EXECUTIVE SUMMARY

SKILLS NEEDS DEVELOPMENTS, VOCATIONAL EDUCATION AND TRAINING SYSTEMS IN THE CHANGING ELECTRICITY SECTOR

Project Consultant

Spin360

Sustainability | Progress | Innovation | Network

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Spin360 supports companies, industrial associations, social partners and institutions in taking advantage of the opportunities for a development model based on prompt and ongoing anticipation of changes. The pillars on which the growth models we propose are based are: Sustainability, Progress, Innovation and Network, with a broad 360-degree approach.

With the support of the European Union

FOREWORD

The European social partners for the electricity sector—industriAll European Trade Union and the European Public Service Union (EPSU), representing the trade unions, and Eurelectric, representing the electricity-sector employers—have identified the skills needs for the electricity sector and education and training systems as a priority for their joint work. There are several drivers motivating these priorities. Firstly, the ongoing transition of the electricity sector driven by the decarbonization and the digitalization of the sector and the skills required by new technologies and business models. Secondly, high youth unemployment in Europe: the situation of young people in the labour market, and especially the transition of young people from education to the labour market, has been identified as a priority.

The mitigation of climate change coupled with digitalization of the sector will have a serious impact on employment. It will result in shifts in employment and job profiles that need to be addressed urgently. Education and training systems will have to provide for the skills that our sector needs in order to respond to these shifts. Our joint understanding and cooperation to promote a Just Transition to clean-energy systems within the EU is based largely on the skills dimension. Moreover, Europe has recently witnessed an economic and financial crisis, the effects of which were especially severe for young people. In many EU countries, young people who wanted to enter the labour market were faced with unemployment or precarious working conditions. We have addressed this problem in our Joint Agreement on a Quality Framework for Traineeships in the European Electricity Sector, which provides for good working conditions and standards for young people in traineeships.

These considerations led us to carry out an EU-funded project to study the drivers of change in the electricity sector, their impact on job profiles, the diversity of education programmes in Europe and, ultimately, to identify best practices. With this, the resulting study, it is our ambition to contribute to the discussion and offer best practice or solutions that could be replicated across the EU. What is more, the study and its recommendations have led us to develop a roadmap in which we define the key areas in the field of skills, qualifications, education and professional development that we need to address as European social partners in the coming years. It includes some very specific commitments for the European social partners as well as for social partners at national, sectoral and company level.

It is our ultimate objective to offer an attractive work environment and quality employment—built on a well-educated workforce who contribute to growth, prosperity and quality employment in the entire European economy.

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BACKGROUND

Though electricity systems vary significantly across EU member states, the European electricity system is everywhere changing rapidly.

The most visible developments are in electricity production, with the growing penetration of small and medium renewable plants, meaning that network systems will need to develop and become better integrated. Developments in storage technologies will also be an important part of future systems.

Digitalization, smart metering systems and rapid technological developments of control, information and communication technology mean that energy suppliers will have new opportunities in the market. It will be a market environment where the competitive value of services will depend on new relationships with customers who are becoming more aware of their choices in energy consumption.

Changes underway in the sector have created both new opportunities and new challenges. Opportunities include new workforce potential in the renewable energy sector, especially in information and communication technologies; challenges include the skills gap in the deployment and operation of new technologies and the need for a qualified young workforce.

This *Skills Needs Developments, Vocational Education and Training Systems in the Changing Electricity Sector Report* is the result of an extended study and seeks to understand the following trends:

- Current and future impact, in a timeframe of 10 years, of drivers of changes in occupations in terms of skills needs.
- Current Vocational Education and Training (VET) offer, focusing on new skills needs in the sector.
- Skills mismatches and gaps between skills needs and the current VET offer.
- VET best practice in the electricity sector.

The recommendations included in the report represent an key outcome of the present study and aim to assist the European social partners in the development of a Roadmap on Skills in the Electricity Sector, which is an integral part of their ongoing work to harness the energy transition.

METHODOLOGY

This study has been shaped and developed in collaboration with the European social partners in the electricity sector: EPSU, industriAll Europe and Eurelectric and the members of the project Steering Committee. This has been done with a view to promoting the integration of young people through an updated skills offer in the electricity labour market.

Research tools: three extended surveys and three regional seminars

Timeframe of activities: 13 months (May 2017-June 2018)

Target audience of the surveys:

- 184 stakeholders from leading European employers and trade-union federations in the electricity sector
- 188 VET providers in the electricity sector in 23 European countries

SCOPE

In 2016, "electric power generation, transmission and distribution" generated a turnover of € 1.152 trillion throughout the EU-28, accounting for almost 13% of total EU-28 GDP.

"Trade in electricity" is the most relevant sub-sector in the total turnover, accounting for nearly 47% of the total in 2015. Meanwhile, "electricity transmission" is the least important in terms of turnover with only 6% of the total share.

The study targeted all EU-28 member states. The results are therefore associated with this geographical framework. However, since the research focuses on the sectoral workforce, emphasis has been given to the 11 EU countries that account for more than 80% of the total European workforce in the electricity sector (Fig. 1).

