

Training and Education in the Solar Sector

In partnership with the Clean Energy Solutions Center (CESC)

Hugo Lucas Porta

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Supporters of this Expert Training Series



ASSISTING COUNTRIES WITH CLEAN ENERGY POLICY

Overview of the expert

Factor is an international group, specialized in providing global, innovative and sustainable solutions in areas such as climate change, energy, sustainability, trading and innovation.

Our key value is our people. We have offices in six countries, where our interdisciplinary team works for public and private stakeholders, international organizations and non-profit entities.

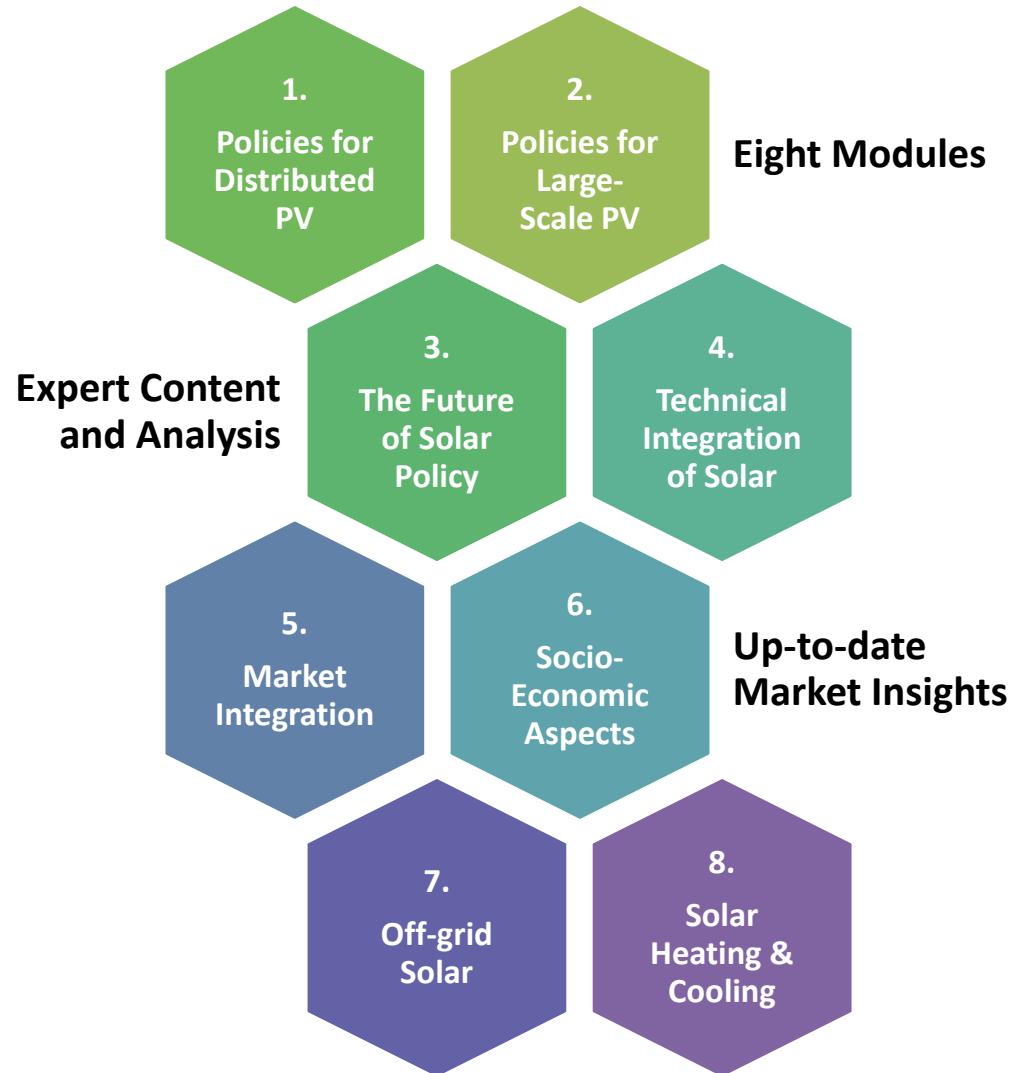
Our own history and experiences are based on constant innovation. This helps us target our services, by combining academic knowledge, technology and practical experience.



