYMENT BREAKDOWN BY SUB-SECTOR



Source: TPWind survey

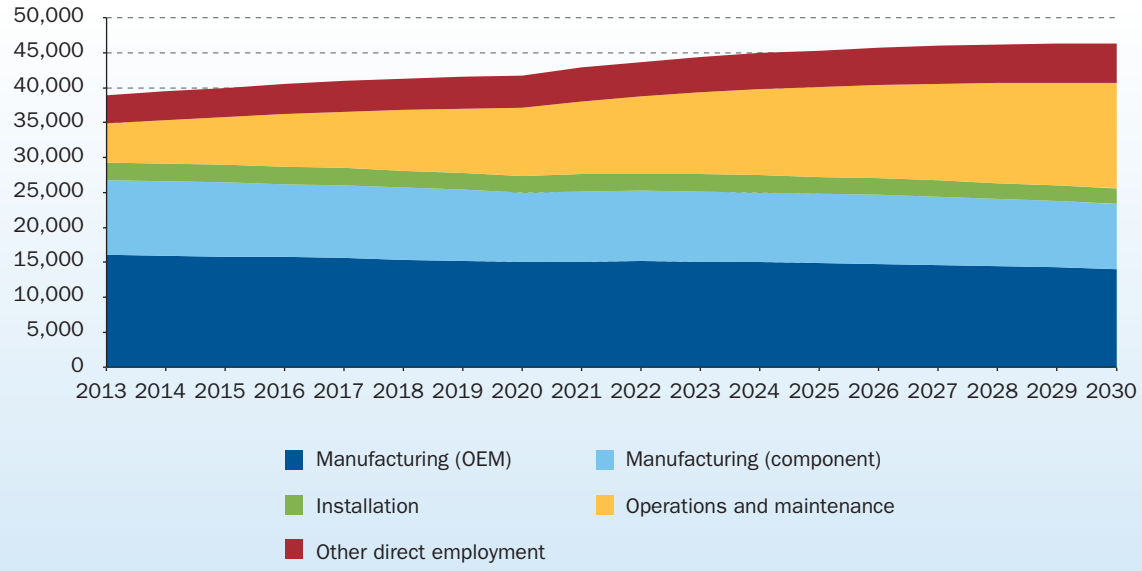
The proportion of employment in O&M is expected to rise as the number of installed wind turbines grows.

Incorporating the changing employment profile and a figure for staff turnover enables the demand for trained staff across the industry sub sectors to be identified.

Nearly 50,000 additional trained staff will be needed by the industry by 2030. O&M will become the greatest source of new jobs and demand for trained staff in 2030.

[9] Based on EWEA analysis.

FIGURE 5 RATE OF JOB CREATION – DEMAND FOR TRAINED STAFF



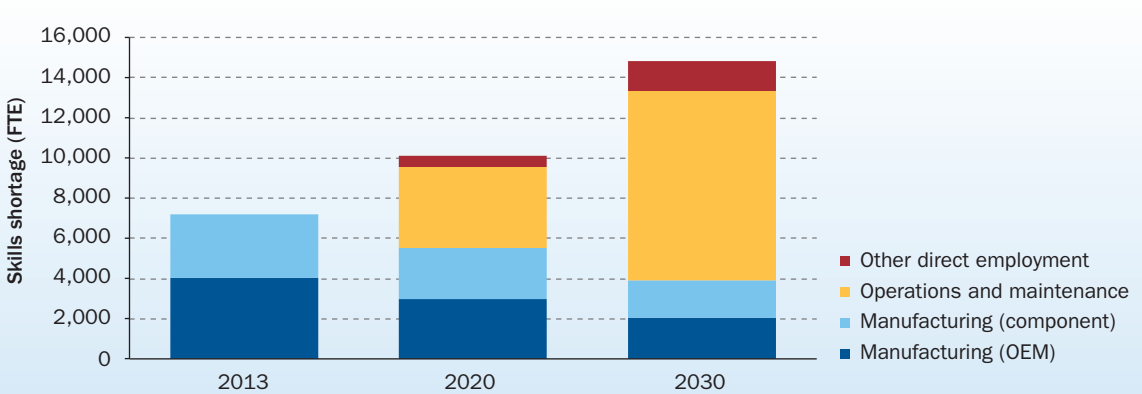
Source: TPWind survey

Gap between supply and demand 2012-2030

The skills gap is defined as the difference between the demand for adequately trained personnel and the supply.

Figure 6 shows a significant and increasing skills gap which expands to almost 15,000 unfilled jobs ('Full Time Equivalents' or FTEs) in 2030, around 4% of the anticipated direct European wind energy jobs. The most important trend is the rapid increase in the gap for trained O&M staff (nearly 10,000 additional workers required in 2030 than are available – more than 60% of the total gap). This large rise in the O&M skills requirement is driven by the growth in cumulative wind capacity in Europe. The number of 'Other direct employment' jobs also increases significantly from 2016 onwards. The gap in manufacturing skills declines in number of jobs driven by learning effects and increases in average turbine size. The gap is expected to decrease as a proportion of the workforce from more than 2% in 2012 to around 1% in 2030.

FIGURE 6 SKILLS GAP TO 2030[10]



Source: TPWind survey

[10] Note that for clarity negative data are not shown even if a 'negative gap' exists in an industry subsector.

2 RESEARCH FINDINGS

Methodology

Wind energy industry training and education was investigated using a questionnaire and a series of interviews with key industry stakeholders.

Findings

This section provides a preliminary analysis of the data. For more detailed information, see the annexes.

Questionnaire results

Finding the right skills

Figure 7 shows that a large majority (78%) of respondents find it difficult or very difficult to find suitably trained staff.

