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FOR RENEWABLE ENERGY JOBS

Deliverable 3.1

SKILL GAPS ANALYSIS

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INTRODUCTION

KnowRES, The Knowledge Centre for Renewable Energy Jobs, provides **job intelligence** to industry, candidates and academic and training institutions, while performing an analysis of the skills needed by the industry to ensure that the provided education and training courses are tailor-made to the sectors' needs. The overall aim of the project is to help closing the skill gaps in the Renewable Energy sector.

The project co-funded by the European Union is coordinated by EUREC. The KnowRES consortium is composed of nine partners coming from four European countries, with complementary expertise. Five associations active in the area of renewable energy, one research centre, located in Spain, recognized expert in providing socio-economic analysis in the area of renewable energy; one University of applied sciences, located in the Netherlands; one recruitment company, located in Brussels, specialised in providing experts for the clean tech sectors

The Renewable Energies (RE) sector is one of the fastest growing sectors in terms of jobs creation. According to the 2015 Annual review Renewable Energy and Jobs by IRENA, an estimated 7.7 million people are currently working in the RE field worldwide and the number will continue to rise. It is a fast evolving sector, highly dependent on technological development; it is therefore important to understand what the existing competences in the area are.

The KnowRES online platform (www.knowres-jobs.eu) collects information on Renewable Energy candidates: students, employees, or former employees in the Renewable Energy sector. A survey was built in order to analyse their skills and expertise. Results are matched to the ones from the survey on industry needs. The comparison between needed skills and existing competences will enable to define areas where specific and additional training is needed in order

to better respond to the requests of the renewable energy industry. The skill gaps analysis report will present matching results of the two surveys. On the basis of this comparison, project partners will define areas where training is needed in order to reduce the knowledge and competence gap.

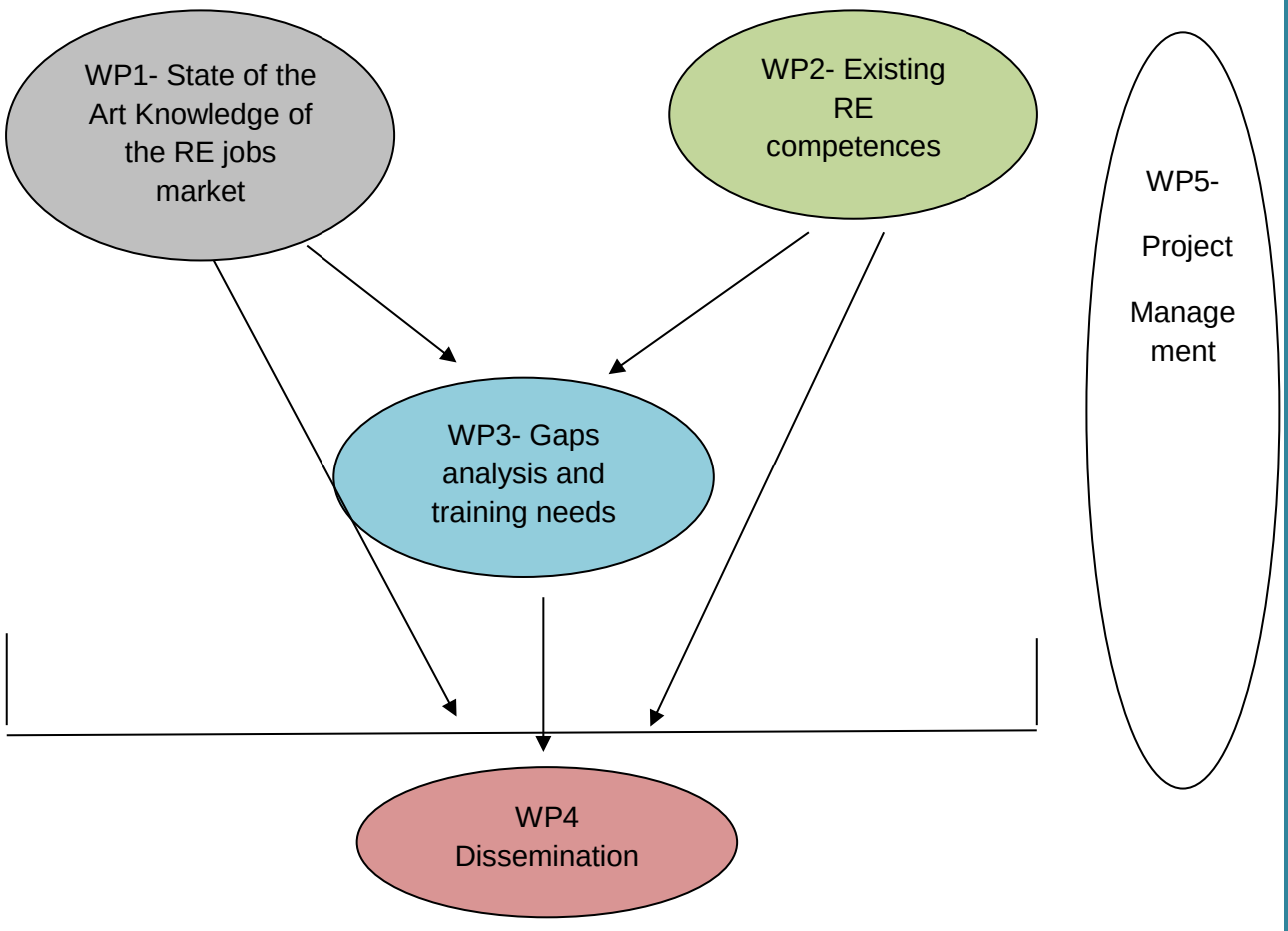

Figure 1: chart flow of the main project activities

1- SKILLS AND RENEWABLE ENERGY

1.1- ABOUT THE SKILL GAPS ANALYSIS REPORT

The Skill gaps analysis report identifies gaps and bottlenecks between the skills needed by the renewable industry and the competences currently available on the market.

