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Training and Education in the Solar Sector

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Webinar Presenter

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Hugo Lucas Porta Hello, ladies and gentlemen. I'm very happy to welcome you to today's lecture on Training and Education in the Solar Sector. First of all, of course, I would like to thank the International Solar Alliance and the Clean Energy Solutions Center, who facilitate this webinar series.

Some background for me before I joined in 2010 Factor, I had been Director of Policy and Finance in the International Renewal Energy Agency, IRENA. There I was responsible for the project called IRELP, IRENA Renewal Energy Learning Partnership, that has the main objective of improving, increasing, and facilitating access to renewable energy education and training.

In this lecture we are continuing the discussion of socioeconomic aspects of solar energies as part of the module 6 of the full lecture program. In this module we will start with the definition of what the education and training is and _____ this _____ importance of education and training in the solar sector. Afterwards we will jump into the main body of the presentation. Don't forget, at the end of the presentation you will be given the chance to test your knowledge with a little quiz.

The learning objective that this lecture provides will consist in having an overview of the education and training situation for renewables, and solar in particular; an overview of the training offer; the most required profiles in the solar sector; and policies and recommendations for increasing and approving education and training in solar.

The International Renewable Energy Agency, IRENA, at the end of 2017 it was estimated that there was 10.3 million people employed in the renewable energy sector directly or indirectly. It's not only employing the most, it is the

photovoltaic, with more than 3.3 million jobs. In addition, solar thermal for heating employs 0.8 million people.

Qualified human resources are needed all along the value chain: for your planning, manufacturing, installation, operational maintenance, and the commission. But on the other hand we see here a graph by the European _____ Associations that show how in Europe the percentage of new professionals with studies in science, technology, engineering, and mathematic continues to be lower than market demand and very constant.

We have to take into consideration that given the distinctness of renewable energy sector production technologies is a sector that demand highly qualified specific skills. In addition, the renewable energy industry, and the solar in particular, has to deal with a workforce that is not easily transferable, neither from conventional to renewable energies, nor within different renewable energy sectors or technologies. Today we are facing a scarcity of qualified human resources, and this is an obvious barrier to technology dissemination. Adverse effects of deficient training of solar technologies, of both the public and professionals, may manifest itself through an increase in the cost, inefficient utilization, and a bad reputation for solar technologies.

Education is the finding of the transmission of knowledge to a person so that he or she acquires a certain information. And training, it is the process of which the skills needed for a particular job or activity are gotten.

After this basic introduction we can jump now to the main body of the presentation. The first part of the lecture is devoted to provide insight on the assisting offer of education and training. Information summarized in a recent research article being one of the few _____ to work addressing the challenge of the scarcity of professionals in the renewable energy sector in general. Methodology used in the research was in three phases: A literary review; an analysis and assessment of the most comprehensive database of renewable education and training, the IRENA Renewable Energy Learning Partnership, IRELP database; and finally, interviews with professionals from the renewable energy education sector, all responsible for human resources in renewable energy companies.

Regarding geographical distribution of the location, first finding of the paper is that the more acute shortage is in developing countries. Forty per cent of the data sets are for Europe, 33 for North America, 6 from Africa. This raises concerns if we compare with the resource potential or with the declared targets in the National Determined Contributions of African countries. Most common cited challenges to increase education and training in developing countries are financial constraints, shortage of qualified teachers and trainers, lack of know-how in developing curricula.

There is a very important mismatch between education offer and industry demand. For instance, on the technology _____ scope of the training. Project development, operation and maintenance, construction and installation, and manufacturing for wind and photovoltaic demand hands-on training, but 32 per cent of the data sets are master's level, and only 16 per cent are

categorized as vocational training. When recruiting for managerial positions the experience is more important than the academic background. Reasons highlighted in the interviews are the size of the solar market and structure. The solar sector relies heavily in subcontracting, and subcontractors do not talk with academia, so there is a lot of developing curricula and hands-on training.