FIGURE 7 EASE OF FINDING SUITABLY TRAINED STAFF

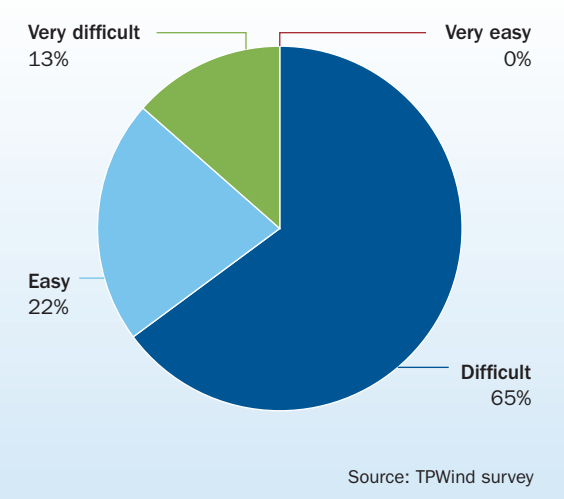
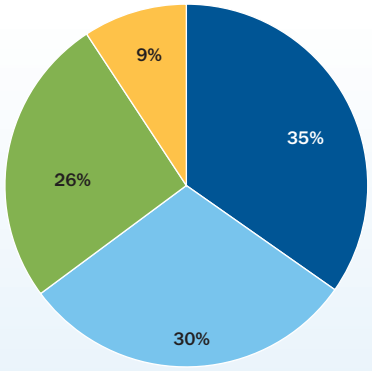


FIGURE 8 OBSTACLES TO A SUITABLY SKILLED WORKFORCE



Source: TPWind survey

Constraints in the supply of appropriately trained staff

The most frequently cited reason for the constraint in supply was a mismatch between the education system and new technologies and industries, perhaps due to links with academia not being strong enough. Figure 8 gives an overview of the answers.

Industry skills priorities

When asked the preferred profile for recruitment[11], technical expertise was seen as the most desirable by a small margin. Table 2 presents the breakdown of responses.

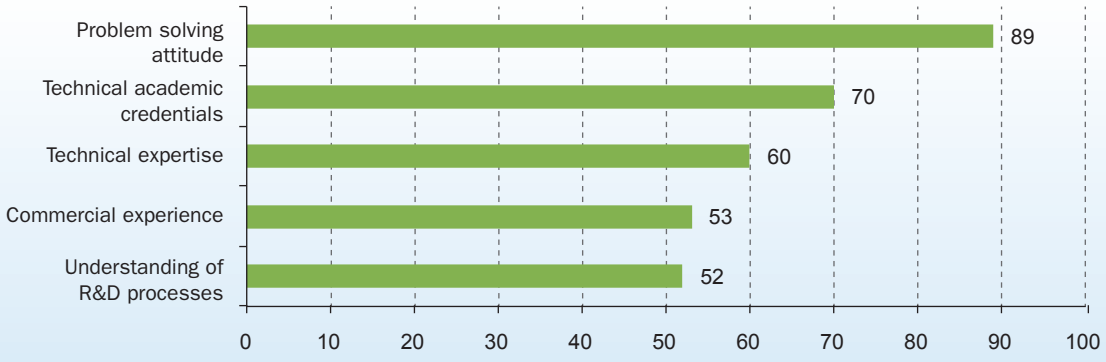
TABLE 2 PRIORITISATION OF PRACTICAL SKILLS, TECHNICAL EXPERTISE AND INDUSTRY KNOWLEDGE SKILL TYPES

Skill type	Percentage who chose it as top priority
Practical skills	32%
Technical expertise	38%
General industry and market knowledge	30%

Respondents were also asked to rate the importance of various skills in potential employees[12].

As Figure 9 shows, the most important skill for employers is problem solving aptitude.

FIGURE 9 RELATIVE IMPORTANCE OF SKILL SETS WHEN RECRUITING



Source: TPWind survey

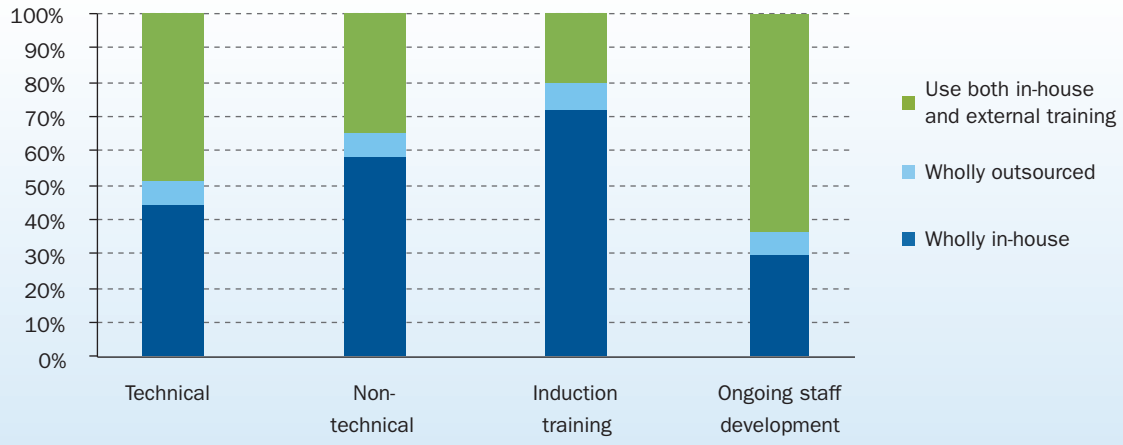
[11] The question was: "what do you look for when recruiting staff? The choice of answers was "1. Technical specialists, with good knowledge within engineering, mathematics, science, or other applicable disciplines; 2. Generalists, who have a good knowledge of how the industry operates and up-to-date knowledge of the market; 3. Practical specialists who can apply a good level of factual knowledge and practical skills to daily problem solving in the workplace."

[12] The question was: "what do you look for when recruiting, in terms of appropriate skills and qualifications, and how would you rate these skills and qualifications in terms of importance to your business?"

Staff training provision

Where organisations offer training, the vast majority is provided in-house. Induction training and professional development are more likely to be undertaken in-house, but companies tend to use a combination of in-house and external training for staff development. Figure 10 provides an overview.