This report puts together the results developed in the two first work packages of the KnowRES project by analysing where the gaps lie in terms of skills needed by the industry and available competences.

Identified target groups are: employers, candidates, and training and education institutions. KnowRES produces a set of sectorial reports and regularly updated EU wide Renewable Energy job profiles validated within the industry. A sectorial approach was selected due to its effectivity to analyse and strategically identify skills. In addition, technical sectors such as renewables are more sensitive to labour market imbalances and that can have a quicker impact on productivity and costs, it seems therefore more appropriate to select a sectorial approach[1]. Sectorial reports are based on information coming from energy agencies, companies, associations of the different industries, secondary sources, market analyses, etc. in which the accuracy and interpretation of the data are directly related to the objective of the agents involved.

In measuring a changing occupational structure, surveys of employers (companies and business sectors) and surveys of employees and candidates (labour force surveys) will be used:

[1] Please see KnowRES Deliverable 1.1 : *Good practices examples of industry friendly green assessment and forecasting tools enabling the detection of green skill gaps*

- **Employer surveys** can provide immediate information, including a useful measure of levels of activity and overall employment levels as well as the occupational structure within industries. They are also used to assess employers' opinions and perceptions about current skill deficiencies and anticipated future changes.
- **Employee or candidate surveys** are used for analysing skills mismatch at individual level, reflecting over-education (within sectors) or misemployment (across sectors).

This information is complemented by a screening of the relevant education and training programmes currently available on the market in the area of renewable energy.

A literature review of recent studies on similar and relevant topics have been performed, and a practical case study on the development of new education programmes based on a skill gaps analysis in the North of the Netherlands will illustrate the purpose.

1.2- EMPLOYMENT INTHE RENEWABLE ENERGY SECTOR

Even though the main purpose for the stimulus of the implementation of Renewable Energy technologies in industrialised countries has been to reduce the environmental impacts of energy consumption, renewables provide many other benefits in the social and economic fields.

Among other socioeconomic impacts such as energy security, economic growth, territorial cohesion, it is the **employment generation** which seems to gather most of the interest from various stakeholders. While companies are usually interested in the employment created by a specific project, public administration focus its studies in the employment created by a stimulus program and different associations of industries highlight the importance of the total employment in a sector.

As a result of the energy policy promoting renewable energy, a dynamic and continuously developing business sector has sprung up in Europe.

According to data from the Employ-RES project, in 2005 the European RES sector employed 1.2 million people, equal to 0.65% of the total EU workforce and generated €58 billion value added equal to 0.58% of EU Gross Domestic Product (GDP).

In 2011, only the direct gross value added generated by the renewable energy industry reached €93 billion, which is equivalent to 0.6% of total EU GDP. The renewable energy industry employed roughly 2 million persons or 0.8% of the total EU workforce.

Technically speaking, the gross economic impacts (as well as the employment impacts) of the RES industry include the renewable energy industry itself and the industries depending indirectly on the activities of the renewable energy industry, either as suppliers of the intermediary inputs needed in the production process, or as suppliers of capital goods. About 55% of value added and employment occurred directly in the RES sector and 45% in other sectors due to the purchase of goods and services.

Next figures show the evolution of the total gross value added and employment induced by RES deployment between 2005 and 2011.

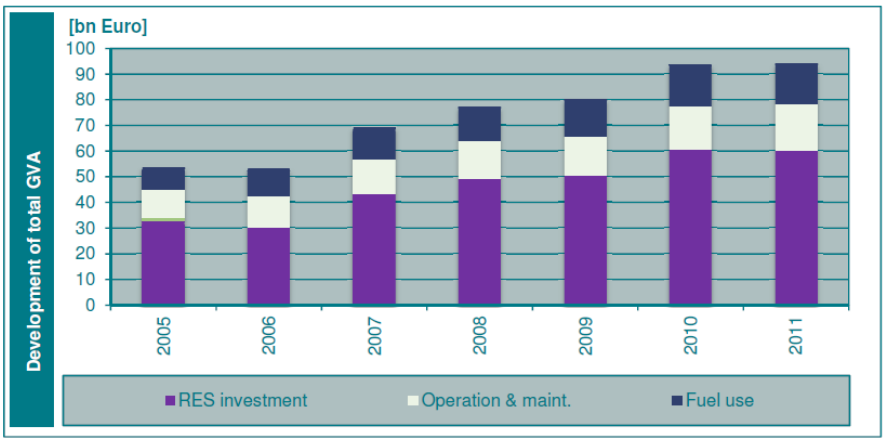

Figure 2: Development of total gross valued added induced by RES deployment between 2005 and 2011 (Source: Support Activities for RES modelling post 2020. Final Report)