KEY FINDINGS FROM THE RESEARCH

The study highlights high expectations among respondents that certain drivers of change will impact on occupations in the sector: more than 50% of respondents replied positively for 10 out of 15 occupations in the sector (Tab. 1) and digitalization and technological changes will pose the greatest challenge to the workforce in the sector, as compared to decarbonization and new business models (Fig. 2).

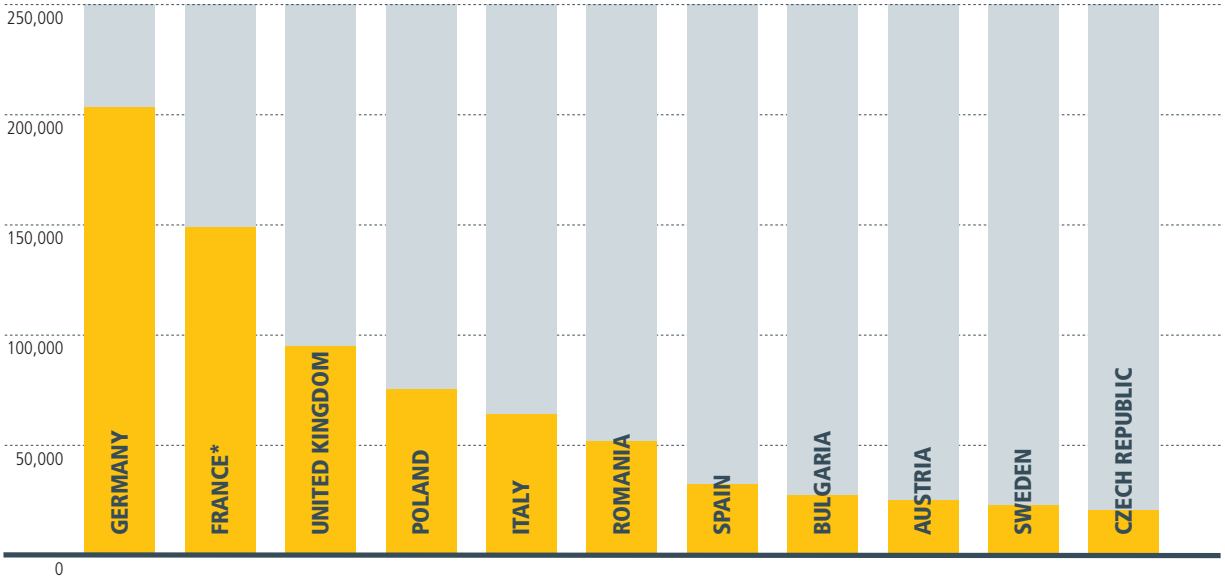
Network and Household Metering Technicians, Engineers and ICT specialists are the occupations with the highest expected impacts (Table 1).

In the next ten years, occupations in the sector will require new and updated skill sets to meet the challenges posed by the energy transition and climate change.

Our research explicitly asked respondents which skills they expected to be in most demand for a set of fifteen occupations. The skills identified by respondents mainly belong to the following three categories: "technology-digital" (40%), "soft skills" (22%) and "specialized technical skills" (16%) (Fig. 3).

FIGURE 1

COUNTRIES THAT ACCOUNT FOR 80% OF PEOPLE EMPLOYED IN THE INDUSTRY "ELECTRIC POWER GENERATION, TRANSMISSION AND DISTRIBUTION" (No, 2015)