FIGURE 10 CURRENT INDUSTRY TRAINING PROVISION TRENDS



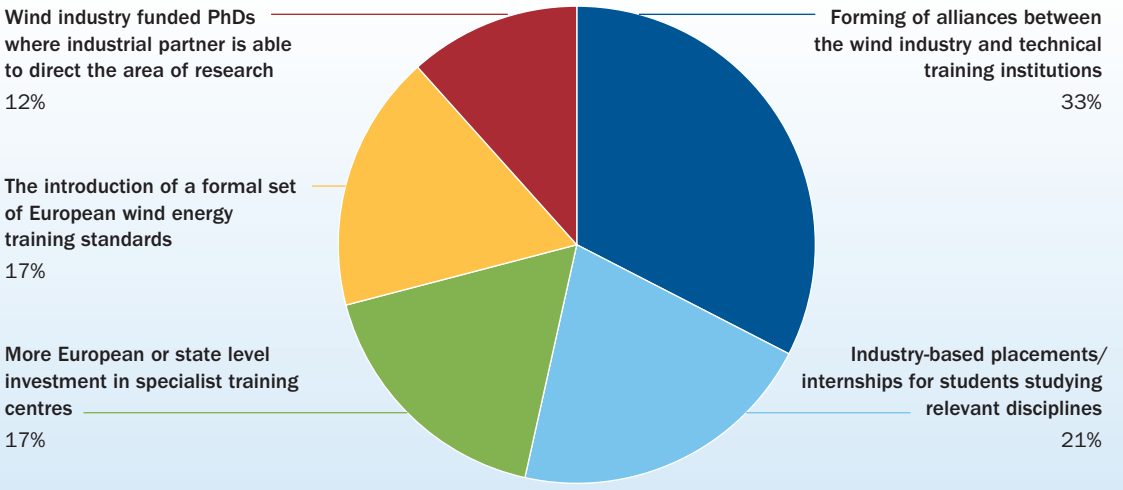
Source: TPWind survey

Suggestions to improve the provision of training and education

The chart below clearly shows that encouraging closer relationships between training and education institutions and industry is the most widely supported proposal.

Figure 11 shows the importance of greater interaction between industry and the education system. Two-thirds of respondents identified this as the best means of improving education provision.

FIGURE 11 SUPPORT FOR WAYS TO IMPROVE THE AVAILABLE EUROPEAN WIND ENERGY TRAINING COURSES

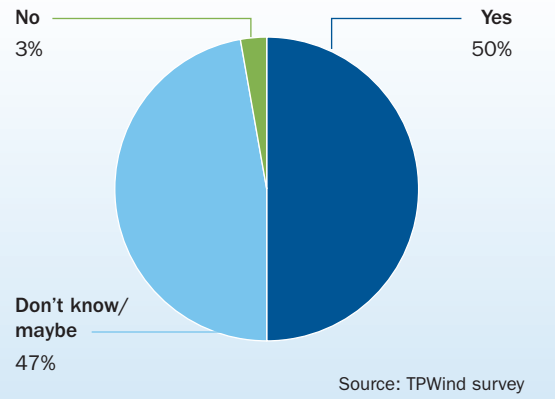


Source: TPWind survey

Respondents were asked whether a set of European wind energy standards would be beneficial. There was a near 50/50 split in responses, shown in Figure 12.

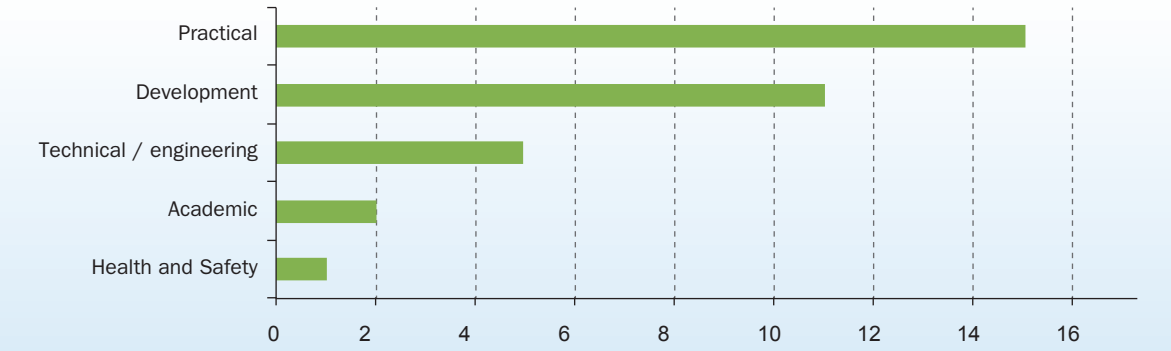
The questionnaire asked where standardisation might be particularly beneficial. Figure 13 below details the responses. Practical skills and those relating to project development rank most highly as areas where new standards may be beneficial.

FIGURE 12 WOULD A SET OF EUROPEAN TRAINING STANDARDS BE BENEFICIAL?



Source: TPWind survey

FIGURE 13 SUGGESTED AREAS FOR STANDARDISATION



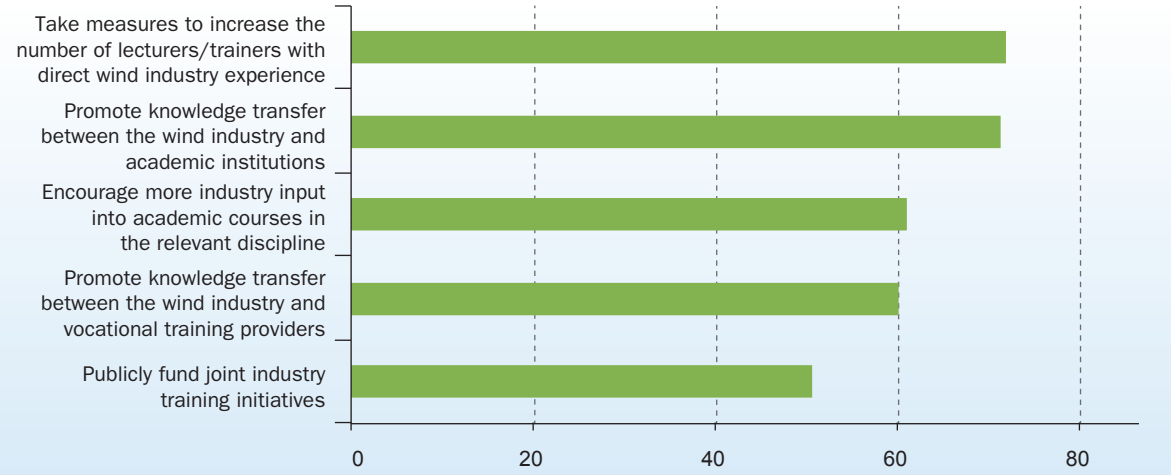
Source: TPWind survey

Suggested policy initiatives

As can be seen in Figure 14, respondents favour initiatives to increase the industry experience of those working in the education sector and greater transfer of knowledge between industry and academic institutions.

Respondents were asked to suggest additional policy recommendations. The promotion of shorter, more targeted training courses and an increased role for industry in academic training were suggested most frequently.