There is as well another mismatch between education offer and industry demand on the technological scope of the training. More than half of the offer have multi-technology curricula that is a low percentage of jobs within the sector that demand a broad overview of renewables, wind and PV demand specialists in the field and in these technologies. From the interviews, more interesting than multi-technology is the interaction with solar technologies in buildings. And there is a great demand for professionals that can integrate solar technologies in different aspects, also for heating and cooling and also for transport.

Very low offer on hydropower; it is because it is already incorporated in existing engineering curriculum around the world. And finally, regarding geothermal, it may look comparatively low, they offer in a location 3.8 per cent of all the education provide _____, but this is concentrated in the countries with higher resources: United States of America, Iceland, Germany, New Zealand, and Japan, with two notable exceptions: the Rift Valley in Africa and more accurate in the Andean Region.

One of the challenges of increasing professional is the need to increase awareness. The research don't on a location, in renewable energy also it studies the interest of professional students in the renewable energy sector. Still there are some professionals from other sectors that are not aware of the opportunities in the solar sector and they don't know where to look for the most _____ _____. There is a need to facilitate access to vocational training. The research analysis using _____ analytics states that the usage of the data varies are interested in education and training in renewable energies. Most of them are coming from Asia or Europe, and they are people in a group of age of 25 to 34 years. While 40 per cent of the inquiries are coming from Africa may look low, taking into consideration the number of renewable energy education and training opportunities clearly are very well in the _____ and the lower _____ access, the level of interest in Africa should be considered. The very low level of inquiries coming from North America suggest that the renewable energy learning partnership database was not the gateway to anyone _____ _____ education and training in the region. Inquiries by age follow the same pattern, a similar sector of the _____.

There are slightly more male users than female, with 54 per cent male and 45.8 female. The higher level of interest from women in renewable energy education compared with conventional energy, or competitive for instance with a graduate in science, technology, energy, mathematics. Companies that were interviewed confirmed that they are witnessing an increased percentage of suitable female candidates in hiring process. Employability of women is higher in the renewables because most people find a job thanks to their

professional network. Professional networks in conventional energies were established a long time ago; they are closed and dominated by men.

On the education and training shortage, given the relatively high level of skills required _____ the _____ to fill occupation, the sector is often faced with a shortage of other required skills to successfully complete _____. Eighty per cent of hiring managers highlight skill shortage as a key challenge. Requirements change so quickly that the supply of skills that was broadly satisfactory in the past no longer meets requirements and systems of skill anticipation, careers counseling, and provision of training and education fail to keep up with change. The growth of the sector can be limited by the system's capacity to provide the labor market with professionals with the profiles that companies require.

Currently most companies are recruiting experienced individuals with comparable skill sets from another sectors in all the technologies and areas and then these people just provide job-specific training. This strategy is costly and risky for the sector, which faces dramatic increases in human resource requirements.

Recent analysis saw the present level of vacancies in the photovoltaic will continue to happen in the main markets as China, United States of America, and Europe.

Most modern years on intermediate use referrals are equipping agencies to find their current role. _____ resource _____ of sources to find their jobs, referrals, equipment _____, LinkedIn, and company websites are being used almost equally, percentage ranging from 20 to 26.

Similar to the findings of the research paper on the skills gap, there is an increased demand for professionals that in addition to solar, know how they have knowledge or all the disciplines to integrate solar into systems, energy systems. For instance, in addition to the skill shortage in renewable energy, the types of jobs required in the sector are diversifying into digital and IT. McKinsey published in 2016 that "digital optimization can boost profitability by 20 to 30 per cent for power utilities." This can be done through smart meters and smart grid, digital productivity tools for employees, and automation of back-office processes. This also implies the need of creation of solar jobs together with IT jobs.

And last but not least, as _____ previously developing countries are more affected by the shortage of the location and training in the solar sector. One of the faster growing markets in the solar sector is the off-grid sector, where all sort of consistent of _____. It's analyzed by the International Renewable Energy Agency, the solar off-grid sector has a great potential to create _____ _____ jobs, and of course in those jobs created for the improvement of the economy when provided with power.

