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Towards a low carbon electricity industry: employment effects & opportunities for the social partners

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Since 2008, the European electricity sector has been a priority for the European Union due to both the demand from European citizens and businesses for energy over the coming years and the challenges posed by climate change. In 2008 the European Commission set out a package of measures to tackle climate change stating that the sector must reduce its CO_2 emissions by 2020 which would require a programme of modernisation. This in turn would require an increase in the use of renewable energies and a reduction of energy consumption through improved efficiencies. However these proposals require European electricity employers and their workforce to play a fundamental role in the adaptation of the industry to meet these demands and in doing so ensuring there is a match between the skills of workers and those required in the sector's labour market.

The transition should be a "Just Transition": this concept can be seen as the shift towards a more sustainable and environmentally friendly economy, based on social dialogue between governments, employers and trade unions, in a way that promotes high economic growth and investments in low-carbon technologies, while ensuring a smooth social transition through adaptation and mitigation actions as well as through the development of skilling and reskilling programs (or just new skills) and the creation of quality jobs.

The current economic crisis has further compounded the challenges in achieving these targets, although the crisis reduces the speed of the transition to a low carbon economy across Europe, it also provides an opportunity. Much more than a constraint, an ecological New Deal, encouraging investments and innovation, can be a real rebound opportunity for the European economy.

It is also clear that the electricity industry is a significant employer and contributor to the development of the wider economies both nationally and locally. Recognising this strategic position electricity companies should engage with both national and local tiers of government together with their regulators on their future development and investment plans.

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4. Executive summary

The European energy sector faces a number of challenges in the coming years and is at the present time at a crossroads of the different priorities of the European Union - the fight against climate change and the implementation of the EU 2020 strategy. The transformation of the electricity sector will involve changes to the occupational structure, skills and competencies and career paths in the electricity sector. How can the social partners engage this transformation to be a “just transition” ?

According to the IEA, worldwide electricity demand will double between 2007 and 2050. In Europe, growth is predicted to be lower but nevertheless representing an increase of 30 per cent, in a context in which the EU has introduced measures aimed at harmonising its domestic markets and gradually liberalise internal markets for electricity.

In 2008, the distribution of electricity production capacity in Europe by fuel was: conventional thermal represented the main part with 53%, then hydro with 22 %, followed by nuclear with 15%, and finally the RES (without hydro) represented only 10% of the total. But Europe is witnessing a rapid expansion in renewable energies, these include wind, photovoltaic, biomass, geothermal, solar thermal, wave and tidal.

Literature identifies three types of scenarios for Europe’s future energy mix for the period 2030 to 2050: Baseline scenarios, Pro-renewable scenarios, and scenarios that promote a balanced mix. A well-balanced mix combining renewable and traditional energy production is possible, even with a commitment to decarbonising electricity production as new technologies, like carbon capture and storage, develop. Major advantage of this mix is that it already matches existing demand, and in the future will also require the building of fewer new production sites.

The European electricity network ought to be modernised to take into account this energy mix. New grids (smart grids and super grids) will be necessary to provide a more user-oriented service, enabling the achievement of the 20/20/20 targets and guaranteeing high security, quality and economic efficiency of electricity supply. Although a great deal of consideration is being given to the future of these networks, the question of financing remains unresolved.

There is an urgent need to increase investments in low carbon technologies due to the fact that investments currently being considered are deemed insufficient to ensure an efficient economic transition. Future needs are considerable: according to the IEA, globally investments that are required, according to a baseline scenario, are estimated to be $ 23.5 trillion for the period 2010 to 2050, with an additional $9.3 trillion in a green scenario. It is also necessary to secure and optimise investments in order to allow new technologies to progress and evolve. Both public and private investment will be required and international collaboration will need to be better organised in order to maximise the impact of these investments. In addition, financial incentives will need to be established to encourage companies to participate in this evolution.

Electricity companies need to be aware that the European labour market will begin to contract from 2020 due to the number of workers retiring and the lower rate labour market

entrants. The impact of these changes will be compounded by the relatively higher age of the Electricity workforce.

In terms of number of jobs, studies consider an increase in the workforce of the electricity sector, but with differences between types of fuels. Coal and oil fuelled power plants will see their workforce reduce, while gas and renewables will increase. Rhythm of deployment of clean coal technologies like CCS will also influence these evolutions. In the distribution field, evolutions are more difficult to estimate, with the introduction of smart meters destroying jobs (traditional meter reading) and creating new ones (advices for reducing energy consumption for example).

The enormity of its impact means climate change will be one of the key drivers in skills demand for coming decades. It is widely accepted that work in the future will require job holders to possess a higher level of skills than it does at the present and this is due to a number of reasons including the increased use of technology in work. Studies on this subject have identified skill needs in generic skills (leadership…), in STEM skills (science, technology, engineering and mathematics), and in e-skills. For transmission and distribution, new skills would be required to fill the skills gap generated by the technological changes that will be introduced in the future, notably in the context of DSOs (Distribution System Operators) and new tasks will emerge, particularly in connection with the technological risks' supervision.

Skill strategy responses will have to be well organised and must anticipate future skill needs in order to establish effective training programmes for workers. In addition the anticipation of what skills are needed in the future is essential if the appropriate actors are to balance the demands from the industry with the supply of labour with the appropriate skills. Just over a third of employers said that their company has undertaken specific initiatives to forecast their skill and competency requirements for the future.

Skills investment should concern not only the amelioration of training and educational infrastructures and programs, but also about putting in place some incentives in order to motivate workers to follow the training.

Social dialogue appears to be an essential component to *make such transition more fair and efficient, but* just half of all companies and trade unions who completed the survey stated that discussions have already taken place and that no specific initiatives had been introduced yet. Moreover, half of the employer respondents stated that they were "unsure of the value of discussing the issue [of climate change] with the trade unions", suggesting more needs to be done to mainstream issues related to climate change into the work of social dialogue.

Both trade unions and employers consider that the public authorities have a genuine role to play in supporting the sector adapt in the coming years, especially in improving skills and competencies to match the supply of skills with the demand from companies.

5. Introduction

The European energy sector faces a number of challenges in the coming years and is at the present time at a crossroads of the different priorities of the European Union - the fight against climate change and the implementation of the EU 2020 strategy. As a consequence the European Commission's energy-climate package, commonly referred to as the '3x20' target, was adopted in December 2008, the purpose of which is to increase the share of renewable energies in Europe's energy mix by 20 per cent by 2020. In addition it seeks to reduce EU's CO_2 emissions by 20 per cent, and to increase energy efficiency by 20 per cent. Given that electricity accounts for a third of all CO_2 emissions from the European industrial sector, these ambitious targets will require a bold and comprehensive transformation of the European Union's electricity sector. Fortunately, unlike some other producers of carbon dioxide electricity generation sector has an enormous potential for reducing its emissions.

The focus within this project is to examine the extent to which the changes that are going to take place can be done so through a Just Transition. The concept of a Just Transition is generally hard to define and varies from person to person. However for this project the social partners have agreed the following definition:

"Just transition can be seen as the transition (or shift) towards a more sustainable and environmentally friendly economy, based on social dialogue between governments, employers and trade unions, in a way that promotes high economic growth and investments in low-carbon technologies while ensuring a smooth social transition through adaptation and mitigation actions as well as through the development of skilling and reskilling programs (or just new skills) and the creation of quality jobs."

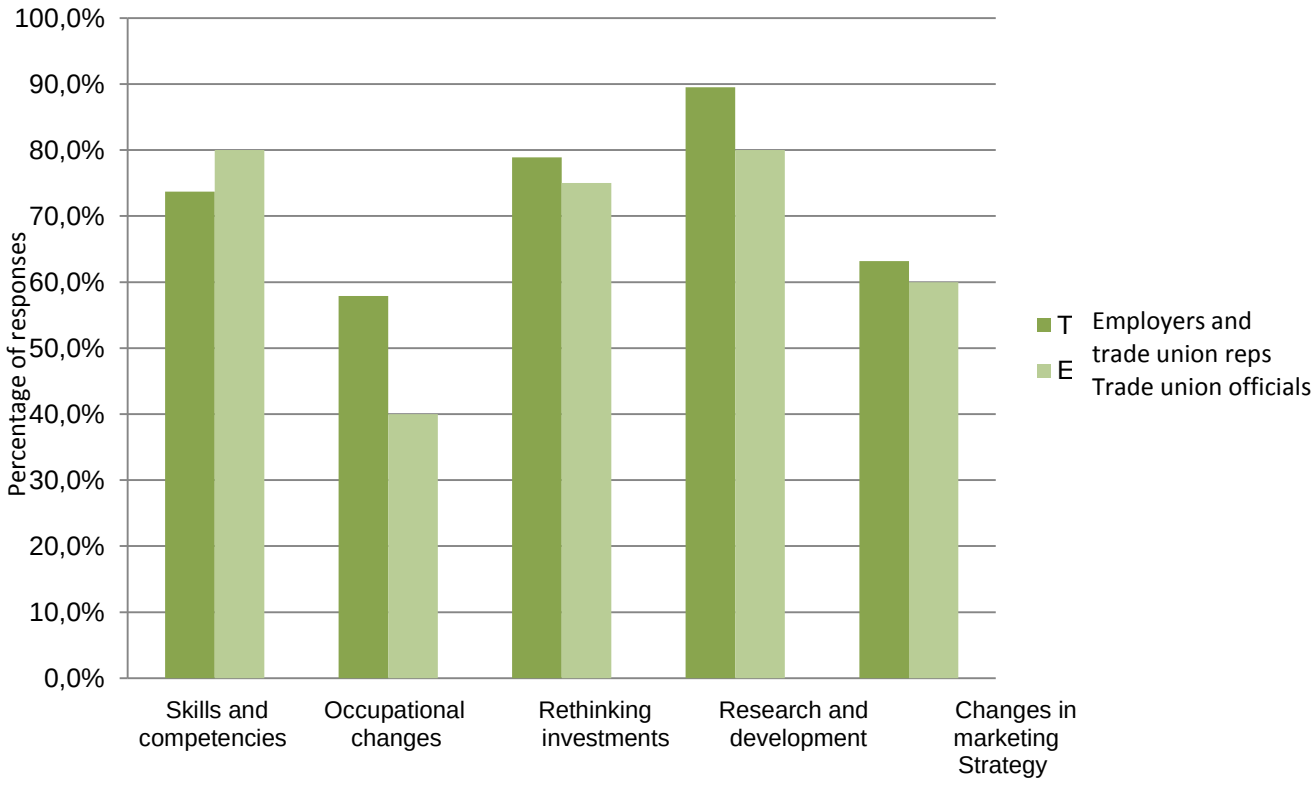
Mr. Juan Somavia, ILO Director-General, said: *"It is indispensable to act very quickly to facilitate economic recovery and job creation at the same time as to prepare a more well-balanced, more just, more long-lasting and environment-friendlier world economy."*

The transformation of the electricity sector will involve changes to the occupational structure, skills and competencies and career paths in the electricity sector. This means that not only will employers need to think about how they do this, but also consider how they can ensure that employees are part of this change.

Opinions expressed by both trade unions, employers and local trade union representatives in the survey demonstrate a general awareness of the challenges posed by climate change and the concept of Just Transition by the social partners. A majority of employer and local trade union representatives surveyed felt they had an adequate knowledge of Just Transition whilst, the knowledge of full-time union officials was more evenly distributed across the 'not very good', 'adequate', and 'very good' options. In terms of the perception by the social

partners on the sector's readiness to confront the challenges ahead, company level respondents (employers and trade unions) felt that their company is preparing to face the challenges while the perception of the majority of responding full-time trade union officials was that companies are unprepared.

Graph 1: How will European electricity companies be affected by climate change?



Although there are small discrepancies between the views of employers and trade union workplace representatives and full-time trade union officials, the general concern is that climate change will impact most upon research and development, investment strategy and skills and competencies.

The European electricity sector is at the beginning of a large transformation process impacting on electricity production, transmission and distribution. This transformation will take decades and will strongly impact upon jobs and qualifications within sector. As a result of this transformation the size, structure and occupational composition of the sector's labour force will look very different than they do today. However the structure of the entire European labour force is changing and will continue to evolve in parallel. The demography of the labour force will mean that previous solutions may need revising. For example as the European labour force contracts around 2020 the traditional system of early retirement as a

solution to the contraction in the number of jobs at company level may not be an option particularly as this is also likely to be impacted by anti-age discrimination legislation.

The number of jobs created or destroyed is determined by a number of factors including the rate at which technology is introduced, the speed at which the industry evolves and the reaction, or anticipation, of the sector's employers. While the contraction of jobs in some areas (coal-based power plants) will not be fully compensated by the development of renewables, additional jobs will be created, particularly in transmission and distribution. Many new jobs will emerge (for example Smart Meter installers) replacing existing occupations (traditional meter readers). This will place an onus on companies to heavily invest in training and re-skilling. However even if the size of energy sector's labour force increases in the future, the new jobs that will be created will be fewer in number than those current jobs which will need to adapt to the new environment. So the sector will need to place a higher priority on re-skilling than on the recruitment of workers with different skills, even if recruitment will also be needed as large part of workforce will retire before 2020.

Companies considering simply recruiting new entrants with the right skills to avoiding developing training programmes for their current employees need to beware: By 2020, the European labour force will begin contracting as workers in their 50s now reach retirement and are not replaced in the same numbers by new entrants. Compounding this problem is that fact that a number of occupations will be in demand by many employers across many sectors, creating a shortage of particular skills and competencies. Europe's ageing population has implications for its labour markets. Unless technology can reduce the need for labour immigration will need to increase in the medium term bringing possible social and political collateral issues.

Methodology

The study was realised on the basis of an extensive literature review, on the expected evolution of the electricity system in the coming decades (production, but also transmission and distribution[1]), its impacts in terms of employment and skills, mostly in Europe and a few ones at a worldwide level. For a complete listing of documents studied, please refer to the bibliography section.

In order to capture the full range of views from the sector two online surveys were done among the affiliates of the European social partners – one for employer and local workplace trade union representatives and another for full-time trade union officials. It was felt that the first trade union group would be in a better position to respond to specific company related

[1] These are not the only components of the industry. More people are typically involved in customer - facing activities such as call centres and in energy services contracting

questions, while the latter would be in a better position to offer more of an overview of the sector within their country. The survey asked a number of questions across a broad area including general and company specific information and ranged from issues related to climate change, skills and competencies, the labour market, joint initiatives and forecasts for the future of the sector. In total 19 responses were collected from employers, 6 from local trade union representatives and 24 responses were received from trade union full-time officials.

The survey made clear to all respondents that the researchers would not, without their express permission, divulge sensitive company information or link, in this report, the names of the respondents and their responses. Only the researchers have access to the data collected.

Due to the response rate (49) the survey responses cannot be taken as representative of the sector as a whole. Nevertheless, the responses do offer an insight into the views of the sector social partners from a broad range of countries.

6. Current trends of the European electricity sector

This section brings together current academic research on climate change and employment and the findings of the survey to produce a clear picture of the threats and opportunities, patterns and trends which the sector will face over the coming decades. It will highlight the views of the social partners on the important issues and draw conclusions from these.

The second section of this publication will examine the key points raised through case studies, within the sector and elsewhere, and available literature seek to offer practical guidance for the social partners. The section will also highlight a number of key areas on which the social partners might usefully focus their energy, and provide guidance and illustrations of good practice to guide them towards producing deliverable and sustainable long term solutions.

6.1 General background

The global population, according to the IEA (International Energy Agency) World Energy Outlook 2009, will increase by an average of 1 per cent a year, from 6.6 billion in 2007 to 8.2 billion in 2030. The European population will grow at a slower rate but even its projected increase of 0.3 per cent a year will have implications for the demand of electricity. The demographic changes which will affect all European countries over the coming decades will

also have serious implications for the demand of energy and the labour market and this is covered in section 2.5 of this document.

According to the IEA and its Energy Technologies Perspectives in 2010, worldwide electricity demand will double between 2007 and 2050. In Europe, growth is predicted to be lower according to the EIA which expects electricity demand for OECD European countries to increase from 3136 TWh in 2007, to 4071 TWh in 2030 - in the BLUE map scenario[2] – representing an increase of 30 per cent.

Given energy's complicated geopolitical context and the predicted increase in demand, the European Union has decided to focus on security of supply. This has direct implications for the means of production of electricity in Europe. To achieve its goal and reduce its dependence on imported fossil fuels to generate its electricity, the European Union will increasingly need to look to low-carbon technologies, at levels capable of meeting the expected increase in base load and peak demand.