FIGURE 14 RESPONSE TO POLICY INITIATIVES



Source: TPWind survey

Interview results

Provision of academic education

Interviewees observed that the number of dedicated undergraduate and postgraduate academic courses has increased markedly. While this is not within the direct scope of this report, some felt that qualifications in STEM subjects is a prerequisite for many of the roles in the wind industry. Some interviewees considered full length academic programmes less beneficial than shorter, more flexible vocational training that can be built around full time employment, funded by employers.

Provision of vocational training

Interviewees noted that the trend to provide skills training directly applicable to the wind industry in-house is likely to continue. They strongly believe that a more flexible, competent workforce would result from standardising vocational training across the EU. Initiatives such as the BZEE German Energy Industry project and the UK's Modern Apprenticeship schem are starting to make an impact.

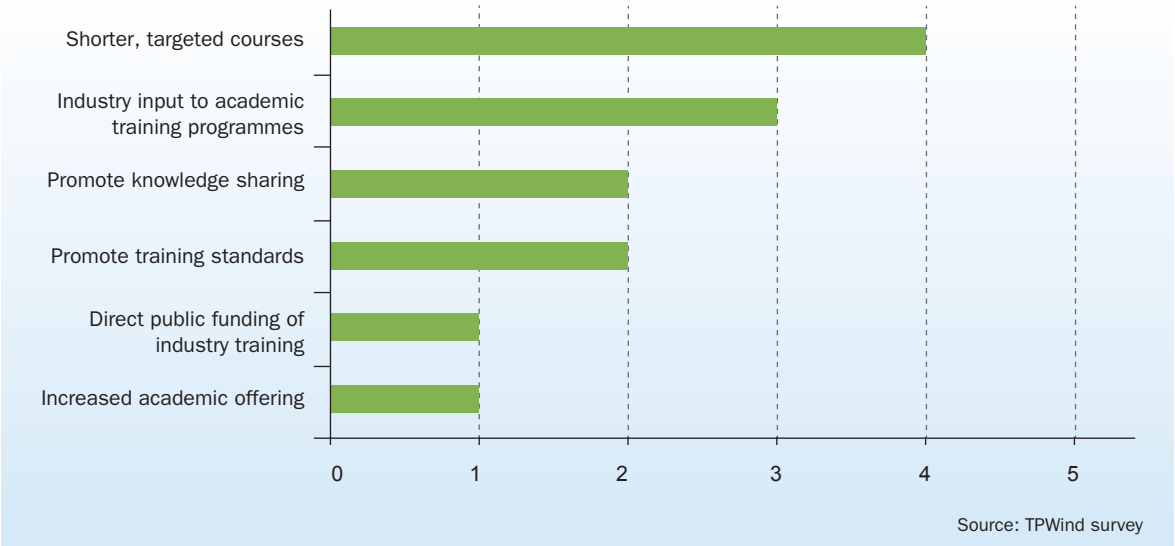
Availability of trainers

Lack of suitably qualified trainers is a serious impediment to providing vocational training. Wind energy companies could work more closely with dedicated training institutes to improve the situation.

The effect of market maturity

The interviews highlighted the variation in training needs of wind energy markets at different stages of maturity. Newer markets require a greater emphasis on the technical skills for building and commissioning wind farms while more mature markets demand O&M skills as well as an increased focus on 'soft' development skills. Standardisation of training programmes may help to rapidly establish training courses and facilities.

FIGURE 15 RESPONDENTS' POLICY RECOMMENDATIONS



© Acciona

3 FINDINGS BY SKILLS AREA

Project and manufacturing engineering

In-house technical training is more likely to be offered to employees than non-technical training. The research found that technical expertise was more valued by recruiters than commercial experience - the wind industry's core engineering skills have been prioritised in recent years. For non-technical training, employers rely on external providers (see Figure 10, page 15). Component manufacturing, turbine manufacturing and installation, and repair and operations activities account for 70% of wind energy industry jobs[13]. Failure to ensure that these skills areas grow with the industry could act as a drag on the development of the sector. Addressing the challenges to STEM education is therefore critical.

R&D

A quarter of questionnaire respondents state that inadequate R&D funding is an obstacle to their business (see Figure 8, page 14) but R&D is not a high priority for industry recruiters (see Figure 9, page 14) as it accounts for just 1% of jobs in the industry.

Multidisciplinary skills and project management

There are fairly few EU-wide, multidisciplinary training opportunities available at graduate (MSc) level[14]. The lack of training might seem to contradict respondents' view that qualities such as 'problem solving aptitude' are valued highly by the industry (see Figure 9, page 15).

The importance of ensuring the availability of people with this profile is highlighted in EWEA's 2009 report[15] that showed that that 16% of employment in the wind energy industry is in project development.

[13] EWEA (2009) Wind at Work.
[14] Jacobsson S., Karltorp K. (2012) Formation of competences to realise the potential of offshore wind power in the European Union. Energy Policy 44 (2012).
[15] EWEA (2009) Wind at Work.

Vocational Education and Training (VET)

VET is likely to continue to be provided in-house (see Figure 10, page 15). It is also the area likely to benefit most from EU wide training standards (see Figure 13, page 16)[16]. VET is considered more important in the engineering roles that account for a large proportion of industry employment.

Business development and finance

Commercial experience ranks relatively low on wind energy recruiters' priority list (see Figure 9, page 14). This may be due to the highly transferrable nature of these skills which are required by around 1% of the workforce[17].

[16] McGovern, G (2010) The Windskill Initiative Final Report.
[17] EWEA (2009) Wind at Work.

4 RECOMMENDATIONS

If left unchecked, the skills gap could lead to a situation in which demand for well trained personnel outstrips supply by 15,000 jobs in 2030. There are two key constraints on the growth of the industry:

- O&M technical skills
- A shortage of STEM graduates across the economy

Areas for action

Academic subjects and workplace training are well covered by a combination of policy and industrial initiatives. Finance and business skills such as sales and marketing are not a problem as they are transferrable skills that are not specific to any industrial sector.

Engineering skills are well covered by policy and industry training programmes, but the numbers of highly qualified engineers required will be large[18]. The focus should be on O&M technical skills.

Multi-disciplinary skills are critical to the development of the sector, currently accounting for 16% of wind industry employment[19]. There are limited EU-wide postgraduate training programmes available. Although many of these roles can be filled from outside the wind industry, the rate of growth and importance to the sector suggest that action is needed. The quality of vocational training should be improved.

Improve core/STEM skills

This problem is not likely to be solved purely in the context of the wind energy industry[20]. In the short to medium term the STEM skills of employees could be improved through targeted courses for employees.