Source: Elaboration on Eurostat data (Nace D351) * 2014 data

FIGURE 2

MAIN DRIVER OF IMPACT ON OCCUPATIONS

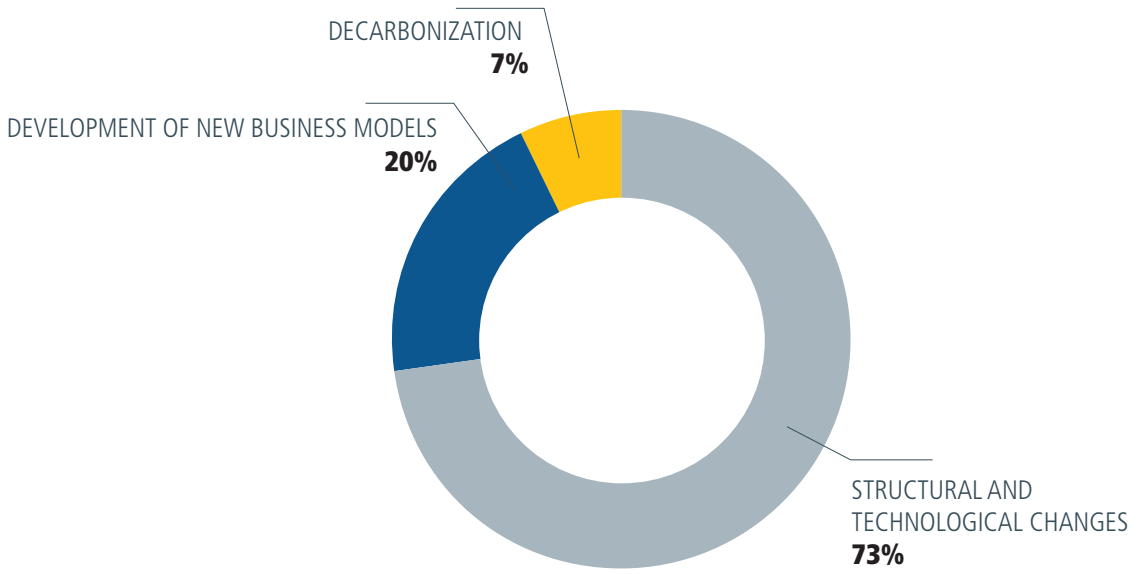


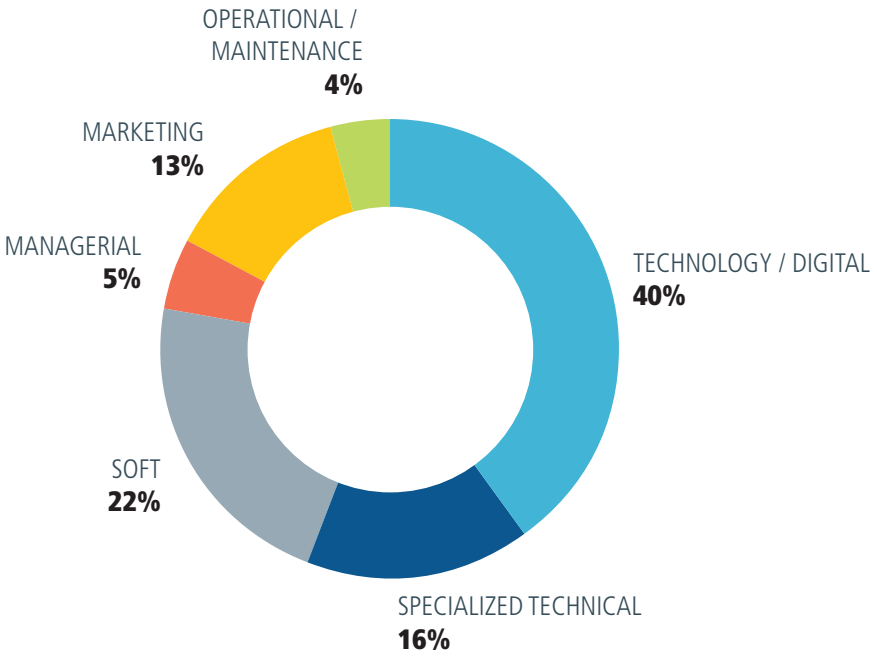
TABLE 1

	OCCUPATION	MAIN DRIVER OF IMPACT	IMPACTS OF DRIVERS ON OCCUPATION
1	O&M: NETWORK-ELECTRICIAN	STRUCTURAL AND TECHNOLOGICAL CHANGES	79%
2	O&M: HOUSEHOLD METERING TECHNICIAN	STRUCTURAL AND TECHNOLOGICAL CHANGES	77%
3	O&M: FACILITY-TECHNICIAN	STRUCTURAL AND TECHNOLOGICAL CHANGES	64%
4	ENGINEER: PLAN.& DEVELOP., PRODUCTION AND MAINTANANCE OF ELECTRICITY GEN. FACILITIES	STRUCTURAL AND TECHNOLOGICAL CHANGES	67%
5	ENGINEER: NETWORK	STRUCTURAL AND TECHNOLOGICAL CHANGES	77%
6	ENGINEER: STORAGE	STRUCTURAL AND TECHNOLOGICAL CHANGES	64%
7	PROJECT MANAGERS AND BUSINESS DEVELOPERS	STRUCTURAL AND TECHNOLOGICAL CHANGES/NEW BUSINESS MODELS	54%
8	COMMERCE & TRADING: SALES MANAGER/ OPERATIVES AND SALES EMPLOYEES	DEVELOPMENT OF NEW BUSINESS MODELS	51%
9	COMMERCE & TRADING: CUSTOMER RELATIONSHIPS & SERVICES	DEVELOPMENT OF NEW BUSINESS MODELS	46%
10	ASSSET ENGINEER/MANAGER	STRUCTURAL AND TECHNOLOGICAL CHANGES	46%
11	ENERGY EFFICIENCY ADVISOR	DECARBONIZATION	51%
12	ICT SPECIALIST: BIG DATA ANALYST	STRUCTURAL AND TECHNOLOGICAL CHANGES	49%
13	ICT SPECIALIST: ICT TECHNICIANS	STRUCTURAL AND TECHNOLOGICAL CHANGES	44%
14	BACK-OFFICE EMPLOYEE	DEVELOPMENT OF NEW BUSINESS MODELS	44%
15	NETWORK OPERATOR AND DISPATCHER	STRUCTURAL AND TECHNOLOGICAL CHANGES	56%

Source: Elaboration of data from project research activity

FIGURE 3

FORECASTED SKILLS NEEDS IN NEXT 10 YEARS
CATEGORY DISTRIBUTION



Source: Elaboration of data from project research activity.

According to the responses, an overall set of 45 skills (22 "most needed", 23 "new skills"[1]) were identified as required in order to match the changes underway in the sector.