The evolution of the energy sector in Europe:

- European Union's strategy vis-à-vis the energy sector: making it more competitive in terms of international competition (energy being a major input in industrial products), while taking into account the environmental issues.
- The sector is moving towards greater independence[3], vis-à-vis hydrocarbon producing countries, with the intention of assuring price control and greater security of supply.
- The EU has introduced measures[4] aimed at harmonising its domestic markets and this has resulted in the emergence of a specific policy on energy.
- In practice, these measures have had a direct impact on the electricity sector in Europe (gradual liberalisation of internal markets for electricity as per Directive 96/92 of 1996 which promotes the creation of a European electricity market[5]).

[2] Blue map scenario from the IEA is based on the assumption of 50 % reduction of GHG emissions in 2050 relatively to 2005. Based on optimistic assumptions about the progress of key technologies, the BLUE Map scenario requires deployment of all technologies involving costs of up to USD 200 per tonne of CO saved when fully commercialised

[3] European Union energy security and solidarity action plan. COM (2008) 781

[4] Directive 2005/89/EC of 18 January 2006, regarding measures to safeguard security of electricity supply and infrastructure investments.

[5] This Directive was repealed by the 2003 Directive (2003/54/EC). It was recently replaced by Directive 2009/72/EC. The 2009 Directive aims to better define the European electricity market in terms of environmental issues which should be more competitive, safer and more sustainable.

6.2 Expected changes in electricity generation

6.2.1 Current Trends

At present, in the context of electricity production, Europe is witnessing a rapid expansion in renewable energy technology which coexists with conventional approaches. In recent years so-called renewable technologies have been developed alongside conventional means such as, oil, gas, coal. Renewable technologiesinclude hydro, wind, photovoltaic, biomass, geothermal, solar thermal, wave and tidal. Nuclear technology which is low carbon contributor straddles the two. It is clear that while some of the renewables rely upon technology that is still being development, others are further ahead or indeed well-established.

Table 1: The distribution of electricity production capacity in Europe by fuel in 2008

Technology	**Capacity (%)**	**Production (%)**
Conventional thermal	53	53
Nuclear	15	25
Hydro	22	16
RES (without hydro)	10	6

6.2.2 Energy mix scenarios for 2030-2050

From existing literature on the subject it is possible identify three scenarios for Europe's future energy mix for the period 2030 to 2050:

- Baseline scenarios, based on actual tendencies
- Pro-renewable scenarios
- Scenarios that promote a balanced mix

The Baseline scenario is used extensively as the comparator (the standard) for all recent analyses. While the name of this scenario varies from one study to another, all posit the same hypothesis - they assume the continuation of current tendencies of usage and in the majority of studies, the authors have integrated the latest stages of the European legislative framework into their analysis. The conclusion of this scenario is that Europe's dependency on fossil fuels will increase over the coming years which would result in a doubling of the current CO_2 emissions from the production of electricity.

In the Pro-renewable scenarios, studies assume that a greater share of Europe's future energy production will come from renewables, and has gained popular support from various NGOs[6]. Their preference for the pro-renewable scenario is borne out of their opposition to nuclear and fossil fuels use. Their position can therefore appear to be rather ideological potentially compromising a thorough objective assessment of the way electricity systems operate and of the EU energy needs for the future.

Other scenarios propose a **mix and a greater balance** between conventional and renewable energies. Numerically most studies align with this scenario.

- The Blue Map scenario from the IEA suggests that up to 2050, there will be a more balanced energy mix between fossil fuels and renewables. However, this scenario emphasises that the generation of energy from fossil fuel plants without CCS would in fact be abandoned and the proportion of renewables in the energy production mix would reach about 55 per cent by 2050.
- The '450 scenario', also from the IEA suggests that the global share of renewables will increase to reach 37 per cent by 2030 and that the share of nuclear will increase becoming more significant.
- European Commission scenario (DG TREN), built in 2007.
- The NSAT Syndex scenario, developed by Syndex, S.Partner and WMP Consult in 2009, suggests that both traditional and renewable forms of energy production are interesting because of their complementarities.
- Power Choices, from EURELECTRIC is based on the PRIMES model, and is a comparative scenario along the lines of the *baseline scenario.* It is based on the premise that by 2050 the European Union would have reduced its emissions of greenhouse gases by 75 per cent. To achieve this reduction in the energy sector, the model assumes a decrease in the demand for energy and a simultaneous increase for electricity due to the progressive fuel-switch in favour of efficient electro-technologies in transport, heating and industrial processes. To meet this increased demand, a variety of options should be implemented. However in order to achieve this existing technologies will need to be improved and this is particularly the case for the production of nuclear, gas and coal (e.g. developing new technologies for capturing and storing carbon). According to EURELECTRIC the energy mix balance will comprise RES, with a 40.4 per cent share of the total, followed by fossil fuels (primarily coal and gas fired plants with CCS), with a 30 per cent share, and Nuclear (28.4 per cent).

[6] Greenpeace (2009), WWF (2008)

These scenarios underline a proposition that a well-balanced mix which combines renewable and traditional energy production is possible, even with a commitment to decarbonising electricity production as new technologies, like carbon capture and storage, develop.

A major advantage of this mix is that it already matches existing demand, and in the future will also require the building of fewer new production sites. According to the study *"Roadmap 2050: a practical guide to a prosperous, low carbon Europe*" from the European Climate Foundation, for the same production of 4,900 TWh a year in 2050, a well-balanced mix (40 per cent REN, 30 per cent nuclear and 30 per cent fossil fuels with CCS) would require 1,280 GW of power, whereas a mix composed of 80 per cent renewables requires a power of 2,020 GW as back-up capacity is required. The resulting difference of 60 per cent will be a key cost consideration for energy companies.

6.3 Evolution in electricity transmission and distribution systems

The European electricity network ought to be modernised to take into account this energy mix. Although a great deal of consideration is being given to the future of these networks, the question of financing remains unresolved.

6.3.1 Traditional electricity grid

According to European Technology Platform Smart Grids, "Europe's electric power system is one of the largest technical systems in the world serving 430 million people, with 230,000 km of transmission lines at the highest voltage levels of between 220 kV and 400 kV and 5,000,000 km of distribution lines at medium and low voltage levels[7]." Nevertheless, the network, as it stands today, faces a number of obstacles:

- It is a centralised system. "The electricity grid has traditionally been developed, designed and implemented in such a way that electricity flows one-way from large generators to widely distributed loads[8]".
- It is a fractured system which separates the various stages of the energy cycle, with production and power plants on one side, the transport network on another and the distribution system on yet another

The current grid system must evolve to better integrate different sources of electricity and "Together with changing demand and generation profiles, this will require changes in the

[7] European Technology Platform Smart Grids, *Strategic deployment document for Europe's electricity networks of the future.* December 2008
[8] IEA/OECD - ETP 2010

design, operation and deployment of electricity networks[9]". This need for change is often now described in terms of a 'Smart Grid'.

6.3.2 New grids

There is at present no official international definition of the smart grid and a number of definitions co-exist. One of these, proposed by the US NATIONAL INSTITUTE of Standards and Technology in its report on Smart Grid Interoperability Standards Roadmap of June 2009, suggests that smart grids represent "the modernization of the electricity delivery system so it monitors, protects, and automatically optimizes the operation of its interconnected elements from the central and distributed generator through the high-voltage network and distribution system, to industrial users and building automation systems, to energy storage installation and to end-use consumers and their thermostats, electric vehicles, appliances, and other household devices".

One of the objectives of future transmission and distribution electricity networks will be "to enable consumer interaction with the grid, both through incorporation of small-scale distributed generation technologies and through demand response coupled with greater energy efficiency based on data and information received on real-time prices and conditions"[10].

In Europe, the ENTSOE[11], in its response to a public consultation on Smart Grids emphasized that *"Smart Grid, is a process to transform the functionality of the present electricity transmission and distribution grids so that they are able to provide a more user-oriented service, enabling the achievement of the 20/20/20 targets and guaranteeing, in a competitive market environment, high security, quality and economic efficiency of electricity supply*", Another thing is the "Supergrid challenge": the long term vision of a "Pan-European" grid able to deal with the 2050 power system challenges.

6.4 Investment needs and solution to facilitate the technology transition

To achieve an ideal electricity mix, generation integrating in a smart transmission and distribution system, as part of the transition to low carbon economy is imperative. To make this possible additional investment will be necessary.

6.4.1 Current investment

Examples of the extensive investments in recent years which have been made into both the production and transmission and distribution systems are given below:

[9] IEA/OECD - ETP 2010
[10] IEA (2009), Global Gaps In Clean Energy Research, Development, and Demonstration
[11] European Network of Transmission System Operators for Electricity

- Globally, according to the UNEP in 2007, the size of investments into renewables are growing quickly: in 2004, their value was estimated to be $27.5 billion, and by 2007 $70.9 billion.
- In 2007 the European Commission's own figures suggest that it spent $15.9 million on R&D on wind energies.
- According to estimates supplied by the Sixth Framework Programme for Research and Technology Development, the European Commission spent $18.9 million in R&D on Smart Grids.

Box 1: The investments made by electricity companies realised from a study by GHK in 2009

STATKRAFT :

This company has already undertaken a number of changes to ensure its transition.

- The company's strategy focused on the development of renewable energies and more environmentally-friendly energy production (Gas power).
- Investments in hydro, wind, and solar power.
- Research in tidal and osmotic power.
- The company demonstrated that through these changes it improved its financial performance.

SWM :

- This company produces 4.3 per cent of its electricity through renewable energies and plans to increase this to 20 per cent by 2020.
- To achieve this target, the company established two strategic research units examining the issues of climate change and renewable energies.
- The company invested in renewable energies and its resulting performance is generally positive.

ENEL :

36 per cent of ENEL's electricity production is provided through renewable energies and the company has already made a number of changes to ensure the transition:

- ENEL invested in better technology for heat production (or thermal).
- It developed renewable energies not just in Italy but further afield.
- It improved the energy efficiency of both its power plants and grids.
- It conducted research on CCS.
- The company reduced its CO_2 emissions by implementing CDM (Clean Development Mechanism).

Projects have been established across Europe, in particular focusing on transport systems and the supply of electricity. A number of projects have come into being with the objective of ensuring that this future transportation and distribution network is put in place:

- At a European level: ADDRESS (working on distribution networks) has replaced FENIX. ERA-NET aims to improve the coherence of research at a European level.
- At an inter-state level, projects that could already be called "smart grid projects" are being set up, for example the cross-Channel line[12] and the collaborative project between Denmark and Norway[13]. What's more, by virtue of this Areva has suggested that the term "smart grid" be changed to "smarter grid" (i.e. that existing networks be made more intelligent).
- At a national level: companies are working on technologies such as Linky electricity meters (recently installed in Italy, Lyon (France) and made standard in Sweden). They are also working on micro-grids, for connecting private households that have solar panels or wind turbines and wish to re-sell their electricity.

While the economic crisis has slowed the progress of a number of projects, its impact on investments varies according to the type of project (for example, those connected to transmission and electricity supply were not particularly affected by the crisis). However, as underlined by the IEA, there is an urgent need to increase investments in low carbon technologies due to the fact that investments currently being considered are deemed insufficient to ensure an efficient economic transition.

6.4.2 Investment needs

According to the IEA, in its document ETP 2010, globally investments that are required, according to the baseline scenario, are estimated to be $ 23.5 trillion for the period 2010 to 2050:.

- $ 15 trillion is required for "new power generation plants" and these will be directed more towards conventional technologies, in particular gas, coal, biomass, hydro and nuclear.
- $ 5.8 trillion will be necessary for maintaining and expanding the electricity distribution network.
- $ 2.5 trillion will be required for the modernisation of the electricity transmission network.

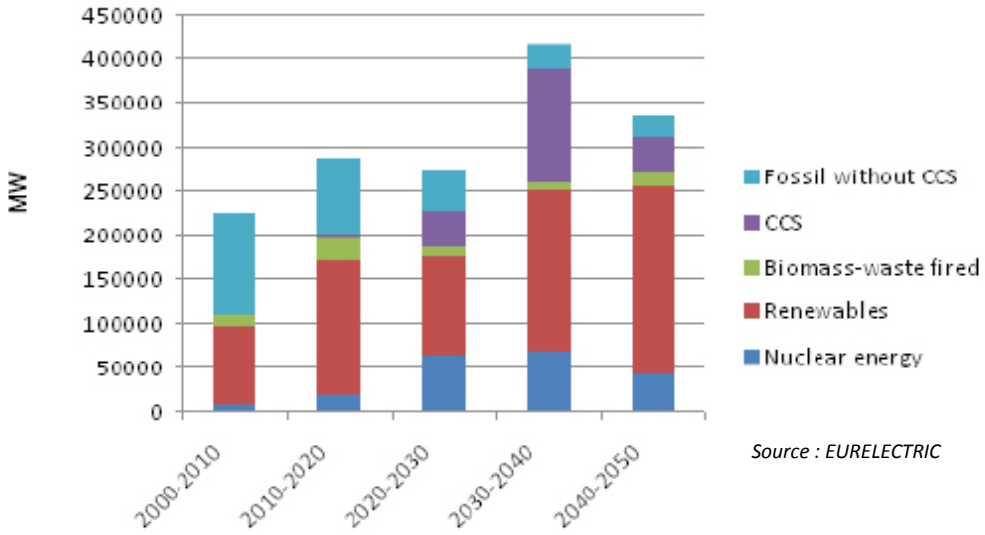
[12] Cable under the Channel allowing Great Britain to benefit from additional nuclear power. The Italian and Greek networks are also connected via cables under the Mediterranean.
[13] Denmark exchanges its wind energy for Norwegian hydroelectricity.

In addition to these investments of $23.3 trillion, the BLUE Map scenario considers that an additional investment of $9.3 trillion is necessary, on the following basis:

- + $ 6.0 trillion in power generation plants (33 per cent of this amount is necessary for the period 2010-2030 and the remaining 67 per cent for the period 2030-2050).
- + $ 1.7 trillion for transmission systems.
- + $ 1.6 trillion for distribution.

EURELECTRIC, in addition to the IEA has concluded, in its Power Choices scenario, that the following investments will be required for the generation of electricity across Europe.

Graph 2: Net investment in generation capacity



Source : EURELECTRIC

However, to realise these huge additional investments, a number of barriers beyond funding must be overcome, relating particularly to technology. For example, in the field of transmission and electricity supply, the European Union will have to resolve a number of technical issues if an "intelligent" network is to be created. Two main challenges have been identified. First, Europe must integrate RES into the energy system on the continent. The second challenge is to create and secure a transmission network under the sea, for example for off-shore wind farms or the Desertec project[14] - in fact as this project will require part of European transmission to be under the sea there are questions yet unanswered at this point. Technologically for example the interrupters, which would, in principle, isolate the lines have to be perfected.

[14] Desertec plans to supply CO2-free electricity in Europe, North Africa and Middle East, produced mainly by solar (concentrated and photovoltaics) from deserts, and transported via high voltages grids around the Mediterranean. More information on the concept : http://www.desertec.org

Certain aspects of the “smart grid project” are therefore still at the experimental stage and need to evolve if these and other technical issues are to be resolved. And there are technical problems associated with distribution that are just as crucial as those concerning transmission. These include the problem of how to manage the integration of all the different energy sources into the electrical distribution network, and the difficulties associated with network optimisation and protection[15].

It is thus necessary to secure and optimise investments in order to allow these developments. Throughout this evolution both public and private investment will be required and international collaboration will need to be better organised in order to maximise the impact of these investments. In addition, financial incentives will need to be established to encourage companies to participate in this evolution. In a number of studies, notably GHK (2009) and the IEA (2010) a presumption is made by the authors that only companies are in a position to analyse the risks and opportunities associated with this transition, particularly in relation to the consequences of climate change (GHK, 2009). Accordingly, their view is that energy demand begins with corporate guidelines, not with public policies. However, ultimately the current economic crisis may well alter this and prompt earlier involvement of the public authorities than might have been the case otherwise.

This is the reason why other studies tend to advocate support mechanisms and policies to support / accompany such programmes (Syndex, S.Partner and WMP, 2009). These would help to "promote clean technologies and available capabilities at affordable prices", while avoiding the negative effects of the crisis. The UNEP report follows the same logic and specifies that the signals of the market and parameters of investments must be clear and stable. This is why, if the market is the only driver of the process, it will not give positive results at the level required. On the other hand, the report underlines that it is only "when there were solid and coherent political support that the markets prospered and transformations progressed the most[16]". So, for these latter analyses, only public policy intervention can truly support the transformation of the economy, and this is especially the case when an economic crisis creates an environment in which private investment is hesitant or unwilling to play a part in the transition.