Incorporating industry experience into training and education

Providing access to hands-on experience in the wind industry, through short-term secondments or visiting lecturer roles for senior professionals, would benefit current and future students.

Although industrial apprenticeships are available to school leavers and graduates, there is scope to extend

[18] Jacobsson S., Karltorp K. (2012) Formation of competences to realise the potential of offshore wind power in the European Union.
[19] EWEA (2009) Wind at Work.
[20] ILO (2010) Skills for Green Jobs European Synthesis report.

them to more people and firms, standardise curricula and increase the involvement of academic institutions in apprenticeships. Industry and universities could jointly funding internships and industrial scholarships.

Expand graduate level wind energy generalists

Academic wind energy engineering degree courses are available across Europe, but there is demand for training STEM graduates in the skills required to develop, build and operate wind farms.

Harmonise VET offerings at EU level

As identified by the Windskill project, VET is a candidate for greater harmonisation of curricula and training techniques. Employers want to see more standard programmes. Harmonisation could include dissemination of appropriate educational content and techniques to industry, or EU level implementation of the Windskill initiative.

Increase the emphasis on O&M training

Although O&M training is available, this section of the workforce could more than triple in size between 2012 and 2030 while other engineering disciplines remain broadly constant. Training programmes in the wind industry must target this skills area.

ANNEXES

Annexe 1

Overview of existing initiatives

Table 3 below provides an overview of the training and education initiatives considered by this study.

TABLE 3 OVERVIEW OF EDUCATION AND TRAINING INITIATIVES

Educational initiatives	Apprenticeships and technical courses	Dedicated training centres	University courses	Knowledge sharing networks and supporting wind energy training
BZEE Skills passport	Energy Management Technician in Europe	Asociación Empresarial Eólica	Erasmus Mundus European Wind Energy (TU Delft)	Bundesverband WindEnergie
European Academy of Wind Energy	Siemens, Renewable UK and Weir apprenticeships	Cabinet Metrol	European Master's in Renewable Energy	Centro Nacional de Energias Renovables
European Institute of Innovation and Technology		National Renewable Energy Centre (CENER)	MSc Wind Power Project Management (WPPM)	EWEA
Upwind project		Danish University Wind Energy Training	University of Strathclyde Doctoral courses	Global Wind Organisation
Windskill initiative		Danish Wind Power Academy	Wind Energy MSc (DTU)	Innovate
		German Wind Energy Institute (DEWI)		IIR
		ForWind		IRELP
		GL Academy		Italian Wind Energy Association
		Haus Der Technik		Renewables Innovation Network
		Training Centre for Renewable Energy (BZEE)		

Annexe 2

Questionnaire survey

The questionnaire was designed to collect information about the types of training courses provided within companies, and the types of training course provided by employers but outsourced to external training providers. It also assessed companies' skills priorities when recruiting staff and the ease with which they are able to find suitably skilled staff. Questions were put to participants to gauge what, in their opinion, were the greatest obstacles to the emergence of a suitably skilled workforce and asked suggestions to mitigate them. Finally, the questionnaire sought to poll the participants' views on the merits of wind energy training standards and other EU-level policy initiatives.

In addition to the 'closed questions' designed to produce quantitative outputs for analysis, a number of 'open questions' were designed to identify important qualitative trends.

Where the relative importance of several options was being gauged each response was awarded a score based on the following scoring system:

TABLE 4 SCORING SYSTEM FOR GAUGING RELATIVE IMPORTANCE OF OPTIONS

Importance	Not important	Fairly important	Important	Essential
Score	0	1	2	3

Interviews

To gain insight into the current level of education provision – and the requirements of industry – a series of 39 interviews was conducted with a group of stakeholders selected to give a broad view on the European wind industry.

Participation and coverage

Questionnaire response

The questionnaire was distributed during October 2011 and answers were received up to the beginning of December 2011. Organisations across the European wind industry (utilities, developers, manufacturers, operators and national trade associations) were approached to participate in the questionnaire. Responses were received from participants in Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Norway, Portugal, Spain, Sweden, The Netherlands, Switzerland and the UK.

39 completed questionnaires were returned with coverage extending to all 16 of the targeted Member States. The response rate breaks down by Member State as shown in figure 16 (next page).

The respondents were in a range of industry subsectors, as shown in Figure 17 (next page).

Interview response

Interviews were held between October and December 2011.