The Internet of Things is expected to have the greatest impact on occupations amongst those identified as "new skills", followed by Automation and Artificial Intelligence, Smart-Grid Knowledge, and Cyber Security (Fig. 4).

GENERAL TRENDS IN SKILL DEVELOPMENTS OVER THE NEXT TEN YEARS

National social partners generally agreed on the growing importance of soft skills for all occupational categories, especially for Installation and Maintenance occupations, which are expected to be largely replaced by machine and technological/digital developments. As such, soft skills would provide these workers with a competitive edge over machines and technological/digital developments in the sector. Furthermore, the digitalization of the sector, together with the growth of internet-based applications are progressively changing the sector, both on the supply and the demand sides. This process leads to increased demand

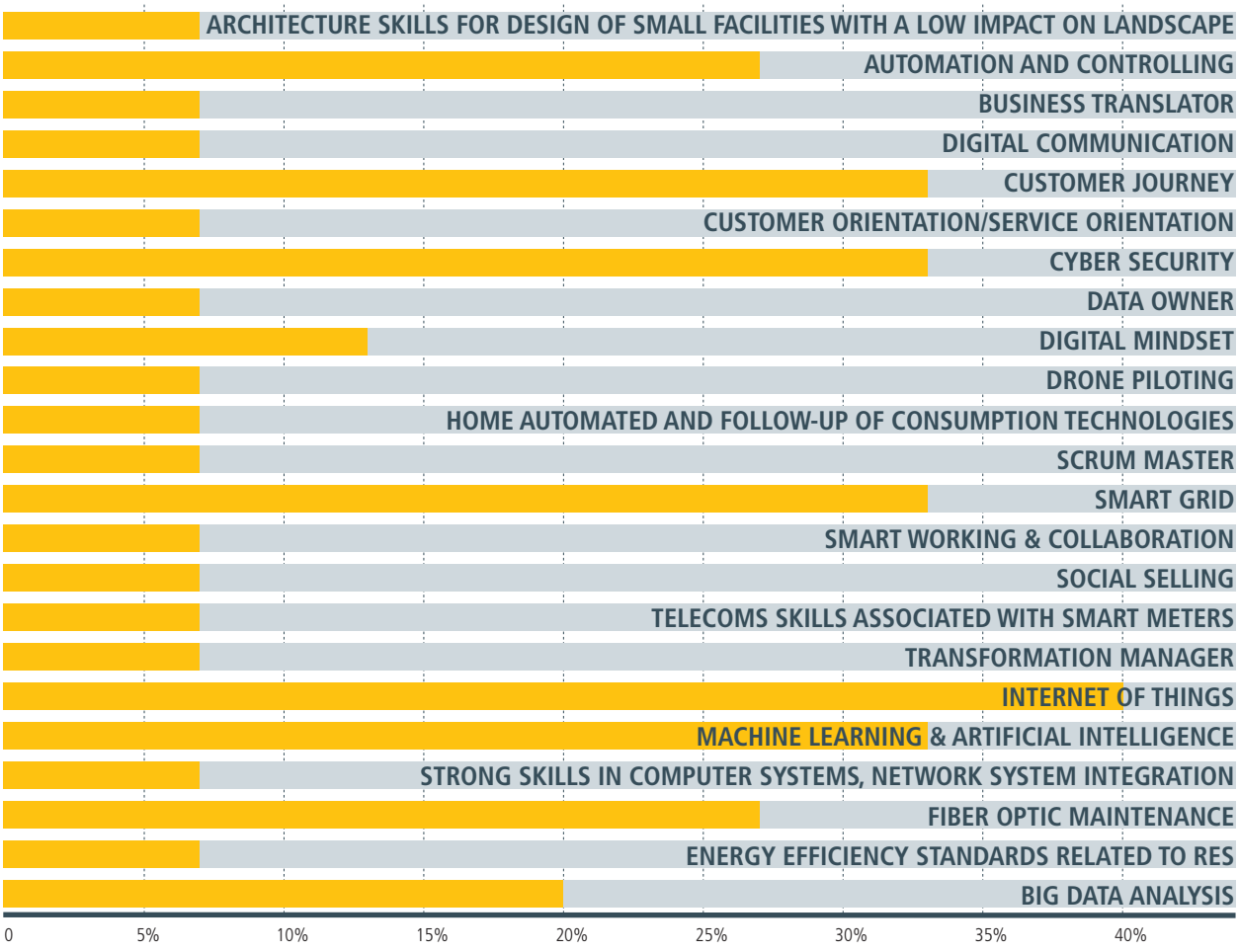
[1] The elaboration of the survey results considered a first set of relevant "more needed" skills from pre-given response options and a second set that were self-specified by respondents as "new skills".

for ***data analytics*** and telecommunication skills ***(Internet of Things, advanced computer skills***) that are relevant to nearly all occupational categories.

The skill forecast that can be drawn from the research aligns to the overall employment trends as identified by national social partners. Specifically, these are the transition from blue-collar to grey collar jobs and from grey-collar to white-collar jobs.

FIGURE 4

REPRESENTATIVENESS OF NEW SKILLS IN OCCUPATIONS



Source: Elaboration of data from project research activity.