In addition to the different points of view outlined above, other studies tend to moderate the discussion around the transition and suggest that innovation must be driven initially through political aid and support and that eventually market mechanisms would need to take over (EURELECTRIC, 2009) because these can increasingly boost innovation not only across

[15] Christophe Kieny – IDEA
[16] UNEP/ILO/IOE/ITUC (2008) : Green jobs – Towards decent work in a sustainable, low-carbon world.

Europe but also internationally. In conclusion, the price of carbon would ultimately become the only engine for the deployment of low carbon technologies (EURELECTRIC, 2009).

6.5 The sector's ageing workforce

As with all ageing populations there will be fewer younger workers entering the European labour market in the future and this may eventually limit Europe's employment growth. The European Commission forecasts that up until 2019[17] total employment in Europe will increase due to rising labour force participation, meeting the Lisbon target of 70 per cent by 2020. This will be achieved through a combination of an increase in the numbers of older workers and an increase in the participation rates of women in the labour force. However, from 2019 onwards Europe's shrinking workforce will begin to reduce overall employment, potentially driving down average growth in GDP from its 2.4 per cent average in 2007 to 1.2 per cent for the period 2031 – 2050.

Between now and 2012 Government action to increase the participation rate of women, disabled and ethnic minority workers may be enough to prevent a scarcity of labour. Employment rates, predicted prior to the current economic recession, will be sufficiently increased so as to offset any decline in number of people of working age. But by 2020 there will be no escaping the scarcity of labour brought about by older workers exiting the labour market and not being replaced by sufficient numbers of young entrants.

Electricity companies need to be aware that the European labour market will begin to contract from 2020 due to the number of workers retiring and the lower rate labour market entrants. The impact of these changes will be compounded by the relatively higher age of the Electricity workforce - in eight of the major European electricity companies between 19 and 38 percent of their workforce is due to retire within the next decade. The overwhelming number of respondents to the survey indicated that their company will be affected by the sector's ageing workforce and that this would have a large impact in terms of occupations and future skill needs. Demonstrating this impact, over one third of all respondents stated that 40 per cent or more of the workforce in their company was over 50 years of age.

It is clear from the evidence that employers in the sector are serious about tackling the impact of climate change on the sector. What is less evident is the social partner's engagement over this issue. This may be due to a number of cultural reasons including an unawareness of each party's position and agenda. However, according to the United Nations Environment Programme unless both sides of the industry begin to address the

[17] "New Skills for New Jobs –Anticipating and matching labour market and skills needs", EC Staff Working Document (2008)

issue of climate change and its impact upon the sector, there is a real risk that the sector will be unable to tackle the challenges that will present themselves over the coming decades.

This evidence suggests that unless electricity companies have in place adequate training and development programmes, give due consideration to their recruitment and retention policies and are already some way into their succession planning, it will be too late to begin this process in 2020. At this date, labour will be in short supply and wages will be driven up as a result. Talented workers will have high mobility and only the best companies will retain them.

7. Impact on employment and skills

7.1 Effects on employment

Representing 24 per cent of the total greenhouse gas emissions from the 15-member EU (old Member States), there is no doubt that the European electricity industry will be disproportionately affected by the proposed reductions in CO_2 emissions and this, in turn, will have a dramatic impact on employment both in terms of job numbers and job functions. With the growth in various types of renewable energy, the social partners will need to consider ways of ensuring a smooth transition from today's industry configuration to an updated model fit for purpose in the 21st century.

The discussions over employment, in terms of the impact of future changes within a sector, often tend to focus on the number of jobs created or destroyed. However although the potential loss of jobs is an important factor, the 'substitutional' factor, or the possibility of a new job in the future being technically performed by an trained individual currently employed in the sector, is also a crucial aspect in terms of future changes on employment.

The difficulty in undertaking any research which attempts to examine the future prospects in terms of skills, competencies and the occupational make up of any given sector is the quality and quantity of data and the availability of previous research. In a recent study GHK highlighted the absence of current research seeking to quantify the number of jobs generated by changes in electricity production in Europe[18]. Where the occasional study does attempt this, the data remain too general and do not offer sufficient points for comparison or analysis. Even in the research undertaken by the European Commission the statistics for the electricity, gas, water and waste sectors are aggregated.

[18] GHK (2009).

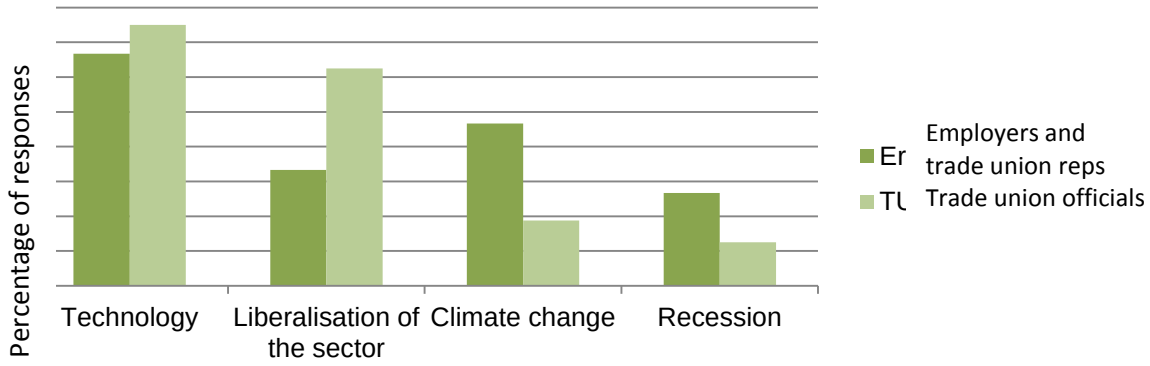
Nevertheless there is a number of reports that offer an indication of possible future trends. For example, research by the ETUC[19] suggests that in the European Union, measures to reduce EU CO_2 emissions by 40 per cent by 2030 will probably not have an overall negative net impact on employment, but rather a slightly positive one. In addition, the research goes on to say that policies aimed at reducing the impact of global warming will substantially change the supply and demand of jobs and qualifications within the energy sector. Crucially, across all sectors jobs will be created in those companies that adapt and take advantage of opportunities, created by climate policies, and jobs will be lost in companies that do not. So job losses and gains will not be evenly distributed across all sectors and countries. For example one study has suggested that in **Germany[20]** alone job losses could amount to 17,000 due a reduction in demand for energy of just 10 per cent. As for technologies, Carbon Capture technology, if introduced at coal-fired power stations, could increase jobs on these sites. Conversely, increases in, for example, the capacity of nuclear energy production could mean gains in employment for those on that site, but could mean job losses for those working elsewhere in redundant energy producing processes.

CEDEFOP notes that the overall workforce within the electricity, gas and water sectors will decline by 2.4 per cent by 2020[21], but the figures for electricity are not isolated. According to the survey carried out for this research, the views of the social partners on this issue differ markedly. The views of those employers who responded to the survey were divided over the changes to the size of the sector's workforce with exactly half stating it would increase and the other 50 per cent stating it would decrease. The trade union representatives who responded were less optimistic and overwhelmingly believe (81%) that the sector's workforce will contract in the coming years.

So what do the social parners think will be the drivers for changes in the size and composition of the workforce in the sector in the coming years? According to the survey responses technology is seen as the main driver for change accross the sector in the coming years by both trade unions and employers. Trade union respondents suggested that the liberalisation of the sector would drive change to a greater extent than did the employers.

[19] ETUC, Syndex, wuppertal institute, istAs (2007)
[20] Ireek W, Thomas S, et al, Der energieSparFonds für Deutschland, edition 69 der Hansböckler stiftung, 2006
[21] "Skills for Green Job - European Synthesis Report", CEDEFOP (2010)

Graph 3: Drivers for change in the sector over the coming years



7.2 Jobs and skills

7.2.1 The quantitative aspect: increasing the number of jobs

Studies on quantitative aspects of employment within the European electricity sector are rare and their conclusions are only partially relevant as the majority only refer to the production of electricity, and fail to address the transmission, distribution and other fields of activity within the sector.

7.2.2 Electricity generation

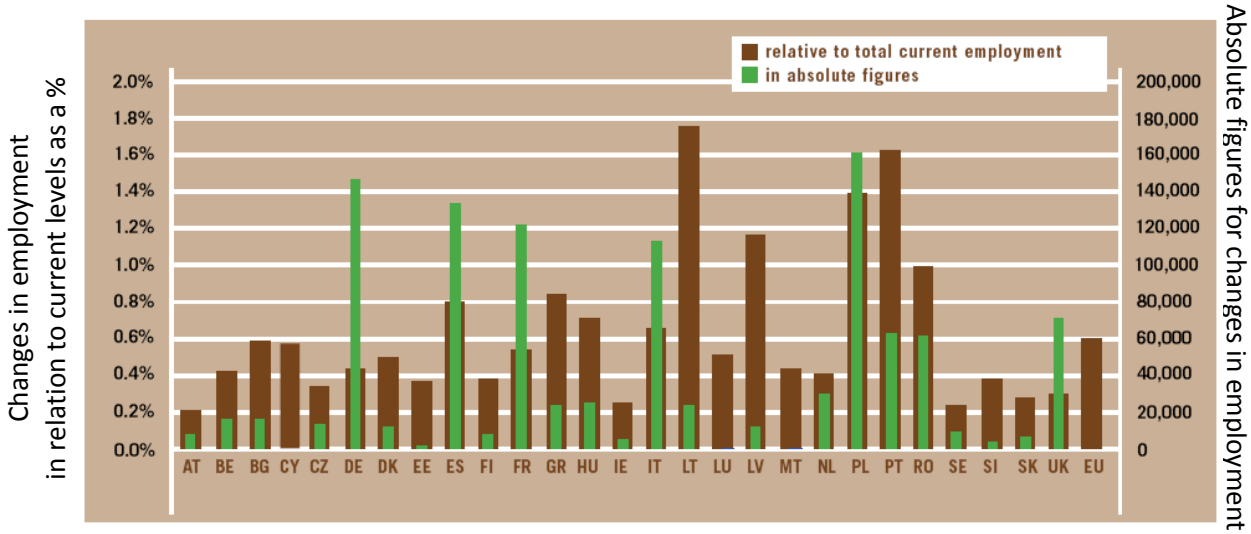
Various studies around the world have estimated the number of jobs in the generation of electricity in Europe in the future. Taking an average of these gives a figure of about 2 million, providing that the European Union proposes policies offering more incentives. The key studies and their findings are outlined below:

- DG TREN with Fraunhofer ISI and al. (2006) suggest that if the European Union adopts "accelerate deployment policies", coupled with incentives for investments, the number of jobs within the sector would amount to about 2.8m by 2020. This can be contrasted with the figure of 2.3m if the sector continues to follow current trends, i.e. no further policy developments or a 'policy light' approach.
- The UNEP/ILO/IOE/ITUC (2008) report points out that if the European Union pursues its current policy of a reduction of CO_2 emissions, then by 2020, the number of jobs in the sector will be 1.4m. On the contrary if the European Union adopts an "advanced renewable strategy", then the number of jobs would rise to more to 2.5m. This report also underlines that of these 2.5m jobs, between 60 and 70 per cent would exist in the renewable industry.

In addition material made available from other studies suggests that the number of jobs will depend on a number of criteria.

- The creation and destruction of jobs will depend on a company's geographical situation. According to DG TREN report, "the relative impact is especially large for Eastern European countries, while the impact in absolute figures is, as anticipated, strong in countries with a large population ".

Graph 4: Differences in employment between ADP-ME and No-Policy scenarios



Source: DG TREN + Fraunhofer ISI (2006), Figure 15 – "Absolute differences in employment between the scenarios ADP-ME and No-Policy for 2020 by countries and in relation to total employment in 2007."

- The Green Jobs report (UNEP/ILO/IOE/ITUC 2008) offers an insight to the relationship between employment and different technologies. According to this study, it seems that many jobs have already been created in the field of renewables. On the other hand, jobs were destroyed in industries working with traditional energies (in electricity production as well as the oil and gas industry). The reasons given for these job losses are related to technological progress and this situation could deepen with the emergence of newer technologies.
- The ETUC and Syndex study states that 192,000 new jobs will be created by 2030, mainly in RES with 71,000 jobs, then Gas with 39,000 jobs, closely followed by nuclear and CCS with 31,000 jobs for each. New jobs in solids (coal) will total only 17,000 and the figure for oil will be 3,000. These figures are lower than those in the previously mentioned reports due to the fact that the ETUC and Syndex undertook a comparative analysis between those jobs created and those eliminated, and between the renewables industry and the traditional energy industries. This result can thus be considered more objective than that of its predecessors as it considers the net gains of jobs in electricity production.

The following section is a summary of both previous studies. Its analysis is based on two, previously defined, scenarios: Base line[22] and NSAT[23]. In this analysis the NSAT scenario is comparatively useful because it takes into account the current regulatory framework. The NSAT scenario highlights an important finding which has gathered support in more recent literature and that is the contraction of employment in coal-based power plants will not be compensated by the creation of jobs in renewables because the new jobs will require different competencies and different status (employee, subcontractor).

According to the NSAT scenario, employment in coal-plant power stations will contract by 23 per cent (representing 43,000 jobs) and in power plants with heavy fuel oil by 50 per cent (representing 7,000 jobs). The NSAT study also assesses job losses in the coal-based power plants; however the Syndex scenario suggests that this loss will be less severe than in the NSAT scenario (14,000 according to Syndex) due to more rapid deployment of carbon capture and storage technologies. As with renewable technologies, the increasing use of CCS will act as an important element in future projections of employment levels within the sector.

Even if the volume of jobs created in the field of renewables is unable to compensate the loss of jobs in traditional energies, it is important to underline that jobs will also be created in the field of traditional energies. The Syndex study highlights the fact that traditional energies will modernise and that this modernisation will lead to the creation of jobs in this sector.

These studies offer an insight into the future of the workforce in the energy sector, but not specifically for European electricity production. This deficit has already been stated by GHK and at present there is no study that really seeks to quantify the number of jobs generated by the changes in electricity production in Europe (GHK, 2009). Where some do attempt this, the results are too general and have no points of comparison and as such GHK highlights their lack of objectivity and states that "any review of the results of these studies has to carefully categorize the different indicators used and the underlying assumptions of the different approaches".

[22] Base line scenario from DG TREN
[23] NSAT scenario from DG Research, the only which integrates Energy-climate package in its estimates.

Table 2: Comparison in the number of jobs in Operations & Maintenance[24]

	2005	2030			*2030 vs 2005 (absolute figure and % of annual change)*					
		Baseline	NSAT Syndex	Eurelectric	*Baseline*		*NSAT Syndex*		*Eurelectric*	
Solids	85	86	26	51	*1*	*0,1%*	*-59*	*-4,6%*	*-34*	*-2,0%*
Solids CCS	0	0	46	34	*0*	*NS*	*46*	*NS*	*34*	*NS*
Oil	19	8	4	8	*-11*	*-3,4%*	*-15*	*-6,0%*	*-11*	*-3,4%*
Nuclear	45	35	37	45	*-10*	*-1,0%*	*-8*	*-0,8%*	*-1*	*-0,1%*
Gas	36	72	66	52	*36*	*2,9%*	*30*	*2,5%*	*17*	*1,5%*
Hydro	19	21	21	21	*2*	*0,3%*	*2*	*0,3%*	*2*	*0,4%*
Wind onshore	10	37	62	52	*27*	*5,3%*	*52*	*7,5%*	*42*	*6,8%*
Wind offshore	1			30					*29*	*14,4%*
Solar	0	2	4	8	*2*	*NS*	*4*	*NS*	*8*	*NS*
Other Renewables	0	2	2	2	*2*	*NS*	*2*	*NS*	*2*	*NS*
Biomass	4	12	29	12	*8*	*4,3%*	*25*	*8,1%*	*8*	*4,4%*
Total	**219**	**274**	**297**	**314**	***55***	***0,9%***	***78***	***1,2%***	***95***	***1,5%***

The table above presents an employment assessment for 2030 of operations and maintenance jobs, for each production method, as well as a comparison with the current situation (2005). The table compares three scenarios: a Baseline, the NSAT-Syndex scenario from the 2009 study for ETUC, and the Power Choices scenario from EURELECTRIC. The same methodology[25] was applied for each to allow for accurate comparisons.