FIGURE 16 NUMBER OF RESPONSES PER COUNTRY

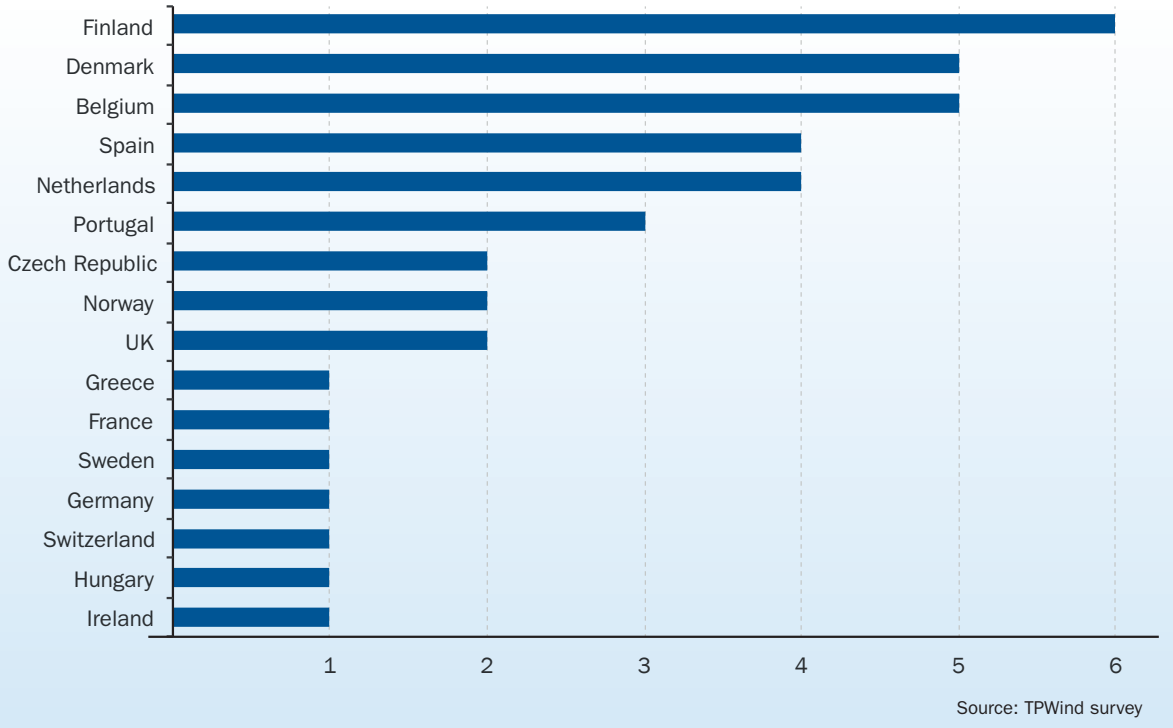
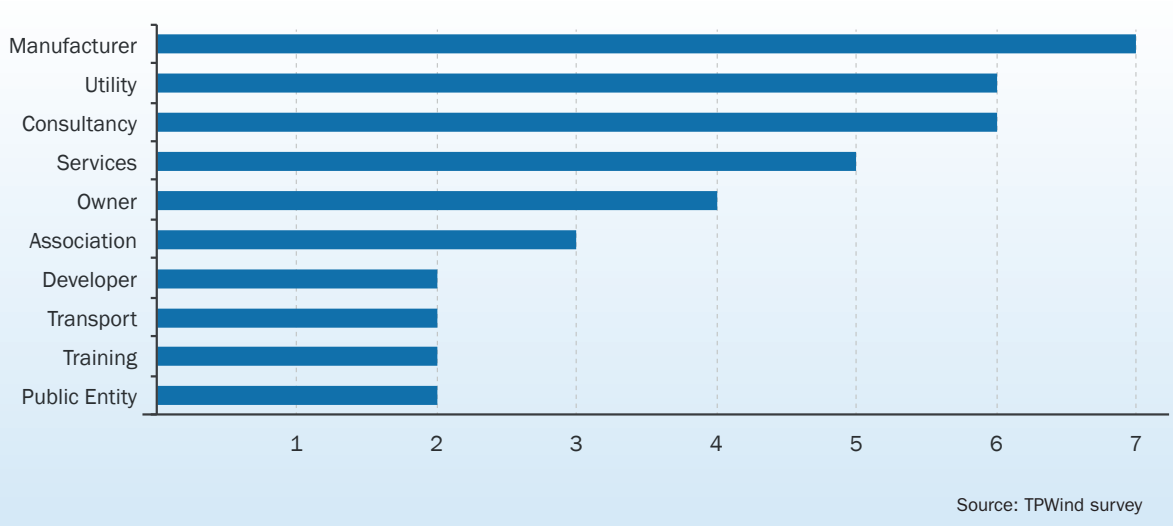


FIGURE 17 NUMBER OF RESPONSES PER INDUSTRY SUB SECTOR



Annexe 3

Literature review

Existing work in this area

A number of studies with similar objectives to this one have already been conducted and published by industry and academia.

Skills for Green Jobs (European Synthesis Report) (ILO, 2010)

A report jointly published by the International Labour Office (ILO) and European Centre for the Development of Vocational Training (CEDEFOP) sought to examine the skills requirement of the 'Green Economy', including wind energy, in six European countries.

The message from the work of CEDEFOP and ILO is that 'green jobs' do not necessarily require new core skills. In fact the training required to enable workers to move into the green economy is often modest with new combinations of existing competencies considered sufficient to meet the needs of new industries. However, two main areas are highlighted as potentially problematic:

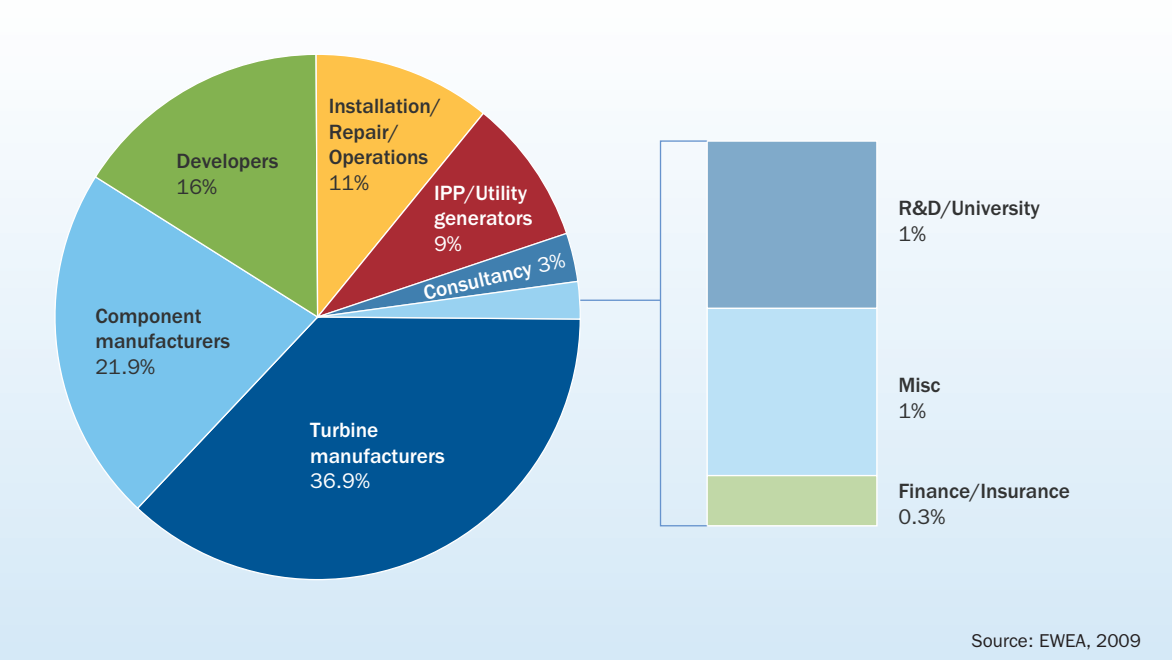
- **Systemic weakness in Science, Technology, Engineering and Mathematics (STEM) training and education in Europe.** Although job specific skills are not thought to require new core competencies, the availability of management and engineering skills suffers from systemic weaknesses in the skills base.
- **Demographic phenomena.** A shortage of engineers coming forward to replace those who are retiring is flagged as a major problem, particularly in the most advanced economies. Tertiary study of STEM subjects and apprenticeships is said to be declining in popularity: with insufficient numbers of graduates a persistent, cross sectoral challenge.