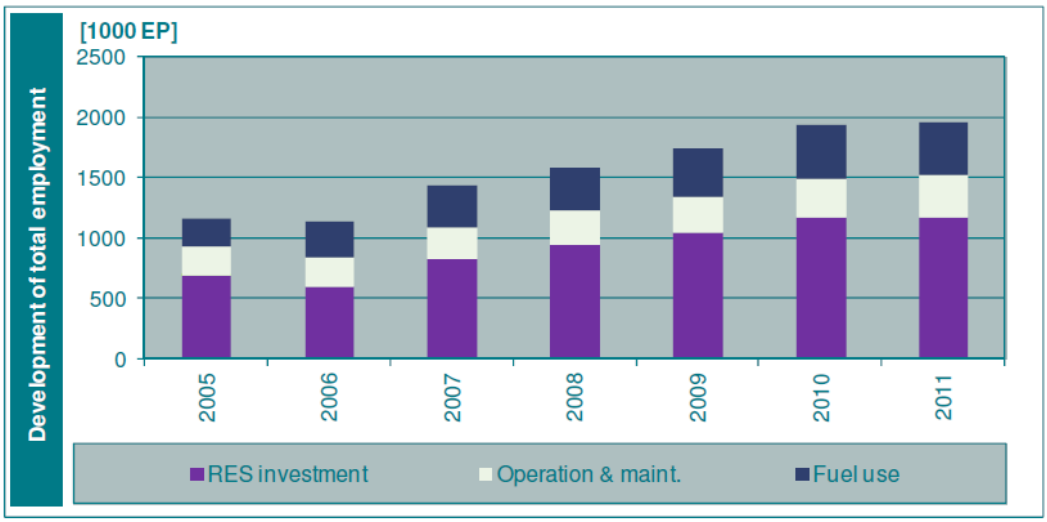

Figure 3: Development of total employment induced by RES deployment between 2005 and 2011 (Source: Support Activities for RES modelling post 2020. Final Report)

A comparison between total employment induced by RES deployment and the development of gross value added shows that employment grew less strongly. This is a direct consequence of the increasing labour productivity (the ratio of gross value added to employment) over time.

If technology and expenditure category are considered, photovoltaics, wind and biomass technologies, especially the non-grid-connected use of biomass for heating purposes are the most important accounting for the 23% of the total impact on the total gross valued added.

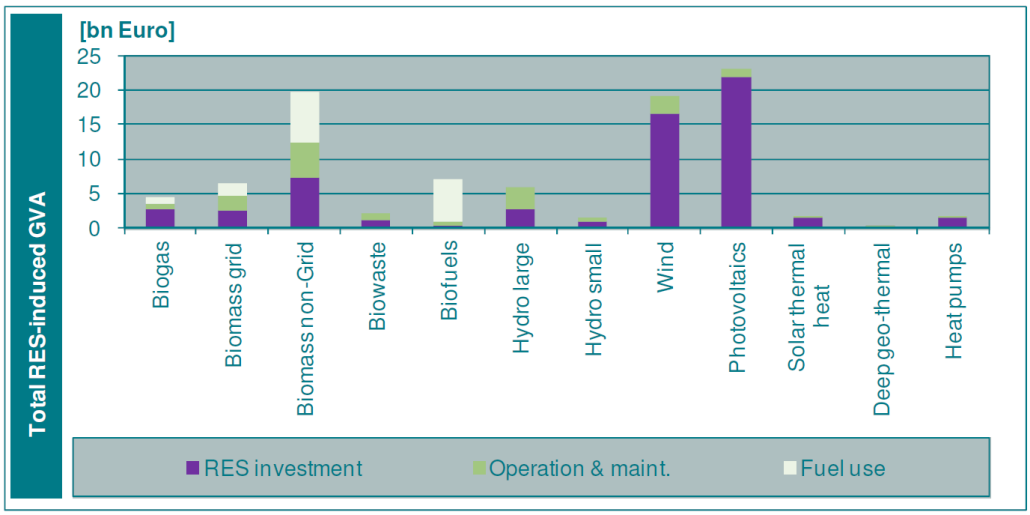

Figure 4: Total gross value added in the EU induced by RES deployment in 2011, by technology and expenditure category (Source: Support Activities for RES modelling post 2020. Final Report)

In terms of employment, non-grid biomass showed the largest share of employment in 2011, followed by PV and wind energy. Other important contributors are the other biomass technologies (except bio waste) and hydropower.

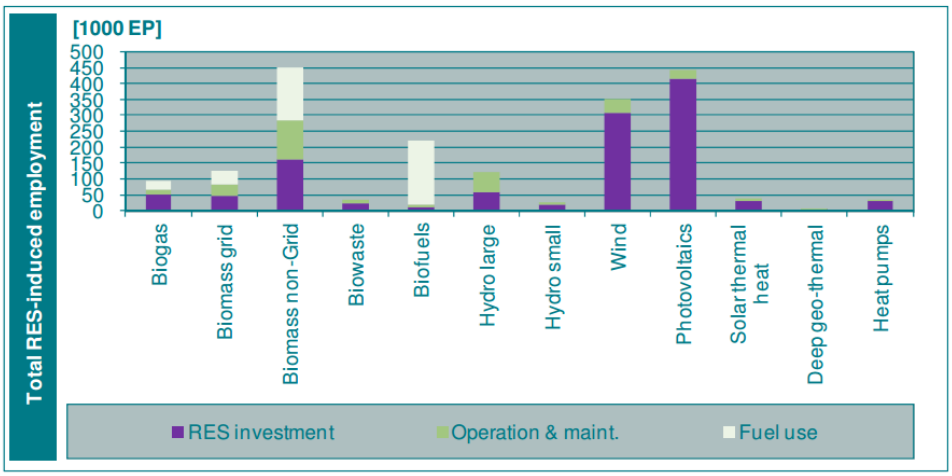

Figure 5: Total employment in the EU induced by RES deployment in 2011, by technology and expenditure category (Source: Support Activities for RES modelling post 2020. Final Report)