A _____ challenge, a global coalition launched #PoweringJobs, a multiyear campaign aimed at creating the new energy skills and jobs needed to provide access to cheap, reliable, and clean energy for all. The Coalition, backed by

Schneider Electric Foundation and the Rockefeller Foundation, is made up of multilateral organization, education and training institutions, global energy companies, civil society groups, researchers, and more.

Similar to the companies, acting in the larger-scale solar facility sector, companies in the off-grid sector are trying to overcome the shortage of skills we train on the job. One of the most repeated experience is the Mobisol Academy.

There are three most wanted profiles in PV companies, or that PV companies are looking for. The first is technology researchers for manufacturing. Second, field technicians in operations and maintenance. And third, engineers, PV system designers for project planning.

With regards to technology researchers for manufacturing, experience and skills required are a doctoral degree is necessary for science that conduct original research and develop new products. However, some workers may enter the scientific field with a bachelor's or master's degree. Computer skills are essential to perform data analysis, integration, modeling, and testing.

The usual responsibilities and duties are physicist observed measure in the _____ and a bit of theory is plain physical phenomena you see in mathematics. In the solar power industry physicists work with _____ materials, science, and engineers to improve the efficiency of solar panels. So must investigate the properties, composition, and _____ of matter and the law that combine the reaction of system to each other. Using this knowledge, _____ in the solar power industry are able to improve on solar service side, develop new materials for organic components. Material science studies the _____ and chemical properties of _____ materials, develop new programs for _____ assisting once.

When it comes to field technician, operation and maintenance, experience and skills required are working knowledge of troubleshooting electrical components and equipment, effective written and verbal communication skills, and minimum of a couple year’s experience in the solar power operations and maintenance. Most commonly the responsibilities and duties of a field technician are maintain all tools, saws, _____, and all work locations in a safe and efficient condition; provide _____ of what mechanical, electrical, _____ _____ for a PV field and necessary equipment. Job may include other miscellaneous _____ duties are assigned.

With regards to engineers for project planning there's plenty. Some skills required are master's degree in an engineering-related field or master's degree in a non-engineering field, and one year of solar industry experience, or a degree in design-related field and one year of solar design experience. Proficiency in AutoCAD, basic knowledge of residential construction techniques, critical thinking and ability to solve problems. The most common responsibilities and duties are create, review, and modify _____ set in AutoCAD and custom software tools. Complete electrical _____ for photovoltaic _____ research document and comply with local and national code requirements in _____ _____; coordinate with site assessors; _____

_____ on sales teams; complete the signs, reaching the customer specification with _____ deadlines; assist in documenting and developing industry best practices and standards and guidelines; delegate project completion back to other engineering team members; utilize software system to record progress of body of task.

The three most wanted profiles for concentrated solar power companies are: Technology researchers, chief sales and marketing officers, also a fair amount of operation and maintenance technicians.

When it got to technology researcher in the field of _____ solar power, the experience and skills required are a PhD in a relevant field of science or engineering such as mechanical engineering, chemical engineering, process engineering, electrical engineer, and experimental physics. High level of organizational, analytical, and problem solving skills. Proficiency in spoken and written English is essential. Instrumentation, control systems, computational and experimental fluid-mechanics, thermal storage devices, high temperature engineering. Most commonly the responsibilities and duties in this job position are design, _____, testing, and optimization are _____ components associated with the CSP receivers _____ _____ storage.

The development or adaptation of modeling, optimization, and control systems for _____ _____ power plant. Working with sensors, that analysis and modeling name at improving the efficiency of CSP systems. Finally, modeling of CSP system and/or techno-economic studies.

With regards to chief sales and marketing officers, the experience and the skills required are a strong track record in technical sales, business development; proven track record in building and leading marketing sales teams; experience managing the entire sales process and reporting relevant sales metrics; negotiation skills; strong organizational and public speaking communication skills; thorough understanding of the demand-supply perspective and well-established relationships with potential customers.