The report advocates economy wide support for STEM education and the 'greening' of existing occupations through the provision of vocational training to enable skilled workers to enter the 'green work force'.

Wind at Work (EWEA, 2009)

In 2009 the European Wind Energy Association (EWEA) identified several areas in which the wind energy industry was likely to experience skills shortages. These areas include engineering operation and maintenance (O&M), site management and project management skills. Wind at Work also provides an invaluable breakdown of wind industry employment by type of job as presented in Figure 18 below.

FIGURE 18 BREAKDOWN OF EMPLOYMENT BY TYPE OF JOB



Source: EWEA, 2009

The most important point to note is that the engineering areas of turbine manufacturing, component manufacturing and installation, repair and operations account for 70% of wind energy industry employment.

The report also provides analysis of the numbers of jobs created per cumulative installed MW and the annual MW installation rate.

Green Growth (EWEA, 2012)

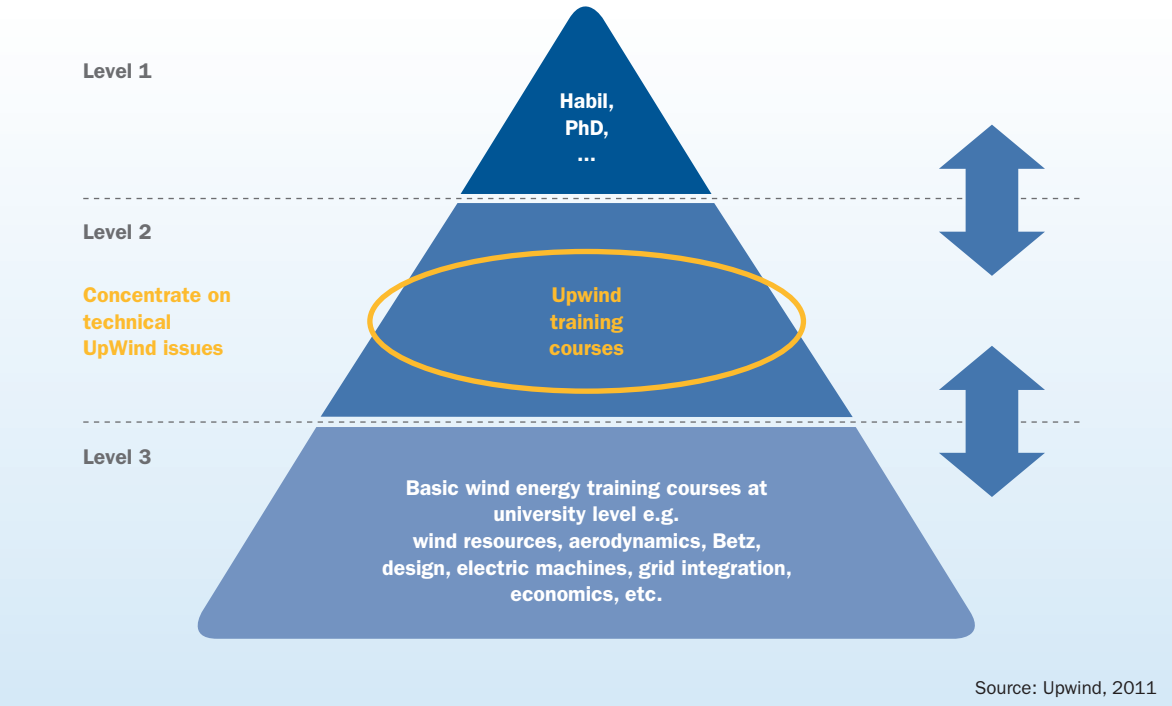
This report provides the most up to date projections for the growth of the European wind energy industry, and its economic implications.

Green Growth concludes that 441,155 jobs will be directly attributable to the wind energy industry in 2030, and there will be a further 352,924 indirect wind energy jobs. The report also projects that the installed capacity of the European wind energy fleet in 2030 will be 400 GW and will contribute €173 bn to the European economy.

Upwind project report (Upwind, 2011)

Led by the Centre for Renewable Energy Sources (CRES), the Upwind project under the EU's Sixth Framework Programme ran from March 2006 to February 2011. The training and education work package focussed on the academic education requirements of the wind industry. The aim was to facilitate the increase of existing wind energy education to provide specific education relevant to the demands of very large wind turbines – the primary focus of the Upwind project. Figure 19, below, shows the target educational level of the Upwind training programme.

FIGURE 19 UPWIND TRAINING TARGETS STUDENTS OF EDUCATIONAL LEVEL 2



Source: Upwind, 2011

The work package also produced a database of existing wind energy education programmes and the Wind Energy Information and Education Network (WEIEN), a training information dissemination tool and collaboration platform.

Windskill initiative final report (McGovern, 2010)

The Windskill initiative which ran between 2006 and 2009 sought to address specific areas of vocational training in the wind industry. The major result was a series of training modules based on extensive industry stakeholder consultation to fill any gaps in the training programmes and to standardise wind energy vocational training at European level. In addition to the Windskill Qualification Standard (WQS), an agency was designed to ensure European wide standards implementation. However, the proposals from the initiative have yet to be implemented.

Formation of competences to realise the potential of offshore wind power in the European Union (Jacobson and Karltorp, 2011)

A paper examining the specific issue of engineering competence has been prepared by Jacobson and Karltorp (2011). The authors see engineering competencies falling into three sub-groups. Table 5 below outlines this.

TABLE 5 SUMMARY OF COMPETENCIES

Deep competencies	Integrated competencies	Generalists
Mechanical engineering	Integrated mechanical engineering	Engineering competences integrated with non-technical project management
Electrical engineering	Integrated mechanical and electrical engineering	
Software engineering	Integrated engineering competences and meteorology	
Civil engineering		

Source: Jacobson and Karltorp, 2011

The paper concludes that the 'industrial transformation' of European offshore wind means that the industry is facing a gap of up to 10,000 qualified engineers by 2020, of which at least 2,000 are required by the offshore industry.

The authors propose ways in which European universities can ensure that this skills gap is filled. These include wind specific post graduate level project management training and greater inter university collaboration. But the main message is that European universities need to increase the breadth of education available. The paper also highlights potential interaction between university education and R&D.

Database framework

A database of existing European wind energy training initiatives was created. It provides a framework for tracking and recording training initiatives.