RES deployment in EU induces a substantial share of employment impacts in small and medium enterprises in the EU: two thirds of the total employment can be attributed to RES deployment. Regarding technologies, those having an above average relevance for SME include non grid-connected biomass use, biofuels and deep geothermal energy use. Additionally, this kind of technologies trigger to a larger extent indirect employment in sectors such as the primary sector, the wood industry or construction.

Employment is largest in Germany with approximately 450,000 jobs, followed by Italy with almost 300,000 employed persons and Spain, France and the United Kingdom with between 100,000 and 150,000. Employment is higher in the new Member States due to their significantly lower labour productivity. Furthermore, RES fuel use generally has a higher share in employment, since the connected primary sector is also characterised by relatively low labour productivity.

The majority of the studies on renewable employment are focusing on jobs generated in the construction stage of an installation and the stable jobs as result of its operation. However, the economic activities surrounding the exploitation of renewable energy are numerous and cover all the links of the supply chain of the energy business, from the component design and manufacturing to the O&M through the assembling, the installation and the commissioning.

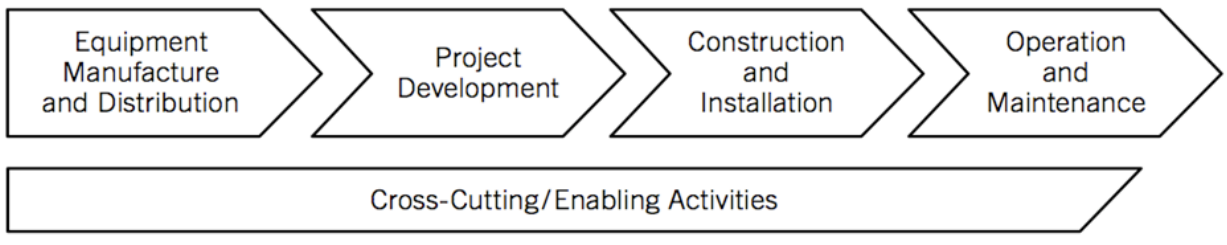

Figure 6: Renewable Energy value chain

Regarding quantity of jobs, it seems clear that there is a significant relationship between the stage of the activity in which the employment is created and the duration of this stage.

It is stated that renewable technologies have a common life cycle that includes 5 stages: research and design, development and manufacture, construction and installation, operation and maintenance or service and updating and/or dismantling.

Several differences were observed between the installation and start up stages, where duration of work is relatively short, and the stage of operation and maintenance (or fuel processing) in which duration of employment depends on the lifetime of the corresponding installation. It is also important to note that the employment that is more likely to remain in a region is related to the stages of operation and maintenance, and is, generally, not very labour intensive with the exception of the biomass sector.

An analysis of value added by economic sector shows that a broad range of sectors are active in directly or indirectly supplying the goods and services needed for the deployment of renewables. Countries with high investment expenditures in renewables (e.g. Germany or Denmark) see strong activity in the sectors supplying investment goods or in the construction sector. In countries with a strong use of biomass resources (e.g. France or Sweden), agriculture, forestry and the wood industry are important. In addition to the primary and the manufacturing sectors, trade, transport and other service sectors are also significantly involved.

For example, the wind power value chain incorporates five main stages: materials; components; manufacture; logistics, development and operations (which includes project development, geotechnical services, transportation, construction, and operations and maintenance); and end use. Every time a wind power project is installed it creates jobs, not only in the manufacturing sector, but also for structural engineers, surveyors, mechanics, sheet metal workers, machinists, truck drivers, construction equipment operators and wind turbine operators.

Next figure shows projections on the development of value added in 2030 and 2050 compared to 2011, subdivided by type of activity (investment in RE facilities, operation and maintenance of

existing RE facilities and use of biomass fuels in RE facilities). In a Business As Usual (BAU) scenario total value added will reach €75 billion, which is lower than the value in 2011. In the policy scenarios, value added in 2030 reaches amounts between €90 and 100 billion in the 30% target scenarios and about €120 billion in the 35% target scenario. Two policy scenarios are considered: *SNP= Strengthened National Policies* (continuation of the current policy framework with national RES targets - for 2030 and beyond- is assumed) and *QUO= quota* (in the case of the quota system, an EU-wide harmonised support scheme is assumed for the electricity sector that does not differentiate between different technologies). Value added in the SNP scenarios is slightly higher than in the quota scenarios due to higher RES expenditures.[2]