FORECAST FOR SKILL DEVELOPMENTS BY OCCUPATIONAL CATEGORIES

TECHNICIANS, INSTALLATION AND MAINTENANCE OCCUPATIONS

According to the project results, technicians are expected to become multi-taskers with an adequate set of soft skills. Facility Technicians will need more social and relational skills to facilitate direct relationships with customers in a decentralized generation system where end-consumers also own small generation facilities connected to the grid. Technicians are also expected to acquire technological/digital skills such as ***drone piloting***, that will be used for maintenance activity, as well as skills relating to ***machine learning and artificial intelligence***.

ENGINEERING OCCUPATIONS (PLANNING & DEVELOPMENT, FACILITY AND NETWORK ENGINEERS)

Energy storage, ***smart grid*** and ***renewable energy technologies*** are specialized technical skills that will be in greater demand amongst engineering occupations over the next ten years, according to the respondents. Those working in these professions will also need ***digital skills*** associated with ***big-data analytics***, the ability to collect and analyze data from the grid and metering systems, and ***automation & controlling*** skills.

ICT SPECIALISTS (BIG DATA ANALYST, ICT TECHNICIAN)

ICT professions are cross-sectoral occupations which will gain increasing relevance in the new energy market. More of these professionals will be required to build knowledge on ***data security*** and ***data ownership***, in order to mitigate the risks of cyber attacks and manipulation of energy tariffs/electric data as well as to safeguard privacy and security.

NETWORK OPERATORS AND DISPATCHERS

Network operators and dispatchers are highly skilled specialists that ensure the distribution and transmission of electricity through network systems. Workers in these roles will need to acquire advanced digital and technology skills (***automation and controlling***, ***big data and advanced analytics***) to control and detect evidence of operating problems in the network. Soft skills such as ***logic, critical*** and ***anticipating competences*** are expected to be in greater demand in these occupations. These specialists will need to be able to identify the strengths and weaknesses of alternative solutions or approaches to problems.

PROJECT MANAGERS AND BUSINESS DEVELOPERS

Office-based work is expected to require more soft skills in comparison with other occupations. Office workers in the sector will need to demonstrate a variety of personal competences to adapt to changes in energy-sector business models. "Project Managers" will have to develop new competences and skills associated with the digitalization of the electricity system, be able to use the amount of available data to take competitive advantage and develop innovative customer-oriented services besides just electricity supply.

ENERGY EFFICIENCY ADVISORS

The expectation is that Energy Efficiency Advisors will need more specialized technical skills in ***storage technologies*** whilst being able to use and interpret a wide set of electrical data flow from a more decentralized energy system.

COMMERCE AND TRADING, ASSET ENGINEER AND BACK-OFFICE OCCUPATIONS

As with Project Managers, cross-cutting occupations such as Commerce & Trade, Asset Engineer and Back-Office are expected to require more soft skills such as ***creative & entrepreneurial thinking*** and ***innovation capacity*** but also ***customer orientation*** skills due to changes in business models that offer services with an increasing level of interaction with end-users.

THE VET SYSTEM IN THE ELECTRICITY SECTOR

As a first step in the research activity, 188 representative VET providers in the electricity sector were mapped in 23 European countries (Fig. 5).

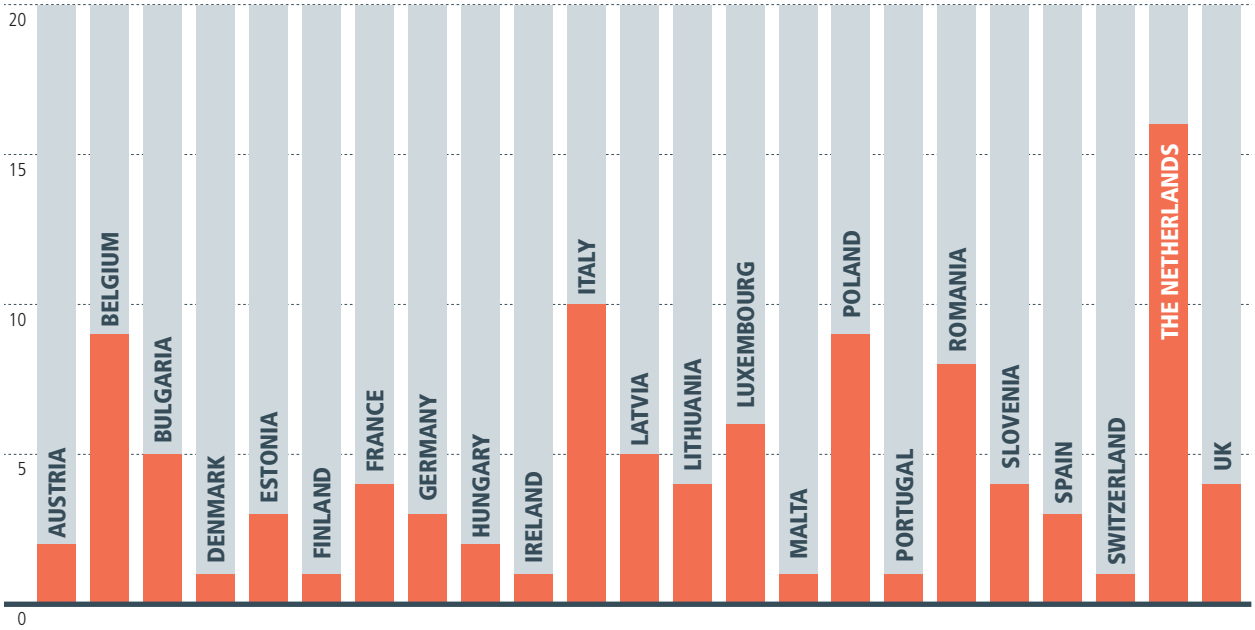
Vocational Education and Training (VET) in the electricity sector varies from one country to another: vocational education can be offered in full-time schools or within the framework of the dual system using, for instance, the apprenticeship. This is a recognized and successful form of work-based learning as it eases the transition from education and training to work and contributes to lower levels of youth unemployment by ensuring a greater degree of future employability. One ongoing challenge for maintaining the electricity-industry workforce is the amount of time required to train new workers; the European electricity workforce is educated through a variety of means but work-based learning methods such as apprenticeships and internship programmes are shown to be the most effective training approach in the electricity sector.