Hugo Lucas Porta
Head of Energy
Dept, [Factor](#)
20 years in RE
Sector
- Worked for
governments and
private sector on
energy transition
strategies

Training Course Material

This Training is part of Module 6, and focuses on Education and Training in the Solar Sector



Overview of the Training

- 1. Introduction: Learning Objective**
- 2. Understanding Education and Training**
- 3. Main body of presentation**
- 4. Concluding Remarks**
- 5. Further Reading**
- 6. Knowledge Check: Multiple-Choice Questions**

1. Introduction: Learning Objective

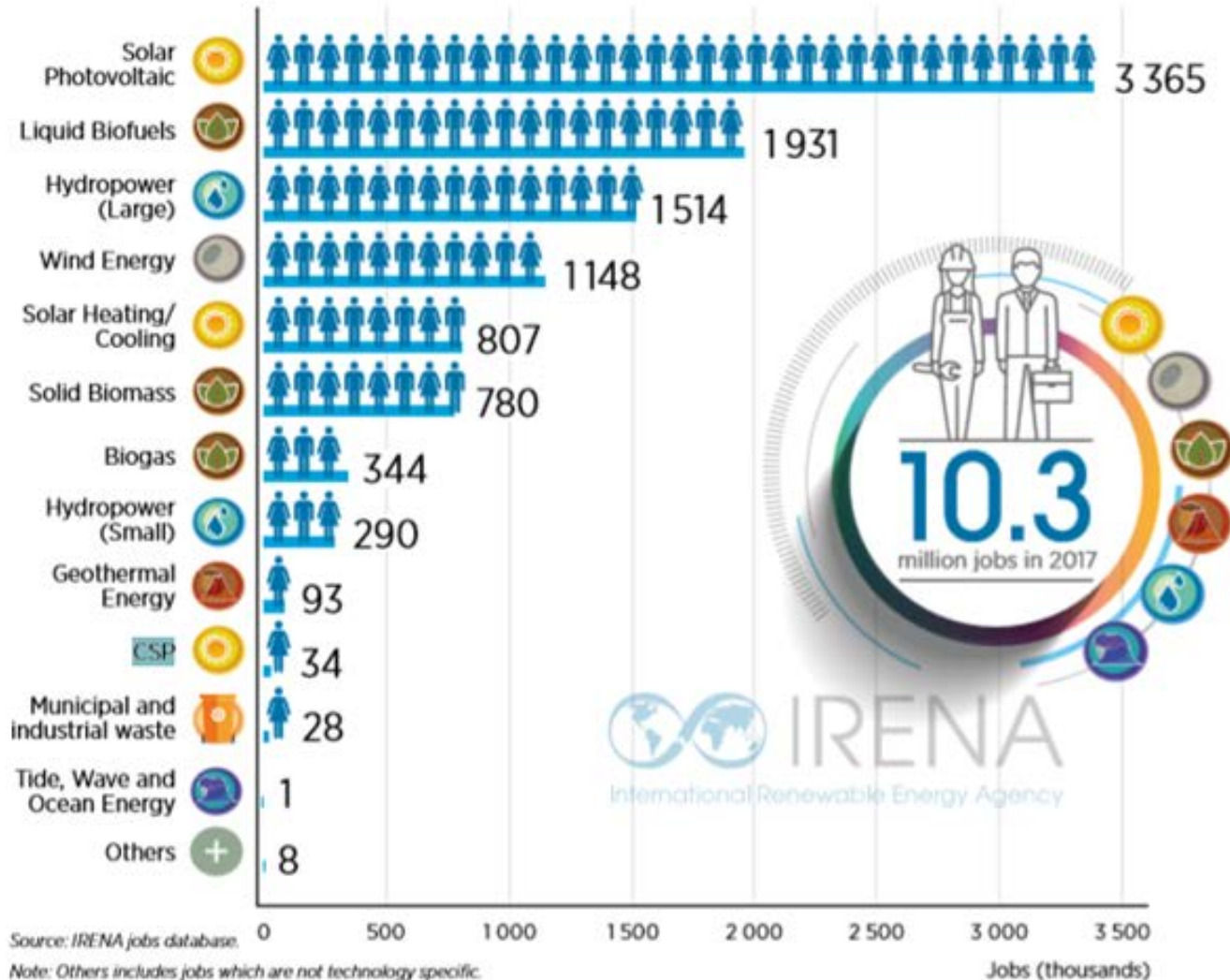
Learning Objective

This lecture provides:

1. An overview of the education and training situation.
2. An overview of training offer.
3. The most required profiles in the solar sector.
4. Policies recommendations on education and training.