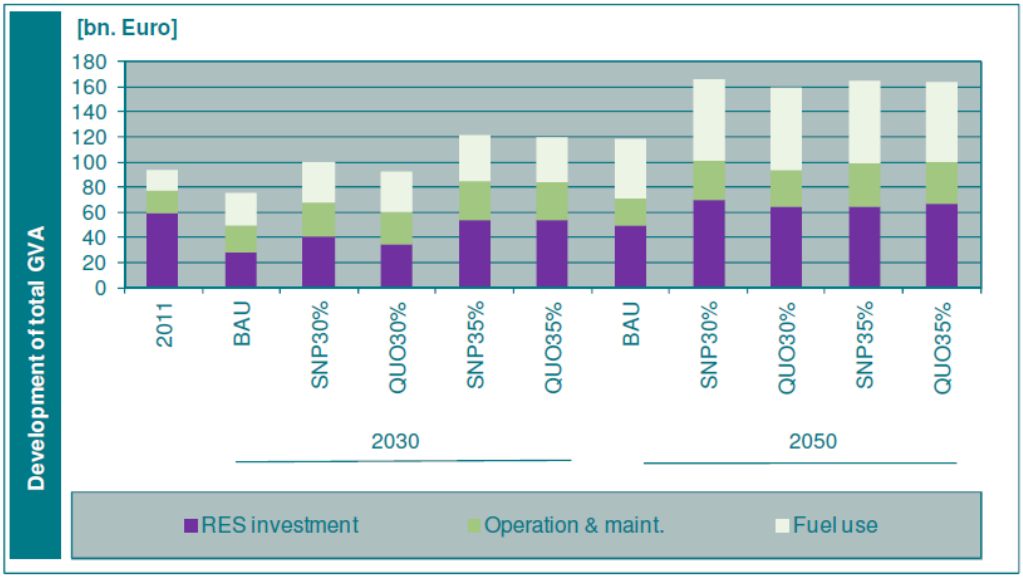

Figure 7: RES related gross value added in the EU-28 by type of activity (Source: Support Activities for RES modelling post 2020. Final Report)

[2] For more details on policy scenarios, please see: https://ec.europa.eu/energy/sites/ener/files/documents/EmployRES-II%20final%20report_0.pdf

All four RES deployment scenarios show moderately positive employment effects on the EU-28 level. For the different scenarios and models, the average results for 2021- 2050 range between just above 0% and 0.64% compared to BAU. However, the positive impact on employment would be higher with a more optimistic scenario. The development of GDP is a key driver of employment. Thus, the difference between the GDP results for the Member States also translate into differences in employment. However, the composition of the economies with regard to importance of labour intensive versus non-intensive sectors also plays a role.

Next figure shows the generation of employment in the four RES deployment scenarios:

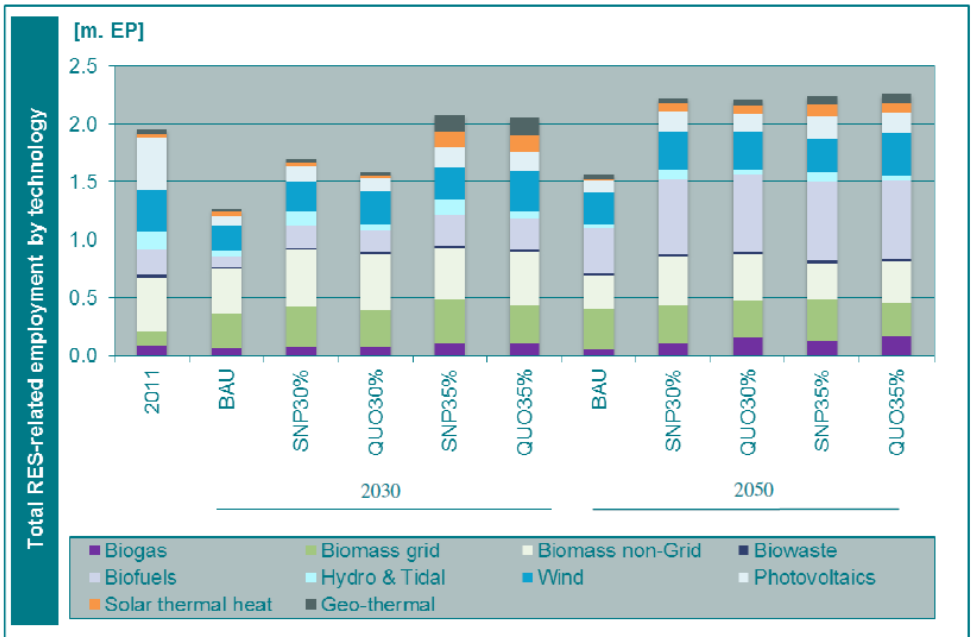

Figure 8: RES related employment in the EU-28 by technology (Source: Support Activities for RES modelling post 2020. Final Report)

If these previsions are promising in the current economic situation, the real impact of the exploitation of renewable energy on economic activity and ultimately on job creation must be analysed using factors such as ***maturity of the RE technology***, and ***availability of training plans***.

Besides other well-known factors, the growth of the renewable energy sector can be limited by the system's capacity to provide the labour market with professionals with the profiles that companies require. Although the specific skills of a sector can be acquired on the job or through courses offered by the manufacturers and incorporated into the company's own training plans, professionals are currently sought to join companies with a high level of training.

The training provided in engineering faculties and intermediate and higher level degrees guarantees generic and transferable knowledge but no specific skills in renewable energy as they have not yet been integrated into the official study programs.

2-OCCUPATIONAL NEEDS, SKILL GAPS AND LABOUR SHORTAGE

2.1- SKILL SHORTAGE IN THE RE SECTOR

Since the industry importance is constantly growing, the European Renewable Energy industry is expected to experience a rise in jobs creations. The demographic shift in Europe (lots of workers exiting the workforce) will also increase the number of jobs openings in all sectors.