The Power Choices scenario seems to be the most popular in terms of employment projections, for two main reasons:

- It relies on a capacity installed in 2030, with 1100 GW, which is significantly higher than the Baseline scenario (966 GW);
- A mix of employment contents for operation and maintenance that is richer than the NSAT-Syndex scenario – the former is one of 1200 GW of capacity, but with a higher share of renewables, which have an employment content that is substantial for construction, but inferior for their current O&M.

[24] According to the Baseline, Syndex and Power Choices scenarios for 2030 and a comparison with figures for 2005 (000s FTE/year)).

[25] The perimeter concerns only jobs in the electricity production. It is about direct jobs by GW (employment in production only, excluding jobs in marketing and structure). The used technical ratios are the fruit of a benchmark realized at the European level which takes into account specificities of organization which can be met between the countries of the Union and or between the producers. Concerning maintenance, the European models can be sometimes rather different, some integrating partly the maintenance, the others outsourcing it completely, in particular the engineering which at the historic actors is generally integrated, while others subcontract it to the manufacturer.

The table also clearly shows the major importance of CCS technologies in maintaining employment in coal plants, and consequently in those regions with a high level of coal in their fuel mix, for example Poland.

7.2.3 Transmission and Distribution

In Europe there are no studies examining the impact of climate change policies on the sector's transmission and distribution workforce. However a recent US study has examined the likely employment trends in the US distribution field. The study, led by KEMA in 2009, analysed the impact on employment of the installation of smart meters and its main conclusions were highlighted in a study carried out by the Global Climate Network (2010).

"Using data from a 2009 study (KEMA 2009), verified through a series of in depth interviews with companies involved in Smart Grid deployment in the US and based on the projected installation of 128 million smart meters– smart meters for virtually every US consumer – this study finds that:

- Around 2,000 jobs per one million smart meters – a total of 278,600 jobs – can be created during the installation phase, notionally from now until 2012.
- Post 2012, a 'steady state' from 2012 until 2018 would provide 139,700 jobs.
- While there would be job losses of 26,200 in the steady state period, mostly in meter reading, which would be rendered obsolete, there would be a net gain, mostly in manufacturing."

7.3 Impact on skills

The enormity of its impact means climate change will be "one of the key drivers in skills demand for coming decades". A recent report by GHK[26] stated that in the seven sectors studied, including the energy sector, the overall conclusion was that the impact of climate change "tended to be in relation to skills rather than on the actual levels of employment". Given this evidence it is important to focus on developing an understanding of what skills are likely to be needed in the future, and those that will not.

It is widely accepted that work in the future will require job holders to possess a higher level of skills than it does at the present and this is due to a number of reasons including the increased use of technology in work. Current research by CEDEFOP presents a poor future for low skilled workers and suggests that the implications of the growth in employment across EU27 until 2015 will be a growth in demand for high and medium skilled workers and a small growth in the requirement for elementary occupations which will require no or little

[26] "Impact of climate change on European employment and skills short to medium term", GHK, (2008)

formal skills[27]. The rate of change across all sectors of Europe's economies will mean that lifelong learning is vital.

Fortunately the studies already mentioned cover this aspect of employment in greater detail. Generally speaking these studies reach the same conclusions and two particularly are relevant for this publication. The report by the Expert Group on New Skills for New Jobs prepared for the European Commission, called "New skills for new jobs : Action now", and the CEDEFOP study titled "Skills for Green Jobs, European Synthesis Report" will both be examined here. Although these studies are not specific to the electricity sector, their main conclusions and recommendations are relevant and can be adapted to this sector.

According to the Green Jobs report, "the most significant and most generalised change brought about by the greening of the economy is the redefining of a large number of jobs in all sectors." This point of view is shared by researchers, but also by politicians (CEDEFOP).

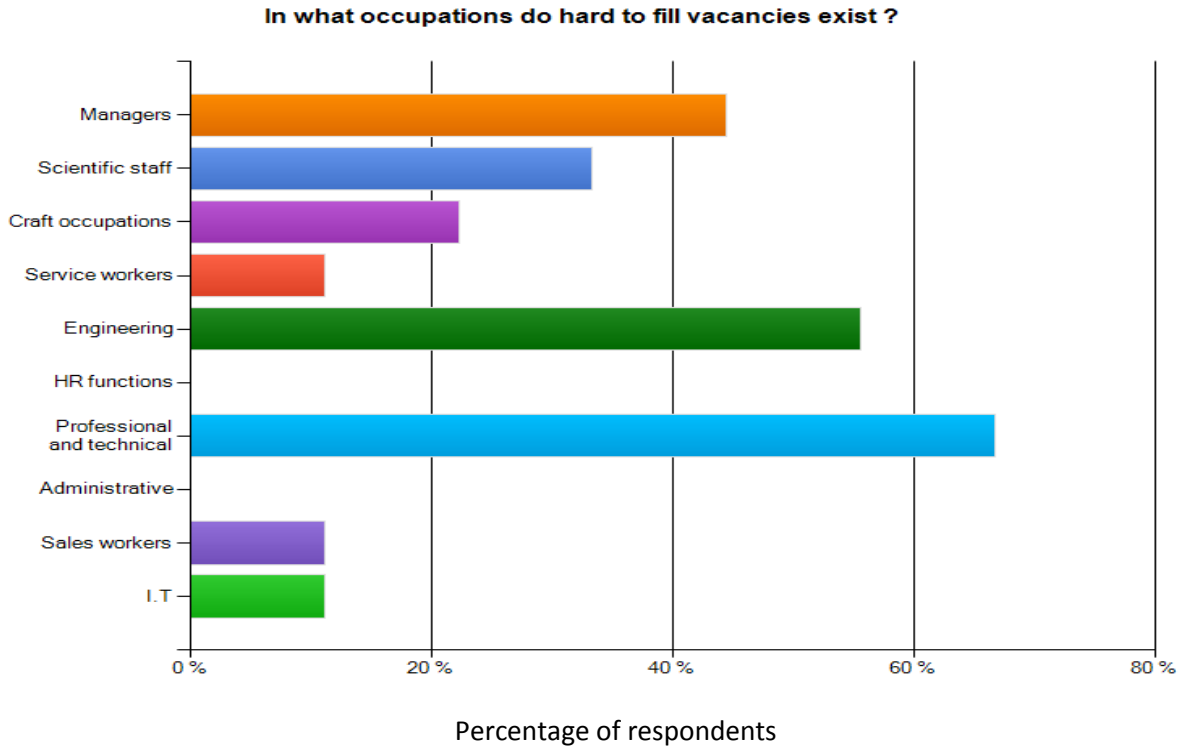
Globally these studies emphasised the notion that skill development responses covers two broad areas: the identification of new skills, and investment in skills.

7.3.1 Identification of new skills

Before attempting to set out the possible changes to occupations, skills and competencies for the coming years, it would be useful to consider the current situation within the sector. A difficulty confronting employers currently is the number of skill gaps (within a workforce) and skill shortages (within the labour market). This leads to employers having so-called hard to fill vacancies so the survey asked respondents to highlight those occupations for which there are currently hard to fill vacancies. The responses are shown in the chart below. It is clear from answers to the survey that there already appears to be a shortage of appropriately qualified workers for occupations within the professional and technical, engineering and management areas.

[27] The European Centre for the Development of Vocational Training (see www.cedefop.europa.eu)

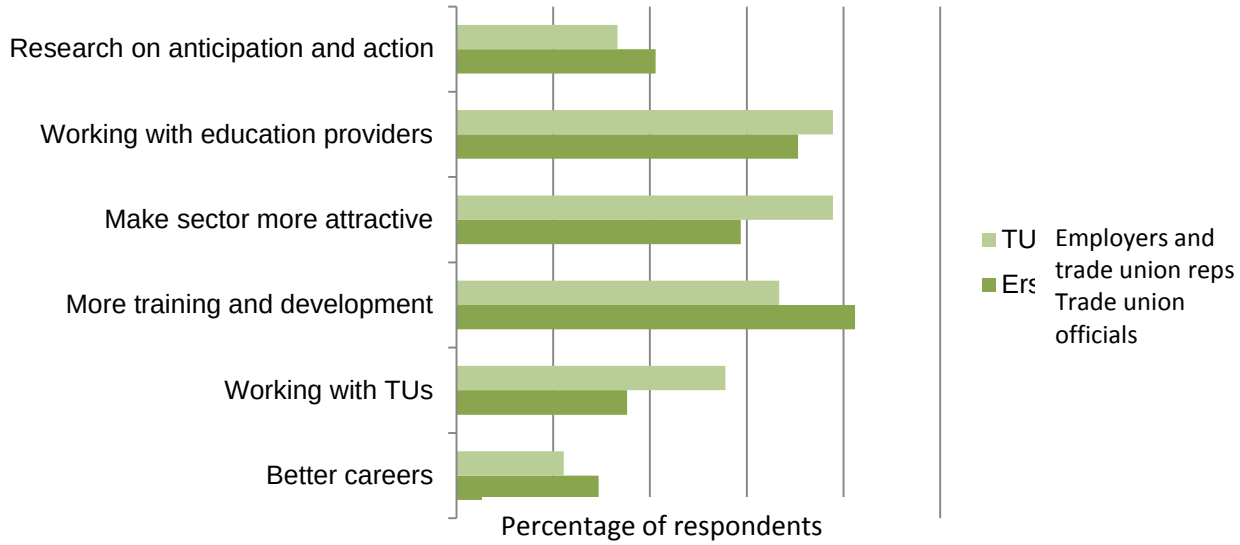
Graph 5: Occupations with hard to fill vacancies



According to the Environment and Labour Force Skills (2008), the changing nature of skill needs for the electricity sector means that "it's probable that together technical competences and management skills will be required", a view reinforced by the responses to the survey from the social partners.

The survey then asked respondents for their opinions of the possible means of tackling skill shortages and these are set out below. While the priority given to various potential solutions differed between the two constituent respondents, both trade union and employer representatives suggested that companies ought to 1) work with education providers, 2) offer more training and development and 3) make the sector more attractive to potential employees and these three issues will be taken up later in this report.

Graph 6: How to tackle skill shortages



Existing studies on this subject have identified skill needs in generic skills (leadership…), in generic green skills, in STEM skills (science, technology, engineering and mathematics), and in e-skills. According to CEDEFOP, the skill gap in STEM skills is more important than in green skills. In addition, the main idea underlined by these studies is the fact that it is important to develop the right mix of skills. According to the report "New Skills for New Jobs", the right mix of skills means combining transversal skills with specific skills needed for a job. For this report, "these competences should be acquired as soon as possible, but they could also be developed throughout life".

For transmission and distribution, according to EURELECTRIC, new skills would be required to fill the skills gap generated by the technological changes that will be introduced in the future, notably in the context of DSOs (Distribution System Operators) and new tasks will emerge, particularly in connection with the technological risks' supervision.

Initially therefore, the main impact will be on research and development and this confirms the findings of an article that appeared in *le courrier Cadre* in December 2009. This, stated that smart grids were going to lead to more communication resulting in a considerable additional skill requirements - for example in power electronics information systems and electrical engineering– and thus more highly qualified personnel. Besides jobs in these fields, it is likely that positions will also be created in the areas of consultancy and maintenance.

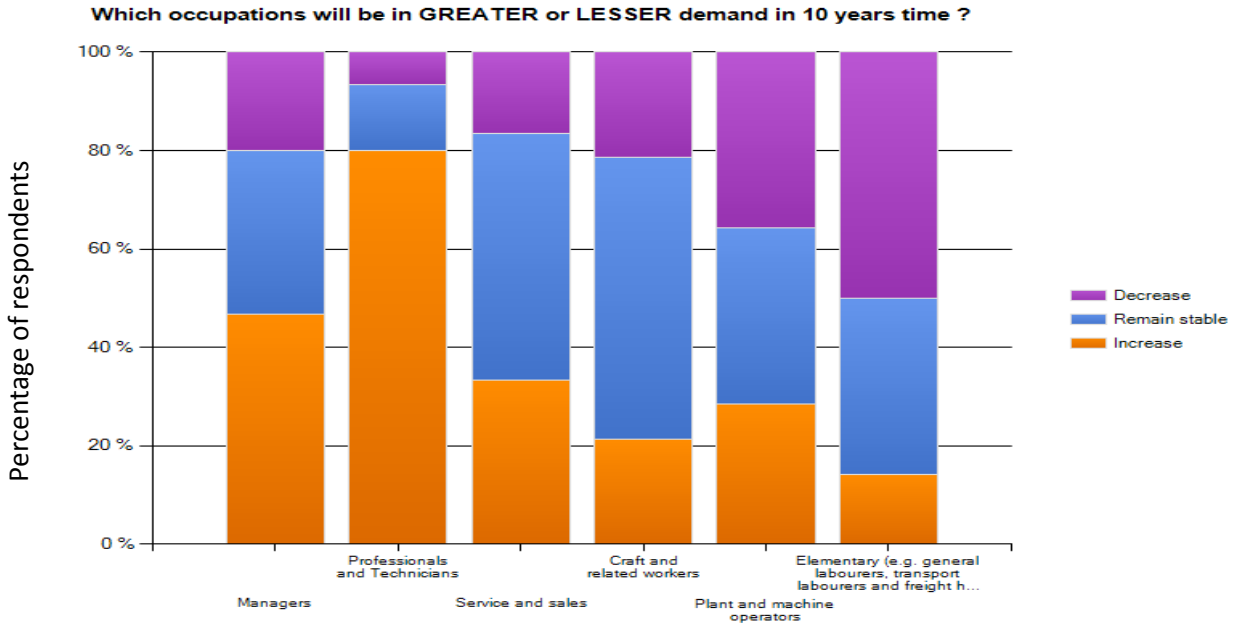
With more modern transmission networks, "the workforce required will be very varied, and will include both highly qualified workers and – something which is more difficult to find at present – technicians to take in charge meter installation and day-to-day maintenance of the electricity network. Both conventional companies and new companies in the field, which have new management models, will be sure to stimulate growth in employment. The actual

process of deployment will involve a gigantic effort, with every household requiring a meter and every PV control panel having to be connected"[28].

The social partners were asked a range of questions regarding skills and occupations within the sector in order to identify those skills and competencies that will be in demand in the future. The survey categorised skills into three groups - General, Technical and Managerial skills and the findings are set out in the charts below.

Employers and trade unions in the sector generally believe that the skill levels within the workforce of the sector will increase (65 per cent) and this is in line with research undertaken. Employers want their employees to have a broad range of skills that cut across a number of traditionally separate blocks of knowledge. In fact today in the electricity sector "employers require enhanced skills, broader skills ... In particular, there is a greater focus on those business-related skills associated with operating in a commercial, competitive environment, such as business/financial management, customer care and service skills, sales and marketing, and IT skills".[29]

Graph 7: Expected growth and decline of certain occupations in the sector



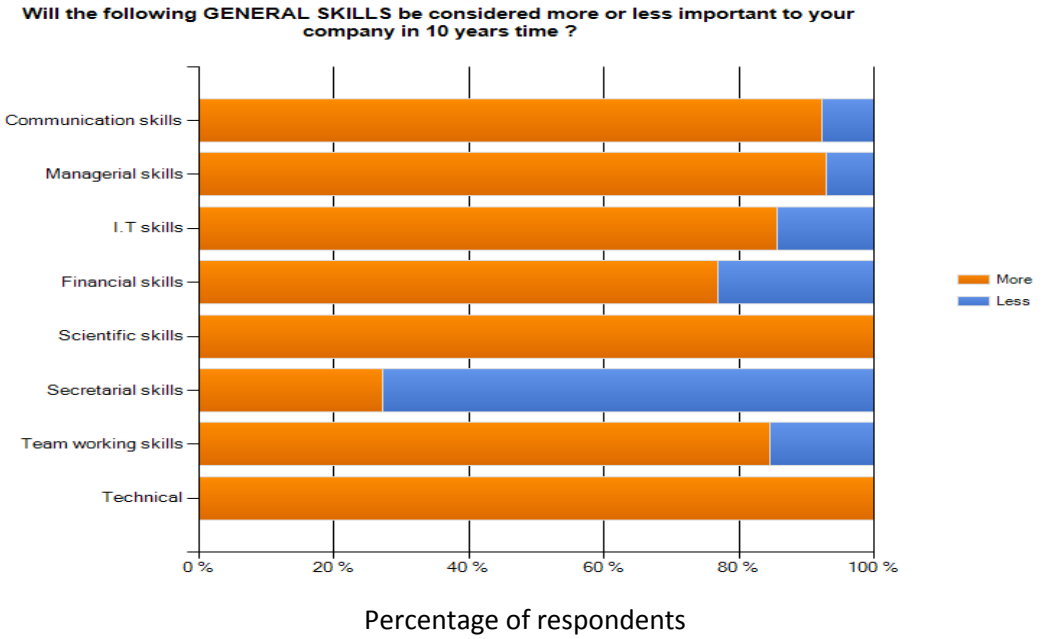
Given the previously mentioned views of the social partners regarding the current shortage of workers with professional, technical and managerial skills, the belief that demand for these occupational groups of workers will grow in the coming years is concerning. Thus this is clearly an area which requires a dedicated response from employers, trade unions, training providers and government. Improving the current situation requires effort by a

[28] Ronnie Belmans, SmartGrids: Intelligent networks - why?, conference on the electricity networks of the future, Wednesday 27 January, 2010, Palais Bourbon, Paris.
[29] "Employment and Skills Study", UK Electricity Training Association (2001)

number of actors and will involve realigning the supply and demand of skills and is an issue further developed in a later section.