With the best and the most common responsibilities and _____: development, implementation, and execution of the marketing policy and marketing plan. Business development of new markets and products, including new business ventures, sales activities from acquisition to contact _____. Management of the sales team and audience; communication with industry organization and _____ _____; management of commercial aspects of ongoing _____ after sales activities and development. Sales business plan development and _____.

With regards to chief _____, a marketing officer, the experience and skill required are good physical condition; ability and willingness to work in hot, dry, and dusty environments. Interest in the practical application of technology and hands-on work. Availability and knowledge to use maintenance tools effectively.

With regards to the most common responsibility and duties. Like with chief sales and marketing officer will provide inspection, electrical and mechanical repairs, as well as a good—excuse me, a good operation. A maintenance

technician will provide expansion, electrical, and mechanical repairs, as well as a historic mechanical troubleshooting for operating solar fields. We maintain all tool stops, _____, and work location in a safe and efficient condition.

Reading schematic _____ _____ sometimes they can look _____ to my methods and _____ for the work, selling parts and components in the power plant, operating and controlling machinery that generates heat and electric power using computer or semiautomatic equipment. The _____ and testing the statement _____ to come forward is tuition, machinery, and equipment using a tested device. Maintaining and repairing the _____ _____ machinery and equipment using found tools and shooting safety of one set of—I know there's been following safety procedures.

We come now to the part of the lecture regarding policy recommendations to improve and increase of the data just to education and training. The first is on strategic planning for skill needs, education, and training. Both quantitative and qualitative skills needs assessment has to be done before assigning a training and skill development policy.

There are several handbook and tools already developed by the international agencies that will provide guidance to assess the needs and qualified professionals when developing the photovoltaic sector and they go to the solar power sector.

Incorporating renewable energy into technical and tertiary curricula to complement the post-graduate of professional location and training can be a good response to the skill gaps, since it will help work is coming from other fields to specialize in the sector, building on a skill they have already acquired from previous studies. They should provide on an adequate basis to this person _____ skills that fit the needs of employers. But that's so equipped learners engage in long-life learning and to manage the transition from education to employment as well as from one job to another or from employment to employment, developing training institutes and centers of excellence. Providing financial support, grants and fiscal measures; professional willing to further train. According to the global energy talent in this, 59 per cent of employees in the renewable energy believe they can overcome this skill gap with additional training and development; 45 per cent with _____ and apprenticeships.

Also in public private partners. Partnership between companies and the academia, and the academia is highly recommended to raise graduate awareness and train then accordingly. Furthermore, there's a need to support training in the job activities, in particular the dual education. Dual education is just an opportunity for future employees to learn. The comfort of accumulated experience is important, as employees will be able to reuse the excess knowledge generated in the process in a new context in the future for companies by maintaining a _____ know how we house, it will limit the use of a skill shortage in case of _____. And regulatory demand even _____, for instance, mandatory _____ define _____ for renewable energy builders can be a very proactive way to increase and improve a location entry.

Standardization and accreditation of qualifications. Harmonized curricula and qualifications across countries can be helpful for reducing the time needed to react to market signals, easing company's workforce selection and facilitating mobility of students and workers. Common quality standards make it possible to evaluate training programs in an accreditation process against a set of defined requirements for competency, quality management, required resources, and qualification.

We come now to the concluding remarks. The workforce deficit and the skill gap in renewable energy industries around the world need to be addressed urgently. There is a critical shortage of skilled personnel to develop, design, finance, build, operate, and maintain solar projects. Currently education and training opportunities in solar technologies are scarce, concentrated in a few industrialized countries. There is a need for comprehensive education and training policies based on capacity needs assessment. There is a need for more technology-specific hands-on training. In addition to increasing improving solar education and training, attracting female workers to renewables will facilitate to reduce the scarcity of professionals.

And now to the end to the lecture. I just want you can test your knowledge in a small following quiz. Thank you very much.