What is clear from the information collected during the regional project seminars is that leading energy companies have implemented their own apprenticeship programmes due to a lack of uniformity in standards and qualifications. This has made it difficult to ensure that applicants have the necessary skills. Some good examples from energy companies are described in the Best Practice section of the report.

FIGURE 5

VET PROVIDERS DISTRIBUTION IN THE ELECTRICITY SECTOR

(%)



Source: Elaboration of data from project research activity.

GAP ANALYSIS – VET OFFER AND FUTURE SKILLS NEEDS

Identifying the gap between future expectations on skill developments was a key task for this study.

According to the overall responses of VET providers, the current offer in education and training matches the demand for future skills needs for only 39% of the total skills analyzed.

Commerce and Trading came out as the occupational category with the highest imbalances in the VET offer. This means that the educational programmes relevant to this category are not effectively responding to the forecasted skills needs. After these, Back-Office employees, Operation and Maintenance, and ICT Specialists are the occupations with the highest imbalances (Fig. 6).

When analyzing overall results from a skill category perspective, "technology - digital skills" is the category with the highest gap in VET offer, nearly twice as high as the average value. "Specialized Technical" skills don't present gaps but imbalances are high due to an overestimated VET offer.

The overall picture of how VET providers are responding to the "new skills" needs in occupations is more concerning, especially for "marketing and technology - digital" skills.

The current VET offer does not yet appear to have included this new skill set in their educational programmes. In the survey of VET providers, we listed the new skills in a pre-given set of options and asked teachers which skills were included in the programme. Nearly 60% of the skills had a response rate below 25%.