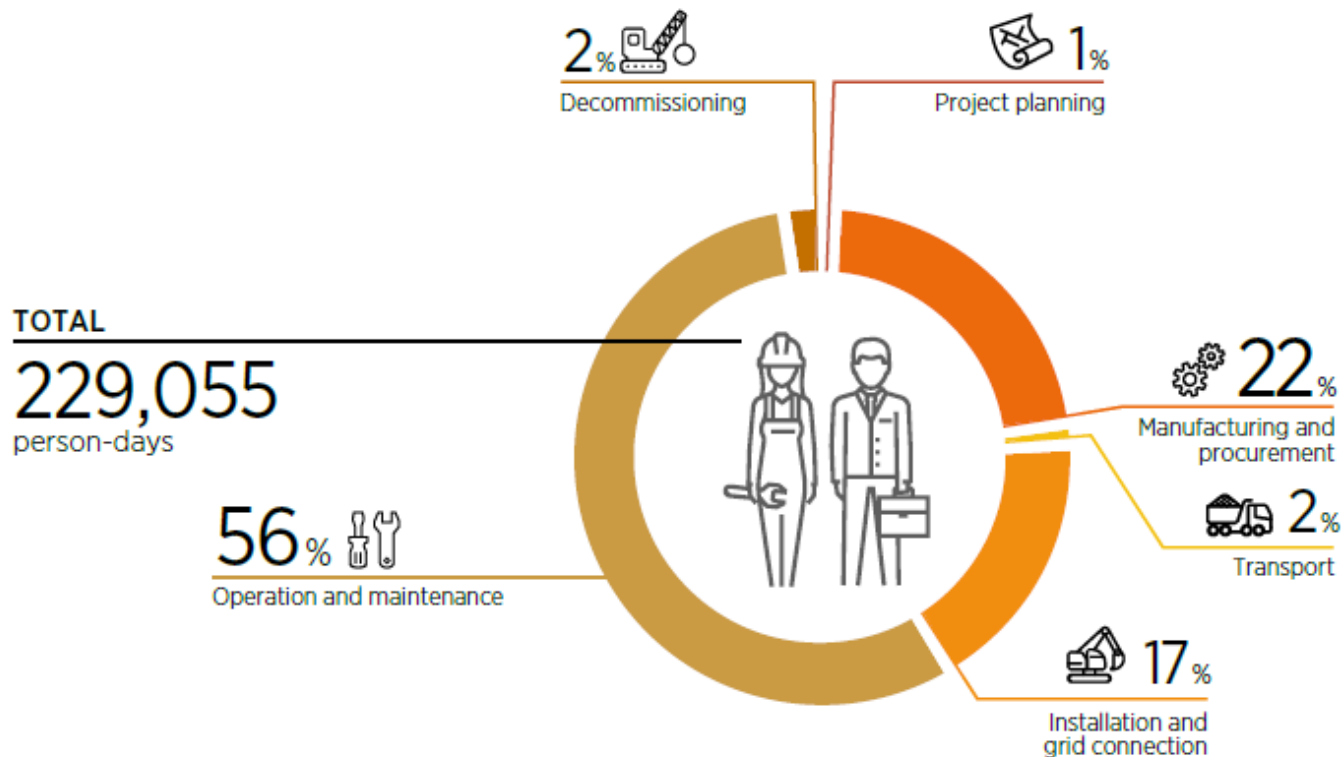
2. Understanding Training and Education

Employment in the RE sector



Employment in the RE sector

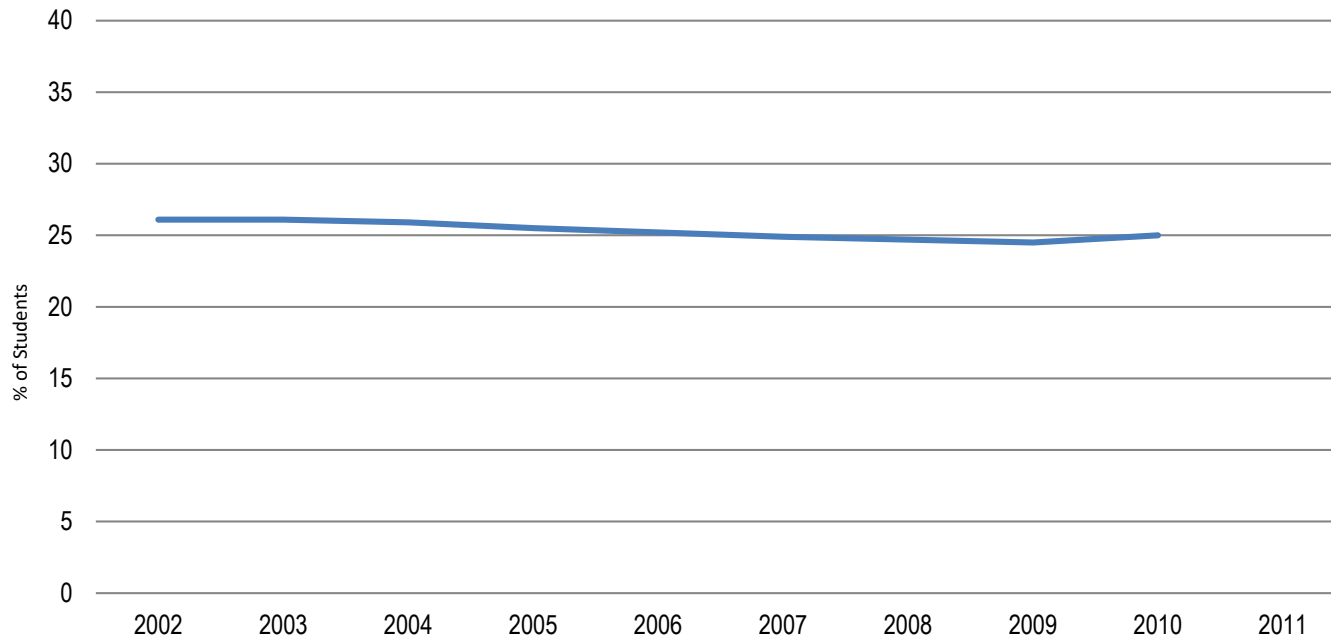
Distribution of human resources required along the value chain for the development of a 50 MW solar PV plant, by activity



Source: IRENA

Understanding Training and Education

Declining Interest in STEM Professions



Science, Technology, Engineering and Mathematics enrollments and Graduates – as a % of Students

Source: EUROSTAT, 2011

Understanding Training and Education

- Given the distinctness of renewable energy production technologies, what is required are highly unique sector specific skills.
- The RE industry has to deal with a work force that is not easily transferable, neither from conventional to renewable energy, nor within different renewable energy sectors.
- Scarcity of qualified human resources represents an obvious barrier to solar technology dissemination.
- Adverse effects of deficient training of solar technologies (of both the public and professionals) may manifest itself through increase of the cost, inefficient utilization and bad reputation of solar technologies.
- Education is the transmission of knowledge to a person so that he or she acquires a certain formation.
- Training is the process of learning the skills needed for a particular job or activity.

3. Main Body of Presentation

Main Body of Presentation

- 1. Research on education and training in the RE sector**
- 2. Education and training shortage**
- 3. Required profiles in the solar sector**
- 4. Policy recommendations**

Research on education and training in the RE sector

Methodology

Research was conducted in three phases:

1. Literature review of academic papers and secondary sources on shortages of skills and education gaps in all renewable energy technologies.
2. Analyses of the datasets in the education and training database IRENA Renewable Energy Learning Partnership (IRELP) and on the use of the education and training database.
3. Interviews with (23) stakeholders: 10 from RE E&T, 8 RE companies, 4 governments, 1 civil society.

Source: Solar Energy Journal, 2018

Research on education and training in the RE sector

Results: More acute shortage in developing countries

40% of the datasets are from Europe, 33% from North America, 6% from Africa. Raises concerns if we compare with the resources potential or the declared targets in the NDC.

Most common cited challenges to increase education and training (E&T) in developing countries are:

1. Financial constraints;
2. Shortage of qualified teachers and trainers;
3. Lack of know how in developing curricula.

Research on education and training in the RE sector

Results: Mismatch between education offer and industry demand, too many high level degrees

Project development, operation and maintenance, construction and installation, and manufacturing for wind and PV, demand hands on training but **32% of the datasets are Master's level, 16% 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.** subcontractors do not talk with academia.