The field headings include:

- Name or identifier
- Type of initiative
- Funding sponsor or owner
- Start date and duration
- Geographical remit
- Educational focus
- Objectives

Annexe 4

Calculating job creation rate

To calculate the number of trained staff required across Europe each year, an understanding of the annual staff turnover rate is required. A figure of 12.7% has been assumed, in line with the findings of the UK's Chartered Institute of Personnel and Development 2012 annual survey report (CIPD, 2012).

This figure is the 'crude wastage'[21] figure derived from a series of UK economy-wide surveys and is neither wind energy industry specific nor Europe wide. Crude wastage is defined as:

$$\text{Labour turnover} = \frac{\text{Number of leavers in a set period}}{\text{Average number employed in the same period}} \times 100$$

Annexe 5

Calculating future numbers of trained staff

Estimating the current and future supply subject to uncertainty. Drawing on the database of training provision detailed in the annexe, an estimate of the number of adequately trained graduates from known courses is made in each of the industry sub sectors identified in Table 6.

TABLE 6 NEW JOB-SEEKERS PER SUB-SECTOR PER YEAR

Sub–sector	Trainees from known courses/yr	Supply of trained personnel/yr
Turbine manufacturing (OEM)	1,200	12,000
Turbine manufacturing (component)	749	7,490
Installation	1,117	11,170
O&M	567	5,670
Other direct employment [22]	410	4,100

It is highly unlikely that the database accounts for all adequately trained personnel entering the wind energy industry. To estimate the proportion that is accounted for, an assumption has been made that the database represents 10% of the newly trained personnel entering the industry. This proportion has been chosen to fulfil the condition that 90% of jobs are currently filled by adequately trained recruits.

[21] This methodology does not consider workforce dynamics such as variation in the length of service and other factors.
[22] Plant owners, consultants, researchers, institutions, universities, finance, business development and other.

References

CIPD (2012) - *Annual Survey Report 2012*
http://www.cipd.co.uk/hr-resources/survey-reports/learning-talent-development-2012.aspx

CEDEFOP (2012) - *Skills for a low carbon economy: what next? Anticipating and managing the effects of greening of industries in the EU. Skills development in the overall context of job quality (event summary)*
http://events.cedefop.europa.eu/GreenSkills-Forum2012/images/stories/GreenSkills/presentations/09_gausas_rev.pdf

CompTIA (2012) - *State of the IT Skills Gap*
http://www.wired.com/wiredenterprise/wp-content/uploads/2012/03/Report_-_CompTIA_IT_Skills_Gap_study_-_Full_Report.sflb_.pdf

EWEA (2006) - *Annual Report 2006*
http://www.ewea.org/fileadmin/ewea_documents/documents/publications/reports/ewea-report2006.pdf

EWEA (2009) - *Wind at Work*
http://www.ewea.org/fileadmin/ewea_documents/documents/publications/Wind_at_work_FINAL.pdf

EWEA (2009b) - *Oceans of Opportunity*
http://www.ewea.org/fileadmin/ewea_documents/documents/publications/reports/Offshore_Report_2009.pdf

EWEA (2012) - *EU reaches 100 GW wind power milestone*
http://www.ewea.org/news/detail/?tx_ttnews%5Btt_news%5D=1968&cHash=ec53ae1c873f50906a1bdfe98814d51c

EWEA (2012b) - *Green Growth: The impact of wind energy on jobs and the economy*
http://www.ewea.org/fileadmin/files/library/publications/reports/Green_Growth.pdf

ILO (2010) - *Skills for Green Jobs European Synthesis report*
http://www.cedefop.europa.eu/EN/Files/3057_en.pdf

IRENA (2013) - *IRENA's Renewable Energy Learning Partnership (IRELP)*
http://www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=35&CatID=110&SubcatID=156&RefID=156&SubID=161&MenuType=Q

Jacobsson S., Karltorp K. (2012) - *Formation of competences to realise the potential of offshore wind power in the European Union. Energy Policy 44 (2012)*
http://www.sciencedirect.com/science/article/pii/

McGovern, G (2010) - *The Windskill Initiative Final Report*
http://www.windskill.net/fileadmin/media/dokumente/final_conference/The_Windskill_Initiative_project_report_for_publication.pdf

Upwind (2011) - *Final Report: Design limits and solutions for very large turbines*
http://www.ewea.org/fileadmin/ewea_documents/documents/upwind/21895_UpWind_Report_low_web.pdf

IMPORTANT NOTICE AND DISCLAIMER

This report ("Report") is prepared and issued by GL Garrad Hassan & Partners Ltd. ("GL GH" or "GL Garrad Hassan") for the sole use of the client named on its title page (the "Client") on whose instructions it has been prepared, and who has entered into a written agreement directly with GL Garrad Hassan. GL Garrad Hassan's liability to the Client is set out in that agreement. GL Garrad Hassan shall have no liability to third parties (being persons other than the Client) in connection with this Report or for any use whatsoever by third parties of this Report unless the subject of a written agreement between GL Garrad Hassan and such third party. The Report may only be reproduced and circulated in accordance with the Document Classification and associated conditions stipulated or referred to in this Report and/or in GL Garrad Hassan's written agreement with the Client. No part of this Report may be disclosed in any public offering memorandum, prospectus or stock exchange listing, circular or announcement without the express written consent of GL Garrad Hassan. A Document Classification permitting the Client to redistribute this Report shall not thereby imply that GL Garrad Hassan has any liability to any recipient other than the Client.

This report has been produced from information relating to dates and periods referred to in this report. The report does not imply that any information is not subject to change.

European Wind Energy Technology Platform

PRINTED BY ARTOOS
ISO 14001
100% GREEN POWER
CLIMATE NEUTRAL COMPANY
SUSTAINABLE DEVELOPMENT
PRINTED CLIMATE NEUTRALLY
certificate number:53520-1507-1010
www.artoos.be

FSC
www.fsc.org
MIX
Paper from responsible sources
FSC® C007370

www.windplatform.eu

TPWind

TPWind aims at enhancing communication within the wind energy sector, improving its visibility and impact, spreading information on relevant R&D achievements and developing strategic pathways for the growth of the sector (such as the implementation of the European Wind Initiative, a long-term, large-scale programme for supporting wind energy R&D, developed by TPWind in cooperation with EU Institutions and Member States and launched in 2010).

The platform gathers stakeholders from the wind energy industry and R&D community as well as representatives of other sectors/ stakeholders for ensuring the development of relevant synergies.