7.3.2 General skills

Graph 8: The future demand for general skills

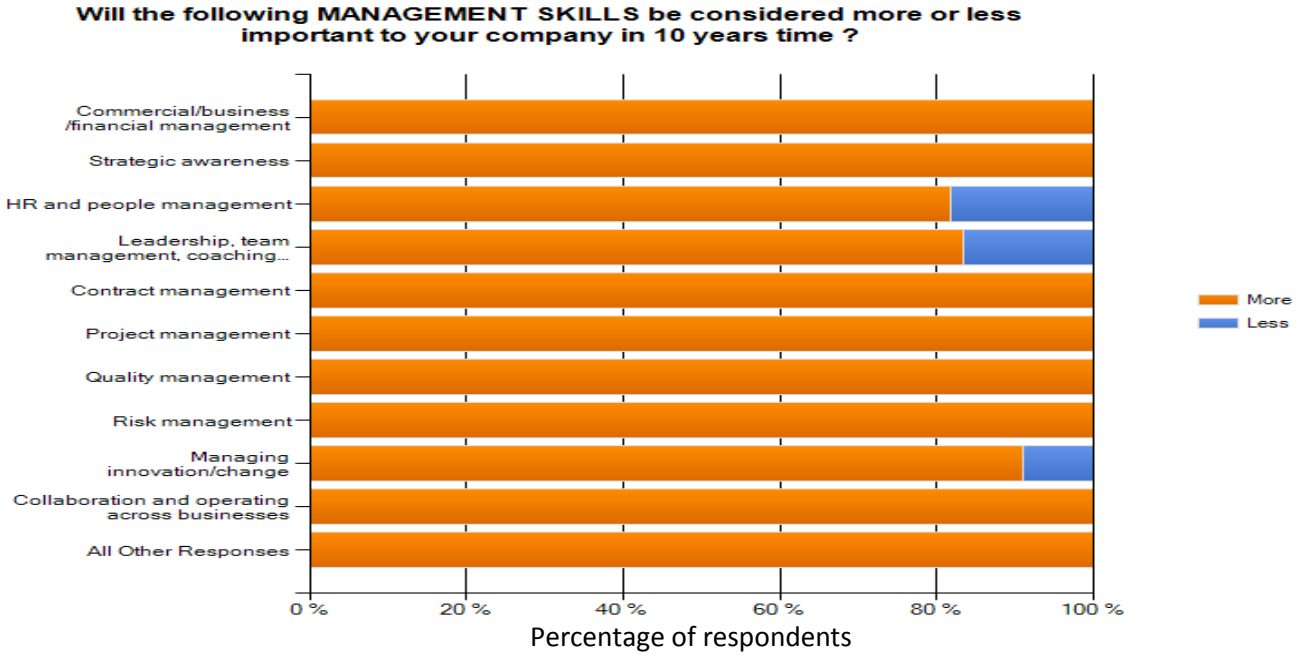


Of the range of skills given in the survey, the social partners consider that in this sector the demand for both technical and scientific skills will increase in the future. This confirms research that suggests there will be a greater need for STEM skills (science, technology, engineering and mathematics) in the future. However STEM subjects are in decline across Europe as a number of publications have suggested that even today, "owing to demographic trends some countries do not have enough engineers to replace those who are retiring, resulting in a shortage of people with the skills to deliver major infrastructure projects".[30]

[30] Skills for Green Jobs (Briefing Note) CEDEFOP July 2010

7.3.3 Management Skills

Graph 9: The future demand for management skills



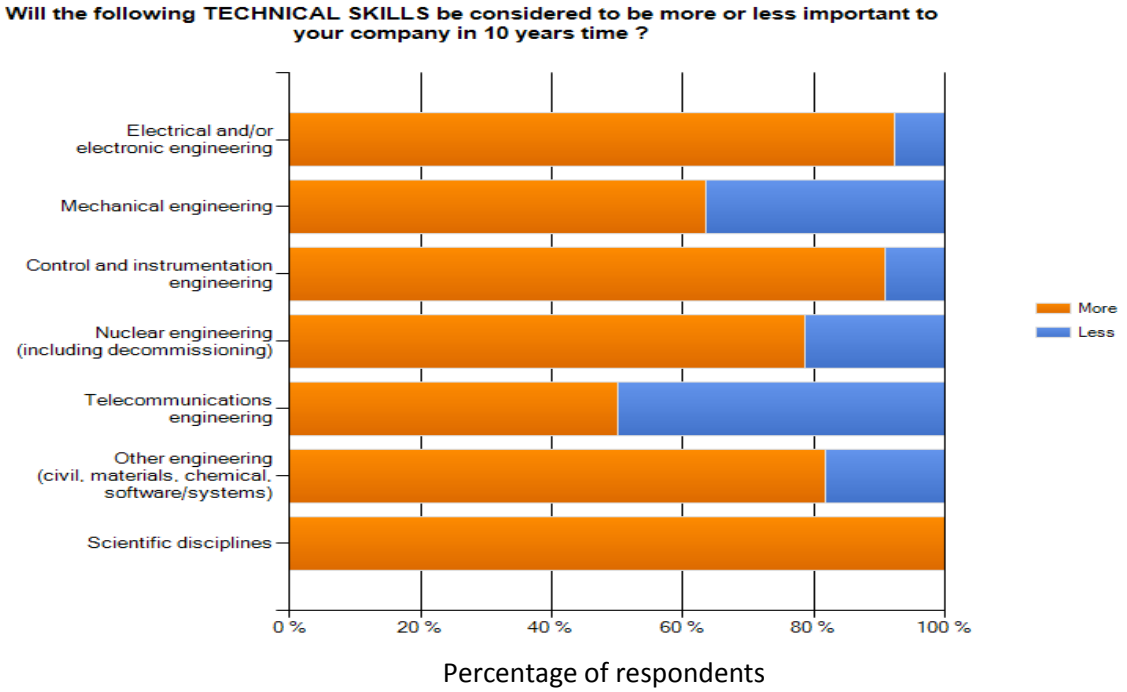
According to CEDEFOP[31] the demand for management skills is set to increase in the future and this confirms earlier work by the sector skills council Energy and Utility Skills in the UK, which suggested that there "is a much stronger emphasis on developing commercial and business-related skills and, as organisations have restructured and moved away from the rigid hierarchical form to a much more flexible one, we have seen a move away from command and control toward a more people oriented approach requiring leadership, team management and coaching/mentoring skills."

Although the social partners' responses demonstrate they agree generally with this statement,, they believe that some specific management skills will be in greater demand than others in the sector. For example demand in the skills related to commercial, financial and business management, strategic awareness, contract, project, quality and risk management and the ability to operate across the business were thought set to increase in the future by all the survey respondents.

[31] "Future Skills Supply in Europe – Medium Term forecast up to 2020" CEDEFOP (2009)

7.3.4 Technical Skills

Graph 10: The future demand for technical skills



The chart above highlights the views of the social partners in respect of technical skills and how they see them becoming increasingly or decreasingly demanded by the sector. It is clear from their responses that those technical skills related to scientific and electrical/electronic and mechanical engineering are thought most likely to be in the greatest demand by the sector in the future.

7.3.5 Gender issues

Finding way to secure higher levels of participation by women in the sector should be seen as key priority for employers in this sector if, as is suggested in the survey responses, and confirmed by research (reference) the demand for higher skilled workers increases. A recent report by CEDEFOP states that while the rates for both men and women with higher qualification have increased, and will continue to do so, "the rates of increase in the number women with high-level qualifications are significantly higher than the rates for men, for both the population and the labour force"[32]. In fact the same report states that between now and 2020 "the number of men in the population with a high level of education is projected to increase by more than 14 million compared with an increase of over 17 million for women". This could present the industry with an opportunity in its efforts to improve its image by recruiting a greater number of female workers. EDF's Corporate Social Responsibility agreement specifically highlights gender equality as an issue the company are seeking to

[32] "Future Skills Supply in Europe – Medium Term forecast up to 2020" CEDEFOP (2009)

address by calling for equal pay, equal opportunities in career paths and by its two agreements to introduce 'catch-up' clauses to achieve the former of these commitments. This sentiment is echoed by many other major employers in the sector.

7.3.6 Skill strategies

Pragmatically skill strategy responses will have to be well organised and must anticipate future skill needs in order to established effective training programmes for workers. In addition, the anticipation of what skills are needed in the future is essential if the appropriate actors are to balance the demands from the industry with the supply of labour with the appropriate skills. Just over a third (39%) of employers in the survey said that their company has undertaken specific initiatives to forecast their skill and competency requirements for the future. According to CEDEFOP, this identification cannot be undertaken at the European Union level or at the sectoral level but at the national and regional level. In the UK the sector skills council EU Skills has mapped out the occupational structure of the electricity sector, with the support of the Unison trade union, and has produced a Skills Strategy that brings together all the necessary steps to be taken to ensure the UK electricity sector has the rights skills in the future. However, at the national level there are no integral skill responses as part of an environmental strategy and programme, with the exception of France (according to CEDEFOP, this country has adopted a mobilisation plan for green jobs), and the UK (in 2009, the UK adopted The National Skills Strategy).

The CEDEFOP report suggests a bottom-up vision, which is shared by a majority of studies. This vision promotes two types of initiative. The first is "a network of regional training centres co-ordinated at the national level to create synergies and to disseminate good practices which would improve inputs into course design and mobility of workers between regions". The second one is public-private initiatives. "Regional governments lead the way in providing comprehensive and organised skill responses, developing successful public-private initiatives that achieved impressive results and could be considered best practices". The "New Skills for New Jobs" report withdraws this idea but discusses further the fact that collaboration between companies has to be considered as an option. Companies that were interviewed in the study conducted by GHK share this last proposition. Three power companies (ENEL, SWM, and STATKRAFT) propose that in order to identify new skills and to improve existing ones, there is value in creating a network of companies in the same sector, so they share their expertise on new technologies.

Social dialogue should be positioned not as a crisis reaction to short term challenges of restructuring, but part of a wider dialogue between the social partners which recognises change as an essential part of organisational life and addresses strategic issues such as employability. The early provision of information and transparency are both fundamental in

establishing trust as a basis for consultation. There is evidence that companies that can adjust to a changing environment are more likely to survive and to sustain employment. A number of companies now engage in permanent organisational restructuring, particularly in sectors facing continual technological change and competition. A strategic approach can allow companies to address the longer-term employability of workers before restructuring forces the issue, taking responsibility for equipping workers to adapt to changing skill and technological requirements. It can facilitate the redeployment of staff in response to planned skills needs and prevent compulsory redundancies. Proper anticipation enables both parties the time to gather information and to analyse and reflect. It also provides an opportunity to formulate more imaginative and creative responses to the challenges that change presents and to the social impact of economic restructuring. These responses might range from process and product innovation to different patterns of working or retraining. This kind of approach seeks to balance the economic, social and environmental issues within the restructuring process. Further information and guidance for managers and trade union representatives on restructuring and social dialogue can be found in the toolkit on restructuring, commissioned by EPSU, EMCEF and EURELECTRIC.

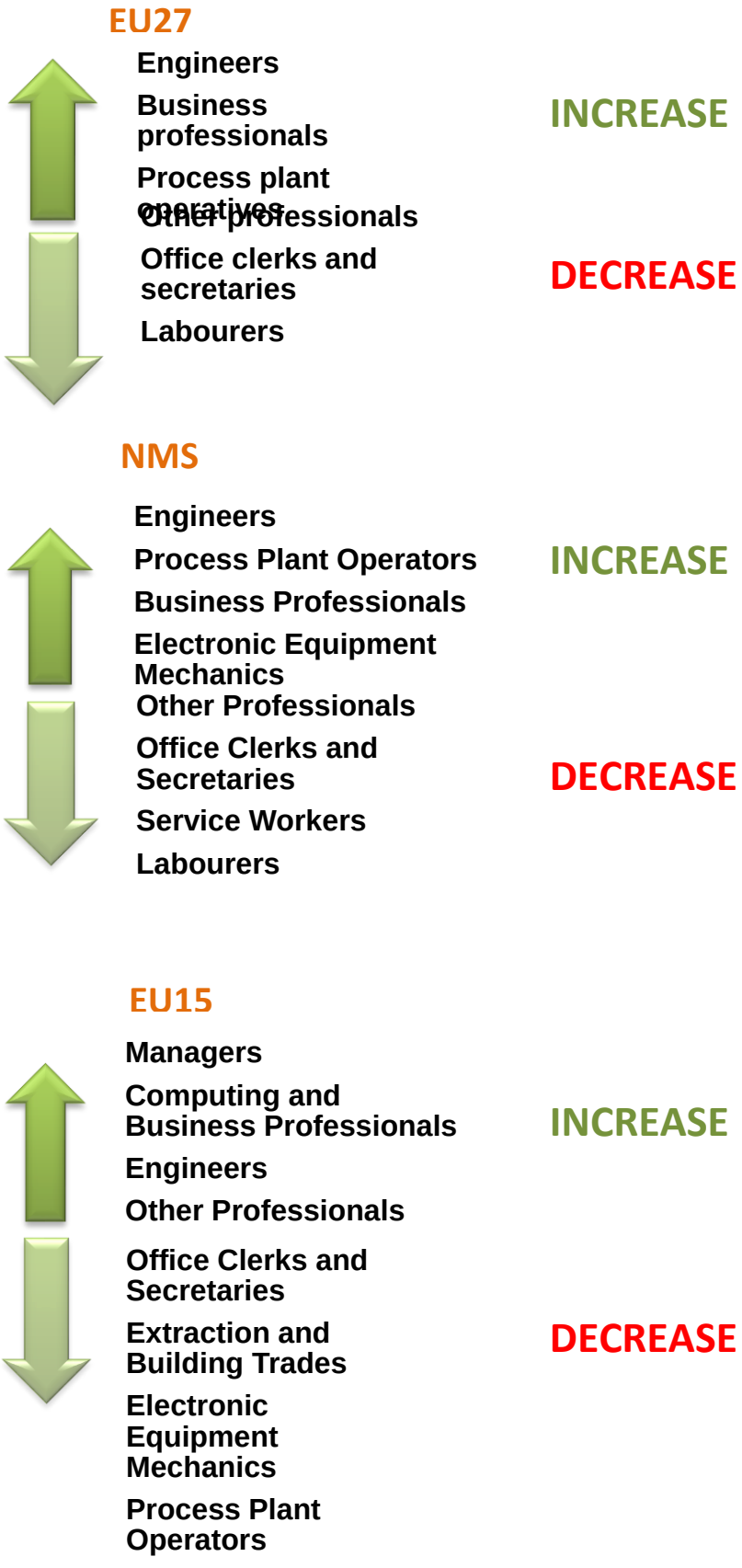
Long-term workforce planning and development are integral to dealing with change, and are particularly important in the context of dealing with climate change. A key role of social dialogue in this context is that the social partners need to engage in discussions over the future skills profile of the sector and, consequently, over training, retraining and up-skilling which will equip workers for redeployment within the organisation - essential given the demographic change and the required changes to the sector's skill profile. This highlights the need for a strategic long-term commitment to continuous lifelong learning for workers, rather than the introduction of retraining as a short-term response. Also relevant may be the view that jobs within newer companies "in particular in renewable energies and energy services, tend to be less well-paid and enjoy less secure conditions of employment than in established branches"[33].

Succession planning is also an important part of this because it enables the social partners to minimise any 'Skill Flight' when older workers exit an industry, taking with them precious skills and knowledge without having had the opportunity to pass these on to younger workers. The anticipation of future skills requirements is fundamental to minimising the potentially negative impact of restructuring and this is no less so in the context of the transition to a low carbon economy. It is expected that the transition to low carbon economies will bring about a higher demand for more educated and skilled workers and a

[33] "Climate change and Employment" SDA (2005)

reduction in the number of unskilled positions. This is likely to require a response at regional and national government level as well as by the EU.