The Renewable Energy sector will create jobs across the entire value chain from equipment manufacture, project development, construction and installation, to operations and maintenance. The majority of jobs will be found in the engineering and technical sectors, but not only, since project development needs skilled workers also from less technical fields, such as from finance or legal sectors.

If we focus on electricity generation projects, jobs needed will be associated with retail, installation and maintenance. In particular, 'new' and priority skills related to innovation may be needed, such as ***problem-solving*** and ***working with stakeholders***. Emerging occupations have been identified relating to the manufacture of renewable equipment (e.g. wind power design engineers), project development (e.g. wind resource assessment specialists), and production and operation (e.g. wind service mechatronics technicians; biomass production managers).
A single project in the Renewable Energy sector involves many workers in different positions; a wide range of backgrounds and skills is therefore needed.

Here are examples of positions that can be found all along the project development phase:

- ***Research, planning and development*** - e.g. data analysts, planners, software developers, GIS technicians, environmental analysts, oceanographers, ecologists, aerodynamics specialists, technical experts, scientists, mechanical and electrical engineers.
- ***Design and manufacture*** - e.g. procurement and selection of kit, technical designers, mechanical and electrical engineers, electrical and grid connection design, geophysicists, marine/technical experts.
- ***Construction and installation*** - e.g. project managers, contract managers, site management, cabling, civil engineers, construction.
- ***Operations and maintenance*** - e.g. grid connection, electricity generation, physical inspection and maintenance, technician.
- ***Support services*** - e.g. business development, communication and public relations, human resources, finance, legal support, administration, facilities management.

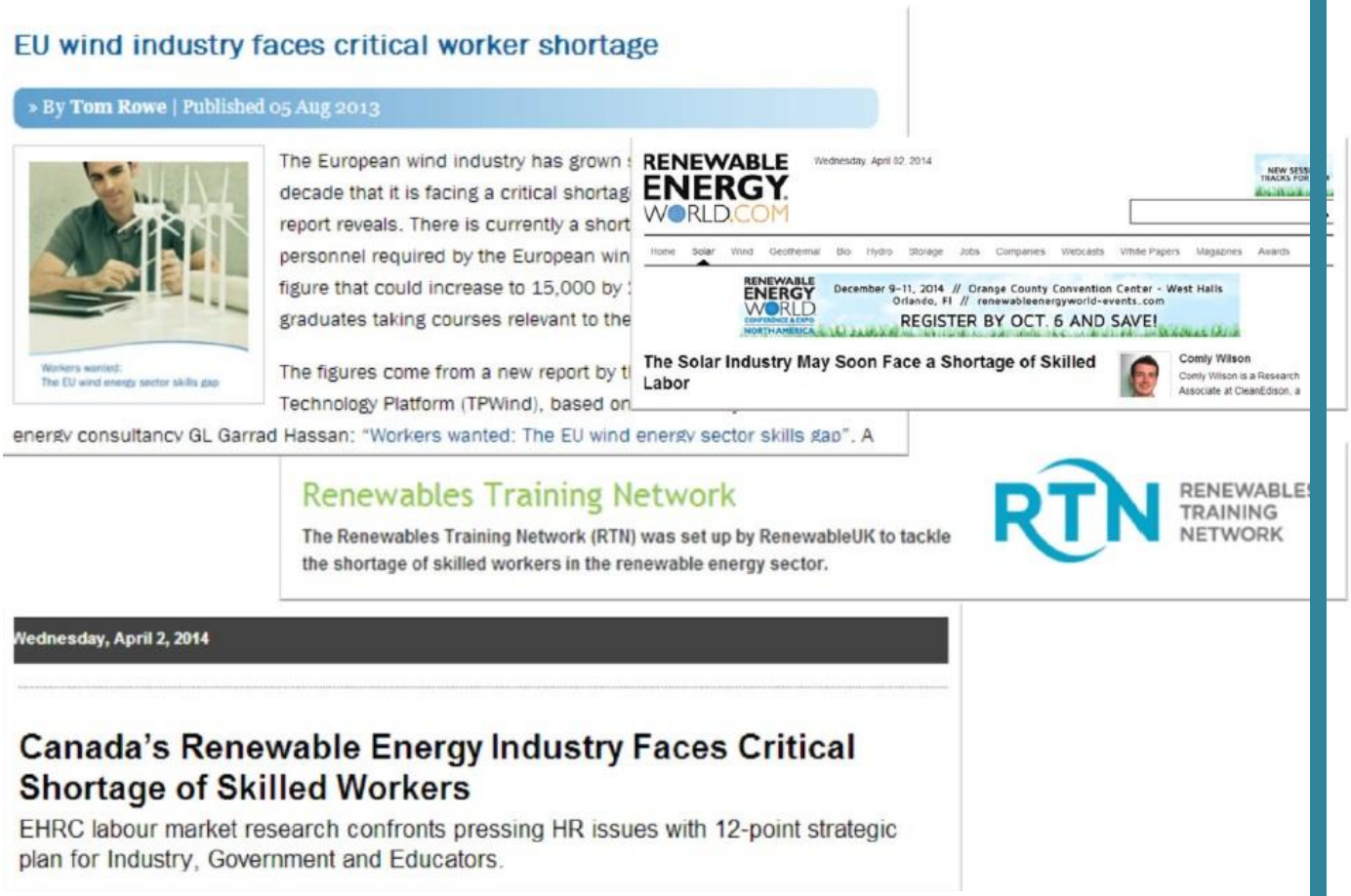

Figure 9: Several press titles on the RE skills shortage

The RE sector is already experiencing shortages in technical occupations, a focus should then be put on the STEM skills (Science, Technology, Engineering and Maths). "Core STEM subjects are needed for most roles in renewables," says Sophie Bennett, skills and employment policy officer at Renewable UK. "Some enter the industry through apprenticeships which offer the chance to gain paid experience and learn 'on the job' while studying for a qualification.