Research on education and training in the RE sector

Results: Mismatch between education offer and industry demand, on the technological scope of the training

More than half of the offer have multi-technology curricula:

1. There is a **low percentage of jobs within the sector that demand a broad overview** on renewables. Wind and PV demand specialist in a field.
2. From the interviews, more interesting than multi-technology is the **interaction with solar technologies in the building.**

Very low offer on **hydropower** because it is already incorporated in existing engineering curricula around the World.

While **geothermal** may look comparatively low (3,8%), it is concentrated in the countries with higher resources: USA, Iceland, Germany, New Zealand, Japan. With two notable exceptions: Rift valley in Africa and more accurate in the Andean Region.

Research on education and training in the RE sector

Results: Interest on renewable energy education and training

Region	% of Total Users
Asia	41.1
Europe	28.4
Africa	14.0
North America	10.1
Latin America and the Caribbean	4.3
Oceania	1.2

Age Group	% of Total Users
25-34	33.5
18-25	27.5
35-44	15.5
45-54	5.5
55+	5.5

Research on education and training in the RE sector

Discussion: Interest on renewable energy education and training

There are slightly more male users than female, with 54.15% male and 45.85% female.

Higher level of interest from women in RE compared with conventional energy (or graduates in in STEM).

Companies that were interviewed confirmed that they are witnessing an **increased percentage of suitable female candidates in hiring processes.**

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 long time ago, they are closed and dominated by men.

Main Body of Presentation

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Education and training shortage

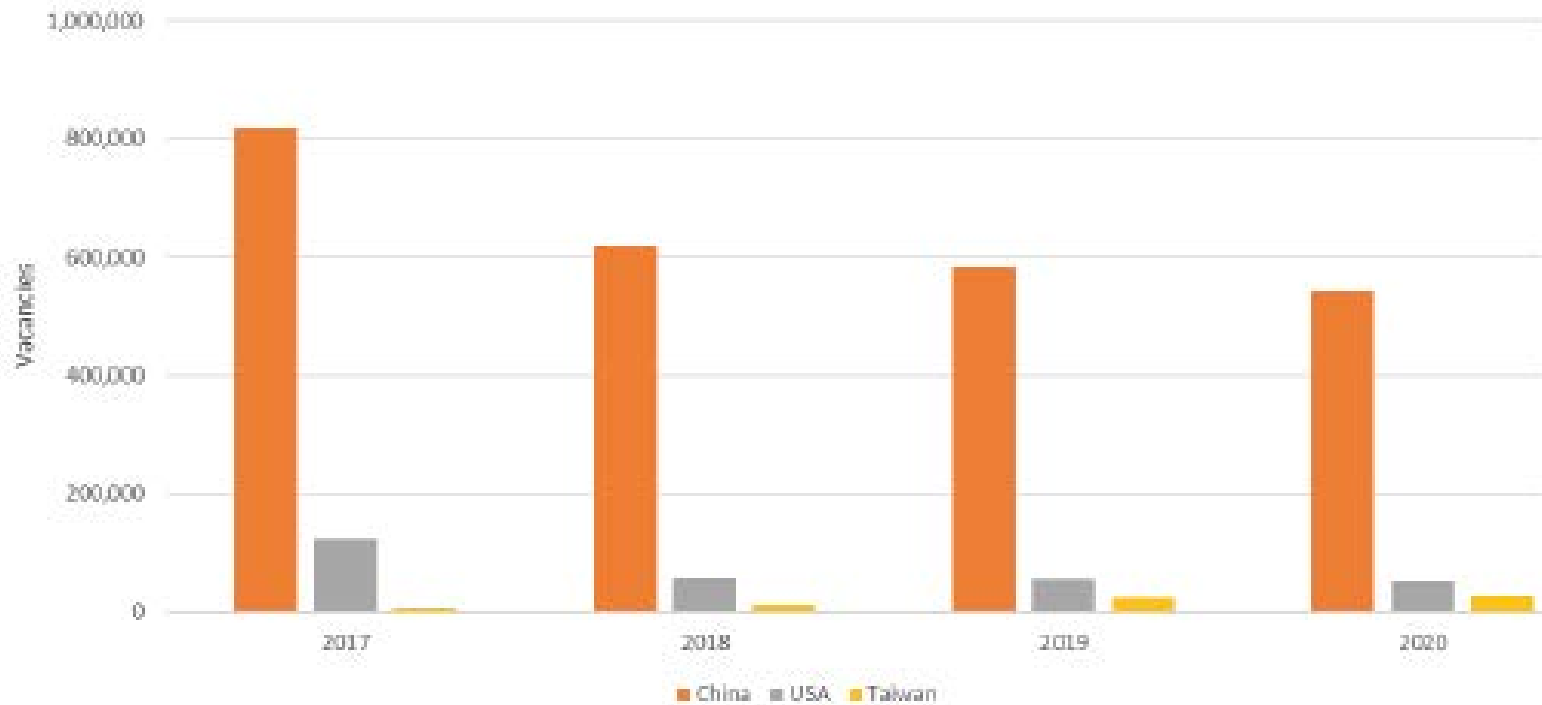
- 80% of hiring managers highlight skills shortage as a key challenge.
- Requirements change so quickly that the supply of skills that was broadly satisfactory in the past no longer meets requirements, and systems of skills anticipation, careers counselling and provision of training and education fail to keep up with change .
- The growth of the sector can be limited by the system's capacity to provide the labour market with professionals with the profiles that companies require.