Figure 1: Movement of skills across Europe 2000 to 2006



The information contained in the diagrams above has been constructed from data by CEDEFOP to illustrate the recent demand of certain electricity sector related occupations across Europe. Upward facing arrows denote an increase in number of employees in the given occupations, and downward facing arrows denote a reduction in the relevant occupation. Although the figures in the diagrams illustrate the movement of occupations for the period 2000 – 2006, they do serve as an illustration of the recent movement of demand for plant operatives in the NMS while the EU15 has been seen an increase in demand for white collar occupations.

7.3.7 Skills investments

Skills investment should concern not only the promotion of training and educational infrastructures and programs, but is also about putting in place some incentives in order to motivate workers to follow the training. According to CEDEFOP, even if it is crucial for workers to get some new skills, most of the time they decline the offer. « A recent survey found that although the majority of electricians were keen to train PV installation, they were reluctant to pay the training provider ».

According to the « New skills for new jobs » report, educational and training systems managed to adapt very well to the new challenges, but there are still some time-lags between the educational world and the world of work.

To fulfil the European Union vision for 2020, the training and educational systems have to modernize to deliver more innovative, flexible, accessible and individualized programs. The studies analyzed mentioned also the fact that skills investments should deal with training the trainers and also on training tools. So, CEDEFOP noticed the fact that “diversifying the range of training tools used need to be encouraged”. The “New skills of new jobs” report gave example of two tools: the e-learning and the concept of learning by doing. This last tool is considered by the “New skills of new jobs” report as “the most efficient learning methods for professionalization and stimulating creativity and innovation.”

It is the reason why the “New skills of new jobs” report explained the fact that it is important to put in place “right incentives” which should encourage education and training institutions to “enhance the adaptation of all schools, universities and training places. The main goal is to foster the dialogue between the world of education and the world of work. Incentives will enable to create an educational system more “open”/ modern. (The “New skills of new jobs” report). The “right incentives” should also « encourage governments, local authorities, individuals, employers and education and training providers to take action. » Finally, the

"right incentives" should give the opportunity for the Public Employment Services to improve and to give to the unemployed more and better information about jobs and skills required.

7.3.8 Attractiveness of the sector

The electricity sector is not alone in its concerns about its attractiveness for a career. This concern is especially so in those sectors that have evolved through technology to become reliant more on technical skills and knowledge than manual labour. For example to improve its image the UK printing industry began to work closer with schools to teach children how the sector had changed from one involving work of a dirty nature to one that relied upon state of the art instruments and highly qualified workers, whose jobs were becoming increasingly white-collar. Improving the image of the sector was highlighted as a priority in the survey and is clearly an opportunity for joint work between the social partners to further develop. Both trade unions and employers expressed the opinion that improving the sector's image could improve recruitment, especially for these hard to fill vacancies.

7.3.9 Corporate social responsibility

Corporate social responsibility is a means through which companies can voluntarily go further than the law requires of them in order to achieve social and environmental objectives in the day to day running of their business. The European Commission has declared that CSR "can play a key role in contributing to sustainable development while enhancing Europe's innovative potential and competitiveness"[34]. There are a number of good examples of companies using their CSR to drive change and really make a difference to their employees. Another role of CSR reports is to highlight the company's work in a number of key areas and to promote good practice.

7.3.10 Technology and renewables

As the Study demonstrates over the coming years electricity companies will invest more in renewable and in fact investments in renewables around the world are growing. In 2004 they were estimated to be $27.5 billion and in 2007 $70.9 billion. Although, according to the Study, the proportion of total energy usage met by more conventional methods will decrease in the coming decades, as a result of improved efficiencies, the share of electricity as a proportion of the total energy consumption will increase. This has led some commentators to suggest that better electricity utilisation is a solution to climate change[35]. The majority of respondents stated that their company is investing in renewables and that this would increase over time. However the precise increase of this investment will be determined by a

[34] COM(2005) 24.
[35] International Electricity Chief Executive Summit (Atlanta, Georgia, USA 2008)

number of other factors in the future - the increase in R&D, changes within occupations and therefore changes to the demand and supply of specific workers with specific skills.

8. Social dialogue and Just Transition

According to the UNEP/ILO/IOE/ITUC report*, "A Just Transition will only be true to its name if transition policies are designed and implemented with the active participation of those whose lives they affect [and that] In order to move from unsustainable industries to more sustainable ones, workers, employers, and governments need to cooperate."*[36]

In the same publication, it is suggested that

> "*Social dialogue at the national level through planning, education, and preparation of changes will make such transition more fair and efficient. The main goal of social dialogue is to promote the building of a consensus and the democratic involvement of the main stakeholders in the world of work. Successful social dialogue structures and processes have the potential to resolve important economic and social issues, encourage good governance, advance social and industrial peace and stability, and boost economic progress. Social dialogue has occurred at the national level through various tripartite mechanisms involving employers, trade unions, and government bodies. Today, social dialogue happens at the community level and in the workplace, and in companies that are seeking to reposition themselves to take advantage of green business opportunities."*[37]

Just under half of all companies and trade unions who completed the survey stated that discussions have already taken place between the social partners but that no specific initiatives had been introduced (see the chart below). This means that over half of all companies and trade unions in the sample have not yet initiated social dialogue specifically on this matter despite the significance of the required change ahead for the sector. However due to the size of the survey sample it is not possible to tell if this situation is indicative of the extent to which unions and employers are engaging in social dialogue across the entire sector.

European Social Dialogue, founded within EC Treaty (articles 154 and 155), is a central component of the European Social Model. It concerns the discussions, consultations, negotiations and joint actions undertaken by the social partner organisations representing the two sides of the sector (labour and management). These interactions have resulted in the creation of over 300 joint texts by the European social partners. It plays a vital role in the governance of the European Union and should seek to add to the national practices of social

[36] "Green Jobs: Towards decent work in a sustainable, low-carbon world" UNEP/ILO/IOE/ITUC (2008)
[37] Ibid

dialogue. The European Commission stresses the need for strong and robust social dialogue, particularly throughout restructuring. It fully supports the role of the social partners in their sectoral dialogue committees and their sectoral and regional monitoring initiatives.

In addition to complying with European and national legislation there is a business case for social dialogue. Consultation with a workforce may reduce opposition to any proposed changes due to the fact that employees are more likely to feel their views and interests have been heard and taken into account this may facilitate agreements and consensus.

Acceptance, or the buy-in, from employees of the proposed changes may also reduce the potential for disruption to the business from those affected by change and may reassure those workers not directly affected about their employer's commitment to treating employees fairly.

The European Commission itself states that "European social dialogue is a major instrument for improving labour standards in the European Union and contributing to modernising labour markets"[38], thus highlighting the importance of discussions between the social partners to support change. However half of the employer respondents stated that they were "unsure of the value of discussing the issue [of climate change] with the trade unions", suggesting more needs to be done to mainstream issues related to climate change into the work of social dialogue.

Engaging with the workforce and their representatives over the changes ahead may be a challenging undertaking for many employers in the sector, particularly given the range of changes and their seriousness. Although change can bring about new opportunities, it can also have negative implications for the workforce. There is also therefore an onus on the other social partner to engage in a constructive manner if confrontation is to be avoided.

Table 3: The extent of social dialogue and joint employer and trade union initiatives in response to climate change

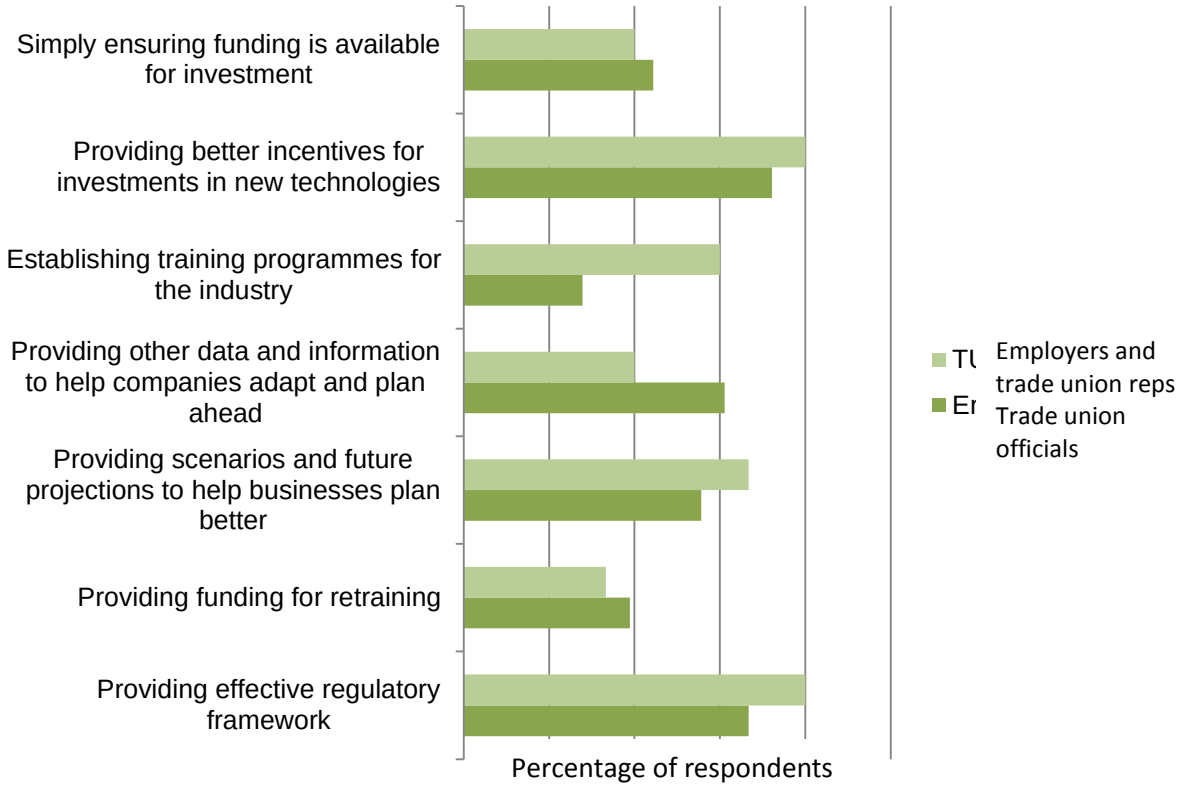
Extent of social dialogue over climate change	% of responses
Climate change has not been discussed by the social partners	8.9
Discussions have taken place but no specific initiatives	42.95
Specific initiatives have been introduced	37.15
The effects of climate change have been included in company agreements	5.25
Specific agreements have been signed by the social partners	5.8

[38] "The functioning and potential of European sectoral social dialogue". European Commission Staff Working Document , (2010)

9. The role of Public Authorities

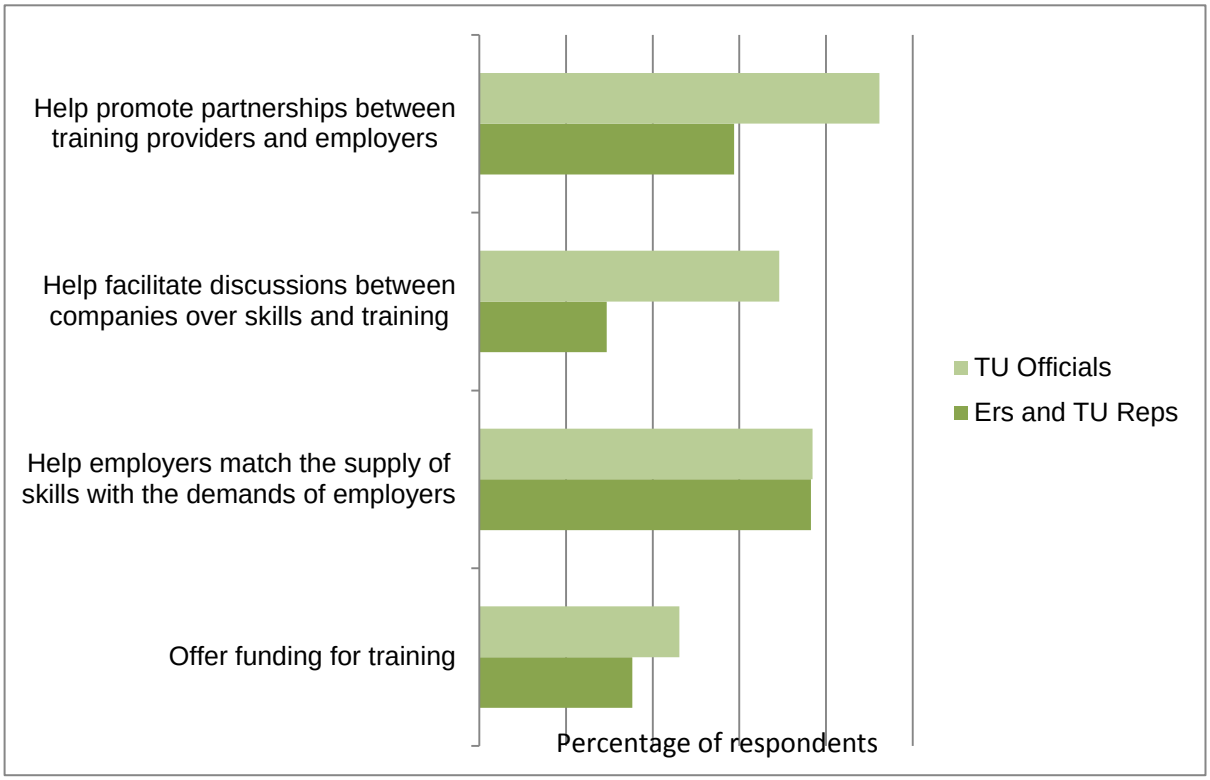
The survey asked the social partners their views on the role the public authorities ought to play in supporting the sector throughout its transition in the coming years, and both partners agreed that the authorities had a legitimate role to play to support the sector through this change. The priorities of the two were similar and the support sought from employers and trade unions largely focused on providing an effective regulatory framework and providing better incentives for investments in new technologies. However where the parties differed was on their views in relation to whether or not the public authorities should establish training programmes for the industry and provide data to help companies adapt and plan ahead.

Graph 11: The expectations from the social partners of the roll of public authorities



Nevertheless, both trade unions and employers in the sector consider that the public authorities have a genuine role to play in supporting the sector in adapting in the coming years. The issue that united both parties in terms of the role of the authorities in improving the capability of the economy through basic provisions of appropriate education and training in basic skills and competencies to facilitate matching the supply of skills with the demand from companies.

Graph 12: Further support from the public authorities



At the regional level public authorities play a key role in supporting training and retraining workers following restructuring. Public authorities in this context include training and education providers, local and central government, job search services, and welfare benefit centres. National and regional governments thus play a key role in providing the necessary labour market policies, in particular in anticipating and identifying future skills needs for national and regional labour markets and providing the infrastructure for workers' longer-term employability. In addition, the transition to a low carbon economy cannot only be driven at the organisational level and will need to be supported by national and regional governments. These should support organisations in their reorientation to alternative energy demands and supply and in anticipating the relevant skills and support workers need in adjusting to these changes.

It is important that the public authorities are involved in good time in order for them to consider how they can provide the required support. There are a number of European-wide initiatives established to support companies undergoing change in particular regions. Trade unions can support an employer's application for support from public authorities. This is therefore a potential fruitful area for the social partners where engagement happens at an early enough stage to ensure buy-in.

Although there are a number of examples where public authorities have supported change within an organisation, there can be competing priorities. The role of public authorities can come into play in discussions over funding and qualifications. Government led regeneration programmes can sometimes offer funding for training during periods of restructuring, so too can much larger EU institutions such as the European Social Fund. The structural funds and in particular the European Social Fund of the European Union are already widely used to upgrade skills and to enhance the modernisation of education and training systems. There is a need to consider how the structural funds can better support the goal of bringing education, training and work closer together as well as modernising education and training systems overall.

10. Conclusions

We are at the beginning of a large transformation towards a low carbon economy in the European electricity sector, in terms its production, transmission and distribution activities and it is clear that this transformation will impact heavily upon jobs and qualifications within the industry. In addition the increasing introduction of competition means that that the companies will in some cases have to develop new competencies in such areas as marketing, sales and customer service.