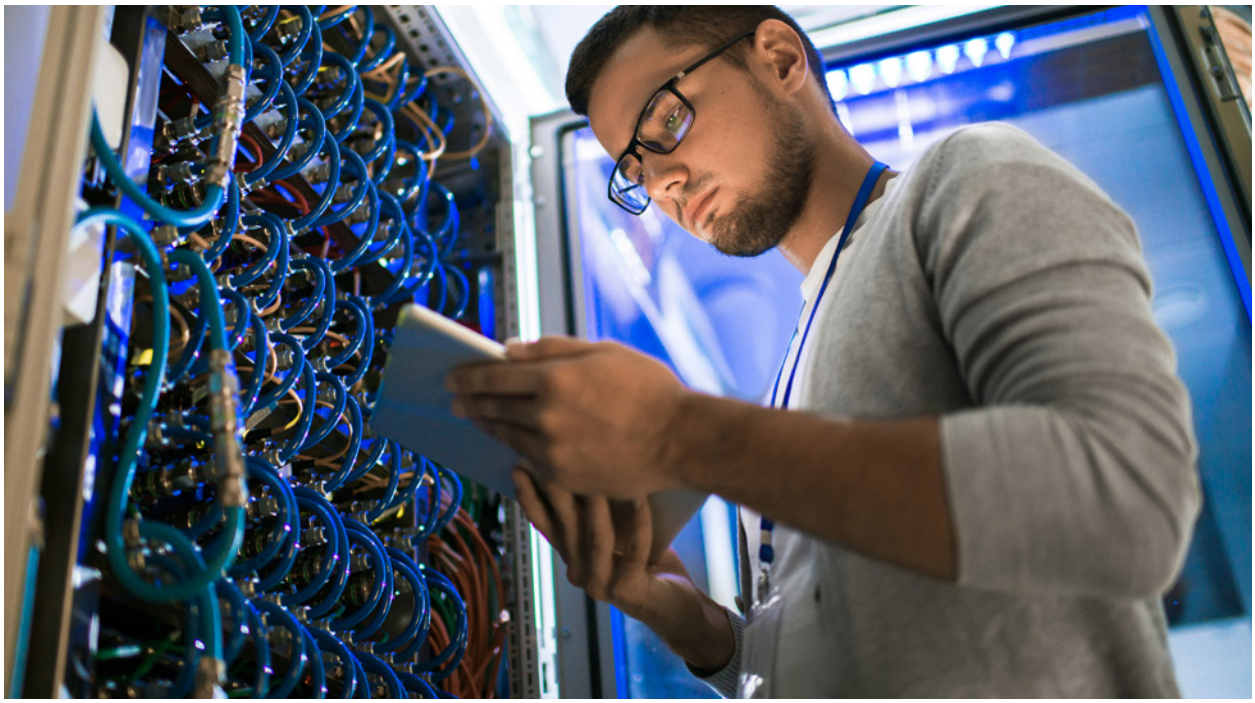
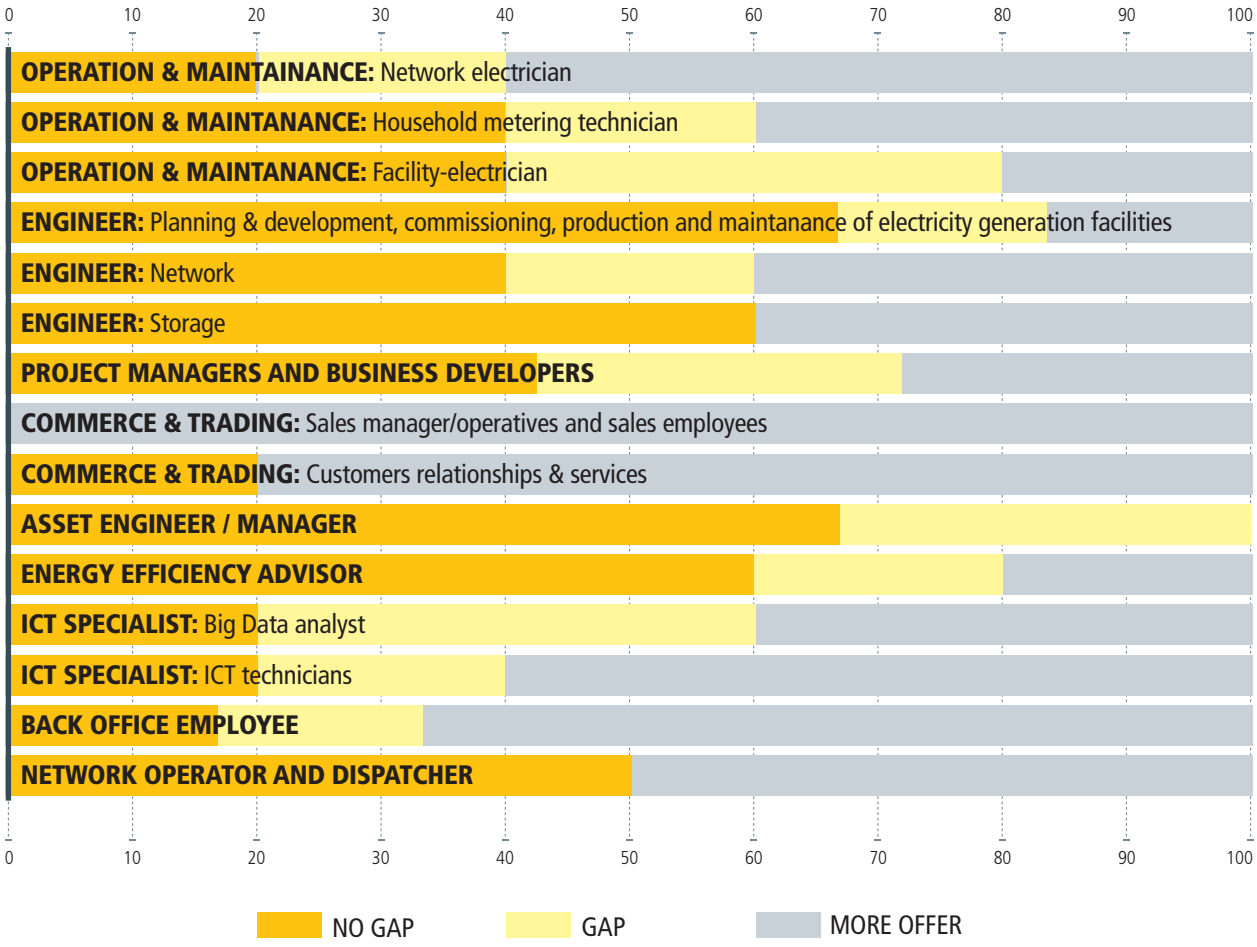


FIGURE 6

SKILLS NEEDS AND VET OFFER: MATCH ANALYSIS BY OCCUPATION
(%)



Source: Elaboration of data from project research activity

POLICY RECOMMENDATIONS TO EUROPEAN SOCIAL PARTNERS

The importance of this report lies in its strategic potential to orientate the actions and programmes of European social partners in the electricity sector towards the development of a Roadmap on Skills.

In order to to be useful in this endeavor, this research includes a set of five recommendations that integrate the main outputs from the discussions amongst the national social partners. Moreover, it is important that the recommendations provided represent the framework for implementation of prioritized actions during the following years of activity.