Education and training shortage

- Currently, most companies are recruiting experienced individuals with **comparable skillsets** and then providing **job specific training**.
- This strategy is **costly and risky** for a sector which faces dramatic increases in human resource requirements.



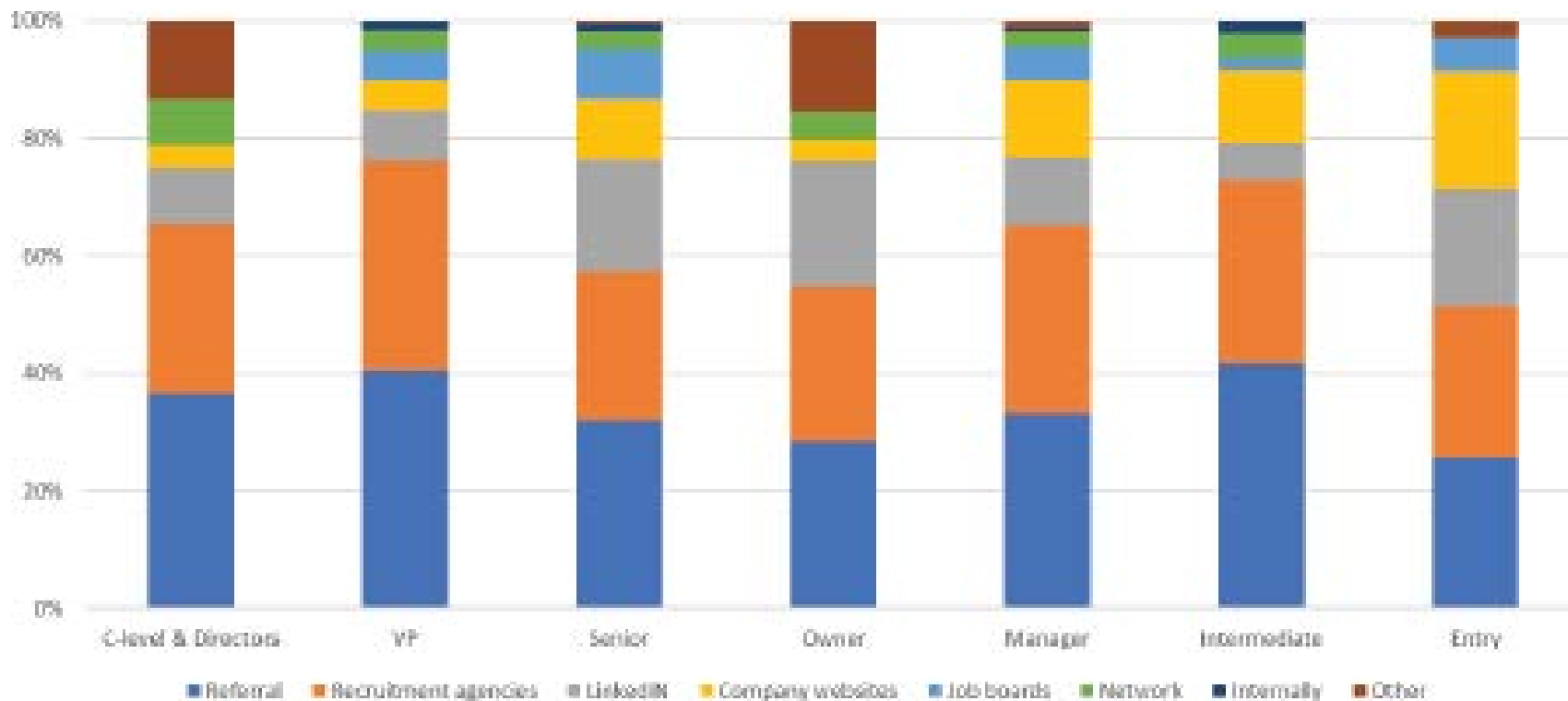
Education and training shortage



Evolution of vacancies in solar PV 2017 to 2020*

Source: Taylor Hopkinson, 2017

Education and training shortage



Source: Taylor Hopkinson, 2017

Education and training shortage

- In addition to the skills shortage in renewable energy, the types of jobs required in the sector are diversifying into digital and IT jobs. McKinsey published in 2016 that “digital optimization can boost profitability by 20 to 30%” for 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 creation of IT jobs.