Alternatively, entrants can gain higher qualifications with relevant graduate and postgraduate courses. If you're a graduate in a STEM subject, you already have skills that are sought after. "Employers tend to look for entrants with professional qualification as a benchmark of competency and a sign of dedication and achievement. They are a good way to progress your career. The IET (Industrial Engineering Technology), IMechE (Institutions of Mechanical Engineers), and ICE (Institutions of Civil Engineers) are particularly relevant to renewables," she notes[3].

Nevertheless, it should not be the only concern, since many more general occupations, such as finance specialists, auditors and lawyers are also searched by companies. Shortages are therefore threatening in all type of occupations in the sector, from the STEM skills to communication, marketing and managerial skills.[4]

2.2- ANALYSIS OF COMPANIES SURVEYS RESULTS

In order to assess companies and organisations' challenges, their recruitment needs and projections, a tailor made survey was designed by the KnowRES Green jobs specialist and reviewed together with the concerned industry association's designated staff to ensure that the information to be collected would be useful and exploitable to all concerned parties (i.e. industry association, companies, training institutions/universities and job candidates). In this regard and for consistency purposes, it was important that all partners involved agreed on working with the same value chain and generic job occupations which were incorporated in the questionnaire.

[3] Sophie Bennett, skills and employment policy officer at Renewable UK. Quoted in *Working in the renewable energy sector*, http://www.theiet.org/apprentices/area-engineering/renewable-energy.cfm

[4] EU Skills Panorama (2014) Renewable energy sector Analytical Highlight, prepared by ICF GHK and Cedefop for the European Commission

The rationale behind the survey research is to assess current recruitment challenges and employment opportunities in the European renewable energy industry by providing an instant picture of the sector's job market with concrete information that could be exploitable immediately by concerned stakeholders.

All surveys are composed of 13 to 16 questions that are adapted to each sector covered by the KnowRES project.

Three questions that can be found in each of the six sectors are particularly relevant to understand skills needs and possible gaps:

- In the past years, did your companies come across any difficulties in finding suitable candidates?
- Do you anticipate any new job opening in the coming 1 or 2 years?
- What occupations/jobs are the most difficult to fill with qualified workers?

There are two fundamental dimensions of the labour market dynamics: changes in skills and competencies needs for existing or new occupations (content), and changes in the number of professionals required (volume).

"Skill" is defined as "the ability to perform specified tasks"[5] or to perform a productive task at a certain level of competence.

According to the International Labour Office, there might be two main causes of labour shortage in a sector:

- there are not enough people interested in working in an area with the underlying abilities required to do the job well; there are deficiencies in training and education arrangements that make it difficult for suitable people to develop the skills required (**skill shortage**)

[5] United Kingdom Commission Employer Skills Survey, 2010, p.4

- requirements change so quickly that the supply of skills that was broadly satisfactory in the past no longer meets requirements, and systems of skills anticipation, careers counselling and provision of training and education fail to keep up with change (**skill gap**).

A summary of the results from the industry survey related the skill shortage and gap for the following six sectors (biomass, photovoltaics, ocean energy, small hydropower, solar thermal electricity and geothermal)[6] is presented below:

BIOMASS

- **a skill gap** with 32 per cent of responses saying "the candidate had insufficient professional experience" and nearly 29 per cent saying "the candidate did not have appropriate education"
- **a skill shortage** with nearly 11 per cent of replies stating they did not receive enough applications for their job vacancies.

The labour shortage is mainly caused by the sector's skill gap, the lack of sector's attractiveness (working conditions, salary package) and leakage of workforce to other sectors. The consequences are delays in projects (longer recruitment processes), higher costs (raising salary trends) and a skill mismatch.

[6] For detailed methodology and overall analysis for each sector, please visit this page: http://www.knowres-jobs.eu/en/Jobs-and-skills/Jobs-barometer/

Bioenergy developments create employment all along the supply chain: forest management; logistics; commercialisation; production of boilers and stoves; installations; maintenance, etc. The majority of surveyed companies/organisations -almost **71 per cent- said they will be recruiting in the coming 1 to 2 years.** This is a testimonial of companies' confidence and optimism about the future of their businesses and consequently of the sector

PHOTOVOLTAICS

While the majority of companies (over 33 per cent) said they had no problem in finding suitable candidates to fill their job vacancies, the analysis of the replies shows:

- **a skill gap** with over 18 per cent of responses saying "the candidate had insufficient professional experience" and over 12 per cent saying "the candidate did not have appropriate education"
- **a skill shortage** with nearly 11 per cent of replies stating they did not receive enough applications for their job vacancies.

The labour shortage is mainly caused by the sector's skill gap, the negative reputation (due to some foul installations which shattered consumers' confidence), the lack of sector's attractiveness (working conditions, salary package). The consequences are delays in projects (longer recruitment processes), higher costs (raising salary trends) and a skill mismatch. Moreover, further discussions with stakeholders show the main recruitment challenges remain skill gap and staff retention in a context of cost reduction pursuit.