Representing 24 per cent of the total greenhouse gas emissions from the EU 15 (old Member States) there is no doubt that the European electricity industry will be disproportionately affected by the proposed reductions in CO_2 emissions and this, in turn, will have a dramatic impact on employment, both in terms of job numbers and job functions. With the growth in various types of renewable energy the social partners will need to consider ways of ensuring a smooth transition from today's industry, to the kind required by consumers in the years ahead.

Low carbon technologies in the future will require a large amount of investment and a supportive public policy environment combined with support from the public authorities will be required to achieve these required levels. Due to the scale of this investment, the sector will need to increasingly rely on both the public and private sectors as sources of finance. Thus it will be desirable to establish international collaboration in order to co-ordinate public sector support, to generate an holistic overview of the entire process and to offer financial incentives which will need to established to encourage companies to evolve, particularly into technologies that are still under development (CCS, solar concentrated etc).

The public authorities have the capacity to offer support to employers through this transition by offering funding for training and establishing occupational standards for qualifications, inward investment opportunities and ensuring that the overall demand for skills from the industry is met with an adequate supply of qualified and competent people.

Overall, the general trends for the future of the sector's workforce centre on three main aspects:

- The number of jobs will depend on the geographical location and the specificities of the technology.
- Even if the energy sector employs more workers in the future, the creation of new jobs will total fewer than the number of existing jobs that will need to be adapted in the future.
- The contraction of employment in some areas (for example coal-based power plants) cannot be fully compensated by the development of other area, for example in renewables.

The UNEP/ILO report defines four types of impact that the economic transition will have on employment: the creation of new jobs, the replacement of some jobs, the permanent loss of jobs and the transformation and/or redefinition of jobs.

If these are applied to the electricity sector, it is possible to identify the impacts on the creation and transformation of jobs in the sector:

- Additional jobs will be created - in particular in transmission and distribution where many new jobs will emerge, for example jobs for the installation of smart meters, of advisory services counsel and surveillance.
- Many existing professions will be transformed and redefined according to the 'greening of skills', the working methods and job profiles, for example engineers will need more flexible and cross-sectoral skills; technical jobs on the production side could more or less be converted.
- Replacement of jobs will probably concern the electricity sector less than others. Nevertheless, some risks may change in the future (for example technical risks, cyber terrorism) and will require specialists in these areas.
- Job destruction will take place in a few categories, for example employees responsible for traditional meter readings going from door to door.
- Growing commercialisation will require the introduction of additional competencies.

So more jobs will be created in the coming decades, but the biggest impact on employment will be their content rather than their quantity. Given the potential shortages of supply in the economy generally it makes sense to consider ways to optimise the utilisation of the sector's existing workforce, which will require employers to invest in the re-skilling and up-skilling of their existing workforce.

The generally high age profile of the sector means that in the future employers will find themselves in increasing competition with other sectors for the availably younger work force although the problem is replicated in many sectors across Europe due to changing demographics. For a Just Transition in the sector, employers may need to review their existing recruitment and retention policies and establish lifelong learning programmes to offer workers continuous development and to generate an adaptable workforce.

There will be a greater demand for managerial, technical and professional skills in the future so to avoid increasing labour costs, due to skill shortages, the industry could consider establishing an education and training regime purpose built for the sector – perhaps in conjunction with other sectors with similar challenges. This could be undertaken in partnership with colleges and other training providers to increase the transparency of skills and competencies and the internal mobility of workers in the sector. In terms of higher skills the research shows that a large growth in the number of women with high level qualifications is expected so it would make sense for employers to ensure that their working arrangements and terms and conditions of employment facilitate the attraction of the sector to this group of workers.

Regarding specific skills, there will be a greater need for generic skills (such as leadership), generic green skills, STEM skills (science, technology, engineering and mathematics) and for e-skills. However given the current shortage of employees qualified in science subjects, the challenge training employees in STEM subjects ought to be a greater priority for the sector than the development of green skills. This might be underpinned by further lobbying of the education sector to provide for and encourage more young people to focus on STEM subjects in their formative years. Thus the engagement of schools, universities and training places, in order to foster the dialogue between the world of education and the world of work is desirable. Incentives should also be considered to encourage governments, local authorities, individuals, employers and education and training providers to take action.

State education and further education and vocational training are all important elements in the education of all individuals. But the learning process should not end with the completion of formal qualifications, and skills and knowledge should be continually acquired throughout life. However this process requires individuals to actively seek and engage further opportunities for learning. Given the need for companies in the sector to adapt over the

coming years, it ought to be possible for employers to satisfy their own needs for skill development and at the same time that of individual employees through the creation of a culture of lifelong learning in the workplace. By establishing such a culture in the workplace employers will maximise the utilisation of skills and knowledge across their entire workforce.

At the company level, to identify new skills and to improve existing, one of the solutions could be to create a co-operative networks to share their expertise on new technologies.

It is clear from this analysis that there are opportunities for future work between the social partners over a Just Transition throughout the adaptation of the sector as a result of the impact of climate change. The survey demonstrated that both employers and trade unions are aware of the issues and are equally committed to tackling them. The only divergence appears to be over the role of social dialogue. The trade unions claim to have expressed their willingness to engage with employers, yet many employers fail to see the relevance of dialogue over climate change, preferring instead to work unilaterally before communicating their decisions to the trade unions. This reluctance may stem from expectations of a negative and defensive approach by the trade unions so there are opportunities for the unions to signal a willingness to engage on dialogue freed from stereotypical expectations of attitude. In the background there is a clear European Commission's commitment to social dialogue and support for this type of approach by the UNEP and the ILO, so it seems that there is support for discussions of this nature.

One of the key issues for employers seeking to develop a comprehensive and inclusive skills development programme is lack of demand from the workforce. This is especially the case for workers with low skill levels as research demonstrates that lower skilled workers tend not to see the economic benefits if training. This seems to be an area of opportunity for the social partners to consider establishing incentives to motivate employees to take up training. As CEDEFOP suggests many workers will not take up an offer of training from their employer, despite the fact that it could be in their long-term interest to do so.

Although the delivery of the right outcomes, in terms of skills and competencies, will be the key preoccupation for companies in the sector in the coming years, the role of communication is also important. Wide dissemination of relevant information serves to ensure a fuller debate with a broad range of stakeholders which, in turn, creates greater opportunities for feedback and improvement. The social partners can support this process by establishing ways of communicating successful methods for involving older workers, anticipating change and creating a lifelong learning culture in the workplace across the sector and by jointly highlighting at company, national or European levels success and failure to help the continuously adapt over the coming decades. Even where a process or initiative reaches its objectives in the present, it is highly unlikely that it will remain relevant

or fit for purpose. Thus the cycle described above is essential in all circumstances and the European social partners should give some thought into how they play a role in the co-ordination of such a process.

11. Final recommendations

This project demonstrates clear evidence of a commitment from both sides of the industry to take seriously the challenges of climate change and what follows is a table highlighting the key issues to be addressed to assist the social partners through a Just Transition. Provided with each recommendation is the rationale, the actors concerned along with the level at which the action should be taken and some brief points on the process for developing each action.

On the basis of the research undertaken as part of this project a number of factors have come to light which may be worthy of further consideration by companies and trade unions involved in the sector. This includes some case studies. This collation can be found in the Appendix.

Table 4: Recommendations for the social partners

The objective	The rationale	The actors and level	The process
To tackle the age profile of the sector to ensure a sustainable mix of skills and competence to meet future needs	The large number of people retiring in the sector in the next decade will not be replaced by younger workers and the labour market will contract by 2020.	Employers Trade unions At the company and sector level	• Raise the problems associated with the sector's ageing workforce among companies, their workforce, trade unions, national and European policy makers • Introduce knowledge transfer and succession planning programmes • Adapt training programmes for older workers so that those who seek further training and development are not overlooked Review attitudes to and approaches to ageing and the management of older workers to facilitate their retention for as long as they feel able to make a contribution • Ensure that the sector is made attractive to young people by improving the image of the sector and in particular exploring options to make the sectors work places more attractive to female workers
Develop anticipatory mechanisms	Anticipating the needs of the industry tomorrow is a key element of a strategic plan for the European electricity sector's future stability and competitiveness	Employers Trade unions Public authorities At the company and sector level	• Consider establishing a Sector Council for the sector • Promote social dialogue at the company and sector levels • Develop partnerships with existing European observatories • Involve a wide range of stakeholders • Managers are key actors in this process
Establish a culture of lifelong learning in the workplace	Those who continuously develop their skills increase their job security and are better able to adapt to change. It is seen as positive response to long term change and restructuring that can ensure that displaced workers, and those unaffected, are equipped with the necessary skills for alternative, internal or external, employment.	Employers Trade unions Training providers Funding authorities At the company level	Employers can • Introduce informal training programmes • Validate prior learning competencies and qualifications • Identify competencies and qualifications required Trade unions and employers can jointly • Introduce workplace learning representatives • Undertake a training and learning needs analysis • Continue to work on the issues raised in the joint statement from EURELECTRIC, EPSU and EMCEF on lifelong learning (2003) Funding authorities can: • Allocate funding towards developing lifelong learning programmes

Table 4: Recommendations for the social partners

The objective	The rationale	The actors and level	The process
Improve internal mobility of labour	To ensure workers can contribute to the business in a variety of ways, offering workers new possibilities, increasing adaptability and enhancing competitiveness.	Employers At the company level	• Establish annual development plans for all employees • Introduce job rotation schemes • Promote the transparency of qualifications • Validating prior learning
Increase the participation of female workers	To exploit knowledge and skills of the high number of females with higher skill levels; to increase the representativeness of the sector so it reflects the wider population, to increase labour pool from with to recruit	Employers Trade unions Stakeholders in the education system At the company and national level	• Improve the image of the sector as a career • Evaluate the diversity profile of the organisation • Generate information about the sector and its career potential for female workers • Consider ways of engaging young women in science and technology • Further information on this issue can be found in the Equality and Diversity toolkit[39]
Work with public authorities	Just Transition requires support from the public authorities for financial investment, funding for retraining, lifelong learning programmes, adequate regulatory environment, incentives for 'green' R&D, educating wider public on issues regarding just transition.	Employers Trade unions Public authorities (career advisers, investors, schools and colleges, government departments, legislators) At the regional, national and European level	• Work with authorities to create a long term relationships with the relevant national and European institutions • Broaden stakeholders and develop long term relationships. • Encourage a greater focus on sectors skills in schools • Work with education providers to establish occupational standards and competencies
Improve social dialogue on the subject of climate change	Effective change management requires involvement of both sides of industry working towards the same goals. Greater chance of successful change if workforce has a voice in the process.	Employers and trade unions at the company and European levels	• Jointly set out the key challenges for the company and its workforce in the coming years • Introduce a specific joint initiatives to raise awareness of Just Transition • Establish a company level working group • Undertake a joint audit of workforce's skills and knowledge and consider how skill gaps and shortages are dealt with • Further information on social dialogue and restructuring can be found in the sector's Restructuring toolkit[40]

[39] Pillinger, J. "Equal opportunities and diversity toolkit", (2007) EPSU, EMCEF and EURELECTRIC

[40] Moore, S. Potter, H. Tarren, D. "Restructuring in the Electricity Industry: A Toolkit for Socially Responsible Restructuring with a Best Practice Guide", (2008) EPSU, EMCEF and EURELECTRIC

12. Appendices

A 1.1 The sector's ageing workforce

The projections for the European labour market in the coming decades demonstrate the need for employers to act to make sure they continue to have enough employees in the future and this could be achieved by:

a) Reviewing attitudes and approaches to ageing and the management of older workers to facilitate their retention for as long as they feel able to make a contribution. Where older workers are due to exit the labour market programmes around knowledge transfer and succession planning ought to be established.
b) Adapting training programmes for older workers so that those who seek further training and development are not overlooked.
c) Ensuring that the sector is made attractive to young people by improving the image of the sector and in particular exploring options to make the sectors work places more attractive to female workers.

Employers ought to recognise older workers' skills and knowledge and their contribution to the company and consider older people when establishing new training initiatives and making other strategic choices across the business. Companies should invest in training programmes for all employees and generate a culture of lifelong learning within the organisation and this is further dealt with later in this section.

A 1.2 Knowledge transfer and succession planning

Succession planning is about examining the current workforce and identifying individuals to fill positions in the future and applies equally to skilled workers and managers. Older members of the workforce can become mentors supporting younger workers, acting as role models and generally offering their advice and support. This can be done in a variety of ways, for instance a younger worker may shadow an older worker. Companies may wish to consider introducing older workers into the delivery of their training programme, either formally by recruiting them as tutors, or informally by involving them in the delivery of certain aspects of the company's training or induction programmes. These types of initiatives will benefit trainees as older workers may have the practical, hands-on, experiences formally trained tutors do not. This type of approach not only increases the profile of older workers within a company, supporting a cultural change, but also demonstrates to younger workers the benefits of seeking support from older workers in their every day working life

A 1.3 Recruiting young people and improving the image of the sector

Due to the ongoing technological changes, particularly in relation to renewables, and the increasing emphasis on scientific and technical occupations, the electricity sector has an opportunity to demonstrate its value in terms of job satisfaction, career development and as a modern sector. This could be achieved by working with schools and colleges. Appropriately trained industry representatives could present the industry to young people in a new light, as an exciting sector with opportunities for career development and newly created occupations based on science and technology. In addition the sector's social partners could consider jointly producing literature highlighting the benefits of working in the sector to young people.

A 1.4 Anticipating change

Constructing a framework for the anticipation of change can create a shared diagnosis between the social partners and generate discussions among the key stakeholders which will enhance the information available to individual employers, training providers and policy makers. Successful anticipatory measures are those that involve approaches at different levels (company, region, country, sector) and involve both social partners. In addition strategies characterised by a bottom-up approach through partnership, including working with the public authorities and training institutions, offer the greatest chance of success and sustainability.

When employers establish initiatives to anticipate change, the role of managers is often overlooked. Due to their regular contact with the workforce, individual managers can identify weaknesses in the company's training and skills programmes, make accurate assessments on an individual's skills requirements and develop feedback mechanisms to the company's training infrastructure. However individual managers will need support and training themselves to undertake this role effectively and to appreciate the significance that the company places on their participation in this area.

A 1.5 UK Sector Skills Councils - Energy and Utility Skills

SSCs are independent, employer-led organisations that cover specific economic sectors in the UK, which seek to build a skills system that is driven by employer demand and have four key goals:

- To reduced skills gaps and shortages
- To improve productivity, business and public service performance

- To increase opportunities to boost the skills and productivity of everyone in the sector's workforce
- To improve learning supply through National Occupational Standards, apprenticeships, and further and higher education.

The strengths of this approach are that it takes a holistic approach to learning and training, involving all relevant stakeholders, provides a link to the workplace and other training and education initiatives and when qualifications are established, they reflect both the needs of individuals and their employers. Overall they seek to ensure that training provision (from colleges and training providers) meets demand (from employers and employees). Sector Skills Councils (SSCs), headed by the Sector Skills Councils Alliance, bring together industry and experts in an effort to align the available courses and qualifications with the needs of industry.

Energy and Utility Skills (EU Skills) represents the interests of the gas, power, waste management and water industries and has established a strategic plan for 2010-13 setting out how the industry will tackle the changes in skills and occupations, derived from its analysis of change in the coming years. In order to ensure the delivery of this strategy, the UK introduced the concept of National Skills Academies and, in 2010 with government funding, the Academy for power[41] was established. The academy is an employer-led initiative created specifically to offer a national approach to long term skills issues, including the supply chain. The academy will heavily influence the curriculum to better reflect employers' needs it will be able to set standards with the aim of improving training opportunities and the quality of courses and help to develop career paths for people entering the industry. National Skills Academies will work with the industry's stakeholders and aim to develop an infrastructure that can anticipate future change, create an occupational standards framework and ensure a supply of effective training providers.

A 1.6 European Sector Councils

To address the mismatch between the demand and supply of skills and competencies the European Commission is in the process of establishing Sector Councils for Employment and Skills in a number of sectors at the European level. At the national level there are skills observatories in 22 member states that seek to anticipate future skills and competencies across a variety of sectors in Europe. In 2008 the European Commission published 18 sector studies and signalled its interest in establishing similar mechanisms at the European

[41] http://www.power.nsacademy.co.uk/

level and earlier this year formally established its plans for their creation. The Commission now wants to hear from sectoral social partners who are interested in establishing a Sector Council.

Sector Councils will utilise the experience and knowledge of national observatories and seek to bring together the social partners, public authorities and training and education institutions to assist developments on sectoral labour markets and connect the information already available at the national level to that at the European.

The social partners might consider discussing the potential of establishing such a body within the sector to help them anticipate future skills needs.