TABLE 2

Nº	BRIEF DESCRIPTION OF THE RECOMMENDATIONS
1	**STRENGTHEN THE ROLE OF SOCIAL PARTNERS IN THE INTERACTION WITH VET PROVIDERS:** Regional seminars and research activity made clear the need to strengthen collaboration between VET providers and national social partners. Capacity building should focus on updating the curricula of education and training programmes in the electricity sector in order to meet the future skills needs of the industry.
2	**MAINTAIN AND UPDATE SECTORAL INTELLIGENCE ON SKILLS NEEDS, IN ORDER TO PERIODICALLY REVISE STRATEGIES AND ACTIONS**: In order to be able to periodically orient the work of VET provision in updating curricula, EU social partners would need to maintain, at EU level, sectoral intelligence on skills needs as required by the changing electricity market.
3	**SYNTHESIZE BEST PRACTICES IDENTIFIED DURING THIS PROJECT AND DEFINE PRACTICAL APPROACHES AND CAPACITY-BUILDING PROJECTS IN ORDER TO SPREAD THEM ACROSS EUROPE:** EU social partners should harness those elements of best practices identified as effective in the report, as well as those from other sectors, to implement projects at a national level.
4	**DEVELOP A SECTOR SKILLS ALLIANCE AIMED AT IDENTIFYING AND IMPLEMENTING KEY ELEMENTS ON SKILLS (AMONG OTHERS QUALIFICATION AND RECOGNITION SYSTEMS):** Recognition of skills and competences within a multi-country and multi-system European electricity sector is crucial to tackle the skills shortages in occupations. These shortages arise from drivers of change that the electricity sector is undergoing but their solutions can create value through education and training activities in companies.
5	**DEFINE AND IMPLEMENT A SYSTEMATIC STRATEGY TO IMPROVE THE ATTRACTIVENESS OF THE SECTOR TO POTENTIAL EMPLOYEES:** There should be a systematic approach in place to compete with other sectors to attract skilled young workers. Other sectors are already implementing strategies aimed at communicating sectoral job opportunities and sectoral values. The electricity sector must compete with these.

VET BEST PRACTICES

Part of the research activity developed during the study was aimed at identifying what is being done in terms of innovative tools in VET systems. It also sought to highlight effective national and regional training programmes, methods to monitor skills needs and address skill mismatches and gaps.

28 best practices were identified by stakeholders in the survey and eight of them were selected in the report. They belong to the following categories:

1. Meeting labour-market skills needs in education and training
2. VET systems: quality and adequacy of programmes
3. Work-based learning methods, apprenticeships

TABLE 3

CAT.	COUNTRY	ORGANIZATION/NAME	SHORT DESCRIPTION
1	Spain	*National Reference Centers (CRN)*	National Reference Centers (CRN) are public centers for innovation and experimentation of vocational training for the professionals in the electricity sector. There are two centers: one for engineers and the other for renewable energy in Navarra. They are a main reference point for professional education.
1	Netherlands	*Stichting Blei Foundation*	A public-private collaboration of the eleven regional education centers, or ROCs, which are structurally active in the vocational qualification, with a broad representation of network companies and contractors. The current learning resources are adapted to the requirements of the new vocational qualification.
1	Bulgaria	*CEZ Group Academy* For university students	CEZ Group is an established, integrated electricity conglomerate with operations in a number of countries in Central and South-Eastern Europe and Turkey, headquartered in the Czech Republic. The Academy provides training and seminars to the students studying in the field of energy and utilities in order to introduce them to the realities of the energy and utilities sector and to attract them to the company (generally as interns).
2	Malta	*Malta College of Arts, Science and Technology (MCAST)*	Established in 2001, the Malta College of Arts, Science and Technology (MCAST) is the country's leading vocational education and training institution. MCAST and the Reggie Miller Foundation (the educational body of the General Workers' Union) run tailor-made courses for employees and employers. Reggie Miller can accredit courses up to Level V.
2	Germany	Dual system for craft workers	Germany's apprenticeship system provides 344 certified trained occupations, designed by the government and industry. The average apprenticeship period is 36 months. The average age of a graduate-apprentice is 22. Apprentices are on average 19,5 years old when they begin their vocational training. The remuneration paid by the company is approx. one third of the salary of a skilled worker.
2	Switzerland	The ***Swiss VPET System***	The provision of VET and professional education is a mission collectively shouldered by the Confederation, the cantons and professional organizations. These partners are jointly committed to the highest possible standard of quality ensuring the skills are updated in line with market demand.
3	Italy	The school-work model: apprenticeships at ***ENEL,*** Italy	The ENEL apprenticeship model was regulated by a collective agreement between the company and trade unions that covered contractual and economic conditions and rights. The apprenticeship programme implemented was a three-year path during the 4th and 5th years of high school, followed by professional training in the company over the following 12 months for the students who achieved the diploma and a level of qualification deemed appropriate by the company.
3	France	Apprenticeship programmes with ***EDF Group (EDF, ERDF, EGDF, RTE)***	The Group prioritizes apprenticeships through work-study contracts to promote social advancement and recruit new employees at every level of qualification. The commitments in the Professional Training Agreement (Défi Formation) testify to the group's plans to develop apprenticeships in France.

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