No new significant capacity additions are expected in the European PV market in the near future. Current activities in Europe are mainly focusing in increasing the performance of existing installations, acknowledging the growing importance of **Operations & Maintenance (O&M).**

Given the market shift from Europe to countries such as China, Japan or the USA for new capacity addition of solar PV, European companies are looking to recruit people who are **flexible and adaptable** not only to a changing market but also to new market, new network and new countries.

OCEAN ENERGY

The replies gathered from companies tend to show that there is no relevant skill shortage in the sector given that nearly 70 per cent of them responded that their company never had any problem in finding suitable candidates. This can be misleading because many companies simply do not have recruitment needs for the moment and some companies have not hired any additional staff for the past 4 to 5 years.

There is however a **skill gap** or skill mismatch as almost 27 per cent of companies said the candidates had insufficient professional experience while some companies stated that the selected candidates was not willing to relocate because of the low attractiveness of the duty station. The many positive replies (74%) to the question on future jobs openings show that the sector is expected to be hiring quite a number of staff for the following occupational functions with engineer and non-engineer backgrounds

SMALL HYDROPOWER

Data analysis tends to show that there is a **skill gap** in the sector given that 31 per cent of companies had difficulties in finding suitable candidates because they had insufficient professional experience while 25 per cent did not have appropriate education. However, 37 per cent of companies never had problem in finding suitable candidates to fill their job vacancies. While mobility does not seem to be an issue, the lack of language skills is problematic especially in project involving transnational collaboration. 60 per cent of companies/organisations said they

are forecasting new recruitments in the near future (i.e. six months to one year-time). Among the rest, 22 per cent are not recruiting at all while 18 per cent of companies are still uncertain about their recruitment planning as recruitment for them are directly linked to projects in the pipeline for which contracts are awaiting for signature.

SOLAR THERMAL ELECTRICITY

- **a skill gap** with 25 per cent of responses saying "the candidate had insufficient professional experience" and nearly 14 per cent saying "the candidate did not have appropriate education"
- **a skill shortage** with nearly 9 per cent of replies stating they did not receive enough applications for their job vacancies.

While 4/5 of the companies said they will be hiring in the near future, the detail of the job to be filled remain often quite generic. For instance many companies cited engineering or project manager occupational functions. However the more specific job vacancies could be classified as follows:

Phase I: Pre-assessment project development

- Marketing
- Central receiver design (CFD)
- Sales

Phase II: Equipment manufacture and distribution

- Modeling of process (meteorological for technical application)
- STE Development (modeling, programming)
- Automation, process, material sciences (fluid)

Phase IV: Operation & Maintenance

- Leaks repairs and hot tapping services

Cross cutting/enabling activities

- Business development

GEOTHERMAL

- **a skill gap** with 17 per cent of responses saying "the candidate had insufficient professional experience" and nearly 10 per cent saying "the candidate did not have appropriate education"

Nevertheless, we cannot talk of a skill shortage, since less than 4 percent of companies replied that they did not receive enough applications for their job vacancies in the geothermal sector.

More than half of the companies had no particular difficulty to find a suitable candidate to their jobs openings.

2.3- MOST WANTED PROFILES

The most wanted profiles companies or organisations that replied to the survey are currently looking for are:

BIOMASS

- Engineers profiles (mechanical engineer, process and construction, production and control)
- Business developer and/or technical sales
- Research engineer

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PHOTOVOLTAICS

- Technology researchers for manufacturing
- Field technicians (Operations & Maintenance)
- Engineers (PV system designer) for project planning

OCEAN ENERGY

- Project manager
- Structural engineer
- R&D engineer

SMALL HYDROPOWER

- Business development manager / Technical sales
- Field service technician
- Mechanical design engineer

SOLAR THERMAL ELECTRICITY

- Technology researcher
- Chief Sales & Marketing officer
- Solar Thermal O&M Technician

GEOTHERMAL

- Drilling engineer
- Hydrogeologist
- Project Manager

2- SKILLS RESPONSE

3.1- EXISTING TRAINING

Training and skills development is understood in broad terms, covering the full sequence of life stages. Basic education gives each individual a basis for the development of their potential, laying the foundation for employability. Initial training provides the core work skills, general knowledge, and industry-based and professional competencies that facilitate the transition from education into the world of work. Lifelong learning maintains individuals' skills and competencies as work, technology and skill requirements change.[7]

Training in Renewable Energy has quickly increased over the past few years. However, employers still face difficulties finding qualified people to fill some jobs opening
A number of EU Universities developed Master programmes related to the field, and a number of summer schools or other short term training courses appeared in Universities offers in the last five years. Vocational training and in-house training in companies are also increasing.

Concerning the offer for Master programme, European Copper Institute, in collaboration with EUREC and the IRENA Renewable Energy Learning Partnership (IRELP), published a report on European postgraduate programs in sustainable energy. The report is intended for students interested in pursuing education in the field and provides a comprehensive overview of the landscape of programmes offered in Europe. While European graduate and post-graduate programmes in renewable energy can vary in terms of duration, content, curriculum, level of detail, degree, etc., there are a few common characteristics that can be used to segment them.

[7] *A Skilled Workforce for Strong, Sustainable and Balanced Growth*, ILO, 2010