A 2.0 Case Study in France: Forward-looking Management of Jobs and Skills in EDF and SNET

The French electricity sector predicts the creation of thousands of jobs by 2020 for three reasons:

- The growth of jobs in nuclear
- The compensation of the loss of jobs related to the decommissioning of coal-based power plants with jobs created in new units of gas combined cycle;
- The development of renewable capacities by 2020 which will create thousands of permanent jobs in the fields of operation and maintenance.

These expected changes will mean alterations in occupations and skills in the various sub-sectors of electricity production. Companies such as EDF and the SNET have undertaken negotiations over this issue, which included the global strategy of the company and its effect on employment and the GPEC initiative in relation to the preservation of employment of older workers and their access to vocational training.

The SNET has a production park consisting mainly of four coal power plants, employing a total 577 people. Over the coming years the company will have to face a cessation of certain units of production, the retirement of employees and the impact of changing technologies. These changes will mean that the company must anticipate the training required to assemble the necessary skills across its workforce. The social partners are currently working through their negotiations and refer to the following themes - a GPEC framework agreement, a project improving mobility, a specific draft agreement for the implementation of an industrial plan and the draft agreement on the employment of older workers.

The decommissioning of the company's coal and oil units, as well as the start of new nuclear units, meant that the issue of skills management entered the discussions - it is predicted that majority of EDF thermal units will have ceased production by the 2013.

Due to a large reduction of the workforce in the last decade, related to the lack of demand from thermal production as a result of overcapacity in Europe, the company redeployed its employees to other units. Over the period from 1993 to 2008, 1,861 employees left these centres of thermal production, representing 60 per cent of the staff in 1993.

Several factors entail a serious loss of skills both in the operation jobs and in those of the maintenance, for lack of anticipating enough the renewal of these skills and to have a pool to promote them, in the short and medium term. The decline of staff, the retirements (which concern mainly the jobs of driving and maintenance), little hiring over the period and the lack of attractiveness of the jobs in thermal units made that the company filled this short-term deficit by a transfer of the employees of maintenance towards the driving and by a mutualisation of the resources and the development of multi-skills in the related jobs. The delayed retirement of volunteer employees allows the transmission of a know-how necessary for the perennation of the skills " heart of job ", a key factor in the improvement of performance.

The sites' closure and the starting of new production units by 2012, requiring fewer resources, will entail a new decrease of staff. Among three professional domains in power plants (driving, maintenance and tertiary sector), the jobs by of driving and maintenance will be the most impacted. The renewal of skills requires a considerable time of professionalization, because of duration necessary for training and for acquisition of the know-how, overviews and experience to be acquired.

A subcontracting policy was encouraged for a long time. It refocuses now on non-strategic activities, in low added value, to focus the internal resources on strategic activities. However, this strong appeal of subcontracting, associated with the transfer of employees towards the jobs of driving and with the ageing employees of maintenance, is the cause of a lack of skills within the maintenance function. So, the skills of the project ownership, boiler making and the faucet factory (?) are particularly required. 43% of this speciality staff will have retired by 2015. The intensification of the skills in certain jobs (intervention and surveillance, business management, methods and expertises) was identified. Other professional domains occurring within the production units are not strongly affected. That is why they plan a minimal flow of recruitment.

A 2.1 Lifelong learning

Establishing the internal processes aimed at supporting workers develop new skills throughout their careers offers several benefits. It can enhance retention by stimulating a company's internal labour market and fill future skills gaps brought about by demographic change. It can also serve to promote interest of the sector as a career among the population generally and introduce highly skilled workers employed elsewhere to the sector, bringing additional skills and knowledge into the industry.

When a company decides to alter the composition of jobs or skills it is important to establish mechanisms to promote training and maximise take up of training opportunities involving trade union representatives. Lifelong learning is a key component of the European Employment Strategy as is seen as positive response to long term change and restructuring that can make sure workers who are displaced by change, and those unaffected who remain in employment, are equipped with the necessary skills to support their employment prospects. There is already some evidence, from EPSU, that there is an established national and sectoral framework of social dialogue over education and training. EPSU's implementation survey of its Lifelong Learning for All initiative highlighted the active involvement in this area of the social partners in Belgium, Denmark, Finland, Ireland, Norway, Sweden and in the UK. However this active participation of the social partners seems to be predicated on a national legislative framework for the involvement of the social partners in this field.

The 2002 agreement, "Framework of actions for the lifelong development of competencies and qualifications" between the European social partners commits employers and trade unions to work jointly on the development of competencies. The agreement sets out four key priorities:

- Identification and anticipation of competencies and qualifications required
- Recognition and validation of competencies and qualifications
- Information, support and provision of guidance
- Mobilisation of resources

The social partners can play a key role in the validation process for prior learning and this will be more so for older workers who may have acquired their skills without the corresponding qualifications. Employers and trade unions ought to assess the current methods of validating informal learning and the derived skills by including, recognising and validating skills learned while in the workplace. The social partners could jointly carry out an analysis of what skills and competencies individual workers would like to develop. This

could include a mixture of informal and formal learning that the company could develop and deliver.

Formal training is only part of the lifelong learning process and companies ought to consider how they can introduce informal learning to generate interest from workers who are unsure about returning to education and also to create a working environment that is seen as progressive and fulfilling. Innovative training programmes can often generate enthusiasm among workers who historically turned away from training opportunities. Offering informal training on subjects not necessary allied to an individual's work can engender an association between the workplace and the learning process. This can be done by offering training at break times or at the beginning of shifts and the time given up by an employee could be matched by their employer – so if a worker is willing to comes into work 30 minutes early to learn, their employer will match that by allowing them 30 minutes away from their work to learn. This association between an individual's workplace and the learning process is a powerful tool in generating enthusiasm for new ways of working and supports the process of change management.

A 2.2 Internal and external mobility

A key tool in the development of career pathways is the creation of sectoral internal and external mobility of employees, through a continuing process of training and competency development, developing employer action that will promote internal mobility and offer employees modern career options and movement within the company. This overarching strategy must be linked to other issues such as age management, equality and diversity and ought to consider the sector's supply chain in terms of career development and skill supply. The supply chain is a crucial part of any industry, which can drive investment and create jobs in the future. Company training strategies can too often focus on job-specific tasks and fail to offer a wide range of skills and competences for employees to either support them in their future careers either within the company or elsewhere.

A good company strategy to create greater internal and external mobility might include:

- Establishing annual development plans from which employers and employees create strategies designed to maintain and enhance workforce skills for the coming 12 months.
- Introducing job rotation schemes to promote continual training and learning. These will also offer employees a wider view of the company which will support their internal career development as well as their understanding of the business.
- Promoting the transparency of qualifications across the sector and beyond.

- Validating prior learning so that individuals are able to translate any informal learning into formal qualifications. As well as increasing the mobility of employees it also guarantees companies a continuous supply of skills and knowledge, which match the wider business strategy.

Successful strategies in developing internal mobility will require good social dialogue over training and learning and innovative company actions. They will also rely on a forward looking approach, rather than knee jerk reactions or crisis management. Larger companies should consider how they integrate their relationship with the supply chain to maximise a sectoral labour market mobility which will create vertical as well as horizontal career mobility. This approach will support SMEs in the sector which often lack the required resources to construct their own skills and training strategies.

A number of employees will favour maintaining their existing role to moving elsewhere within a company and this can often cause stagnation in terms of business efficiency and in the aspirations and ambitions of the individual. For some workers this will be insufficient as a career and they will want an employer that encourages movement between jobs, often involving significant training and up-skilling. This presents a huge challenge for businesses, particularly in light of the greater need in the future for companies to retain the best employees due to demographic change.

A 2.3 Case study: Electricite de Fran

EDF`s sought to create an environment in which individual workers were could enjoy good security of employment yet have future possibilities for individual mobility. According to the company, of its 160,000 workforce roughly 15,000 employees move to different jobs within the company. However many others prefer to stay in the same role. So the company sought ways to improve its internal mobility and has highlighted a number of critical factors that support such a policy:

- Transparency - transparent information on the internal job market
- Communication – giving employees the right information on job openings and training options
- Benefits - highlighting the benefits to managers of supporting mobility amongst their team
- Support – providing the right support to those employees who choose to move

The EDF approach is geared towards high internal job mobility and is grounded on the concepts of lifelong learning using a variety of methods. Workers seeking to move internally

are offered initial training to prepare them for the further technical training they will receive for their new role. The company involves workers with at least four years experience in its internal training programmes and extensively utilises e-learning for technical training.

A 2.4 Restructuring and change management

Any plans for restructuring ought to include provision, and time, for the identification of the necessary skills for the workforce. This could be undertaken jointly by the social partners, generating a perception of teamwork among the workforce, and could involve discussions in groups between managers, trade union workplace representatives and employees. If people are aware of the change and feel part of it, provided they have the right support and training, then the process has a greater chance of success.

A 2.5 Workplace learning representatives

The role of eliciting the views, concerns and ideas of the workforce in relation to training and learning could provide the employer with useful information and guidance about the views of workers and would generate a environment of joint responsibility. Workplace learning representatives could act as learning champions or ambassadors and, if recruited from a cross section of the workforce, could stimulate discussions and an interest in learning as well as inspiring individuals. The added-value of this role is that it would not only stimulate interest in learning but would also stimulate demand for learning and could be based on the UK Union Learning Representative role. There are over 22,000 Union Learning Representatives who have now been trained to raise the awareness of employees of the benefits of training and encourage and support learning activities for employees. Integral to this role is the creation of company level Learning Agreements in which the social partners commit to supporting lifelong learning and which usually include the creation of a workplace training relearning committee through which managers and workplace representatives discuss issues around skills and training.

A 2.6 Strategic planning

Companies might consider establishing a strategic training plan which genuinely involves the workforce and generates a joint collaborative approach. Representatives from managers and trade union can work together to harness the views of the business and to maximise buy-in from the both sides. Trade unions have an important role to play in offering insights into the training needs of the workforce which should complement the employer representatives' knowledge of the company's business needs. Taken together, this information will provide a holistic overview of both the needs and wants of both sides and

can act as a platform on which to build an overall skills strategy. It is desirable that Companies include the needs of all workers and the role of trade unions in this can enhance the 'reach' of this process and engender an atmosphere of inclusivity.

The industry might examine its current training infrastructure and consider ways to improve it, which includes employers, providers, education institutions, funding regimes, delivery, access and content. Companies might consider how they can take a strategic approach to developing and improving training and education within the sector, both for those currently employed and new entrants. This strategic approach should include providing training opportunities for the entire workforce, particularly older workers given the changing demographics, and ought to include a focus on equality and diversity given, for example, the preponderance of women across Europe with higher skill levels.

As with other initiatives, if the social partners can agree to work together constructively over this issue, then there is a far greater likelihood of success. Trade unions can often elicit the negative and positive issues around training and these will offer an insight into the current limitations of the system for the relevant actors. In addition, the actors within the infrastructure may be completely unaware of the limitations or hurdles to active engagement and may welcome the involvement of the social partners.

A 2.7 Female participation.

As indicated above statistics show a greater number of women across Europe hold higher qualifications than men the industry should consider strategies to increase the number of women being recruited across the sector and this will also involve considering how companies can genuinely offer high skilled women a professional career path in what is today a male dominated industry.

To recruit and retain female workers employers ought to consider the external perception of the industry among this section of the labour market. In general the potential solutions for engaging with a greater number of female workers will involve a similar strategy to that concerning other sections of society.

Employers wanting to interest workers from outside the sector, or from within to more senior posts within the organisation ought to consider:

- The image of the sector as an employer. Companies could examine potential improvements to their profile, terms and conditions of employment, working environment, career and training opportunities.

- Companies could consider offering opportunities for young women to experience non-traditional work such as that found within science and engineering.
- The diversity of the sector and their business. Employers could evaluate the profile of the organisation and consider ways to improve equality and diversity, which could include the introduction of a holistic equality and diversity strategy.
- Generating information about the sector and its career potential for female workers. The same approach could be taken in company's attempts to interest young workers in the sector.

Over the last decade a key focus from a large number of training providers and training is the development of courses that are delivered through innovative methods and offer flexibility in terms of their delivery and content. Employers and trade unions working with these organizations are more likely to convince them of alternative methods or approaches, particularly given the potential number of trainees commercially available from a company seeking to establish long term links with a provider.

It is clear that investment into skills should also cover investments into training the trainers and on developing training tools and CEDEFOP suggests that a diverse range of tools and processes must be developed. Incentives must also be developed to alter the behaviour of the training providers and education institutions and to bring together the worlds of work and education to develop a greater mutual understanding and this was certainly highlighted as a priority by the trade unions and employers in the survey.

A 2.8 Improving social dialogue on the subject of climate change

According to the survey results not all employers and trade unions have begun discussions over the effects of climate change on the sector and many more have not yet begun working jointly to tackle these issues. Social dialogue appears to offer an opportunity to overcome the challenges faced by the sector in the coming years. The social partners in the sector need to set out their respective roles within the transition process and begin discussions over the key issues. For example, a trade union interviewee expressed their view that trade unions could play a role in the education process – for instance in explaining to their members the challenges and the need for the support of the workforce for future change.

Companies and trade unions could begin by:

- Setting out the key challenges for the company and its workforce in the coming years, including key issues such as retraining, up-skilling and redeployment.

- Introducing a specific joint initiative to demonstrate to the entire workforce that overcoming these challenges requires a joint approach and that both social partners are willing to do this. This could be briefing sessions where an employer and trade union representative explain the key issues and the need for future change to small groups of workers. This would allow individuals to raise issues or concerns and to join in the discussions about overcoming them.
- Establishing a small company level working group to discuss a specific issue around climate change. This group could be composed of representatives from the employer and trade unions and would feedback the conclusions of their discussions within the existing company level social dialogue framework.
- Addressing the issue of training and skills could begin by the social partners undertaking a joint audit of the workforce's skills and knowledge and then considering how skill gaps and shortages are dealt with.

A 2.9 Case study: Social Dialogue in ENE

In 2009 Enel, along with the Italian trade union confederations CGIL, CISL and UIL and the national electric sector federations FILCEM, FLAEI and UILCEM reached an agreement on two agreements concerning common "sustainable development". The first agreement, called the "Enel Corporate Social Responsibility Protocol", commits the parties to support actions to promote company CSR policies and to adhere to the principles of the fundamental rights of workers, including a commitment from ENEL to respect, promote and implement these in all countries where the company operates.

The second agreement established an "Observatory on Industrial, Environmental and Occupational Policies". This is a joint body formed by six Enel representatives and six sector and confederation trade unions representatives. It acts as a platform for the discussion of the company's industrial, environmental and occupational policies, with a particular focus on the issues relating to the safety of procurements, the liberalisation of the sector, environmental conservation and Enel's industrial policy development.

It was in this context that, in July 2010, a Memorandum of Understanding was signed by the parties which addressed the issues of Enel's Geothermal business in Tuscany and the start up of the Observatory on the Industrial, Environmental and Occupational Policies upon renewable Energy matters. Considering the of the growth targets set by the company, and the importance of promoting and sustaining the company's investment plans the parties arranged an extraordinary session of the Observatory focused on Renewables Energy Area, scheduled for the second part of 2010.

A 2.10 The role of Public Authorities

There is ample evidence from the survey, which demonstrated that the social partners view the role of public authorities as important in a number of areas:

- Providing effective regulatory framework
- Providing better incentives for investments in new technologies
- Providing scenarios and future projections to help businesses plan better
- Help match the supply of skills with the demand of skills from employers

In addition, employers from the sector who responded to the survey wanted public authorities to help promote partnerships between training providers and employers.

However, throughout the text of this publication public authorities have been referred to as having the potential to support the industry in the following ways:

- Public policy intervention can support the transformation of Europe's economies to low carbon usage, particularly in the context of the current financial crisis in which private investment may not be forthcoming.
- Public policy will need to be orientated towards providing incentives and investment, in partnership with the private sector for the development of renewables and biomass-waste fired energy production in particular.
- Employment policies will need to be developed to support the anticipation of skill needs and provide training for trainers, and improve labour / occupational mobility.
- Encourage a greater focus on such skills in schools and propose ways to encourage education providers to work with businesses to meet the demand for these types of skills.

The social partners could give consideration to the co-ordination of state education provision and further or higher education. This will ensure that there is a continuous learning cycle but will mean improving flexibility and the transition between different educational provision. This process will be easier if there are adequate validation systems in place.

Companies and trade unions could establish partnerships with a wide range of public authorities such as education and training providers and other education institutions such as colleges and universities. This will support diversity as employers will be able to ensure these bodies consider the needs all age groups, particularly older workers.

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