Education and training shortage

Access and Jobs

FIGURE 7A. ILLUSTRATIVE SUPPLY CHAIN FOR SPV SYSTEMS



FIGURE 7B. ILLUSTRATIVE SUPPLY CHAIN FOR SMALL / MICRO HYDRO



FIGURE 7C. ILLUSTRATIVE SUPPLY CHAIN FOR IMPROVED COOKSTOVES



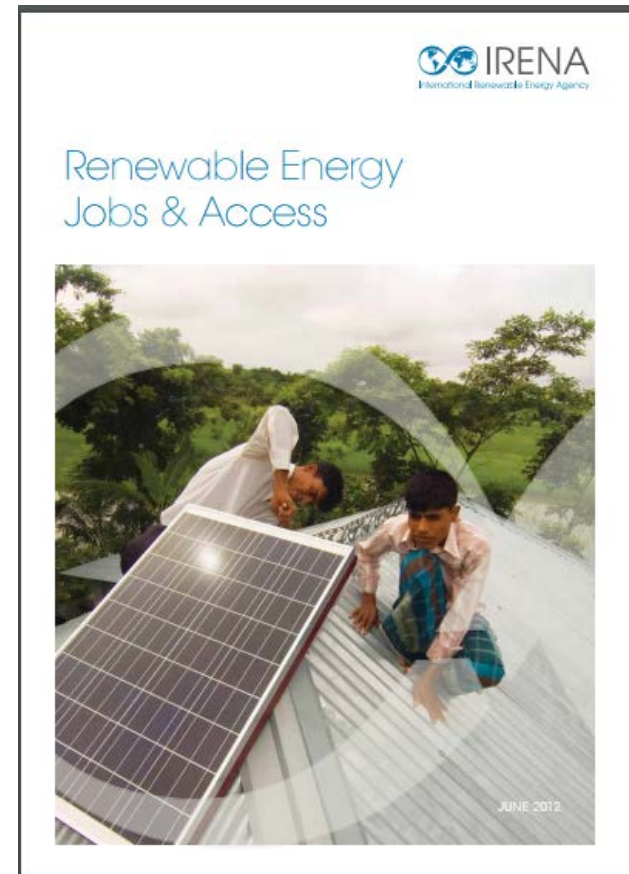
FIGURE 7D. ILLUSTRATIVE SUPPLY CHAIN FOR BIOGAS PLANTS



NOTE: COLOUR LEGEND



Source: IRENA



Education and training shortage

POWER
FOR
ALL

Calls to Action

REPORTS FACT SHEETS IMAGES & GRAPHICS VIDEO AUDIO RESEARCH SUMMARIES CALLS TO ACTION

#PoweringJobs

Energy Access at Work

Building energy centers to shed biomass cookstoves, distributed renewable energy (DRE) solutions already exist to provide clean and safe electricity to almost 1 billion of the 1.1 billion people who lack it. But there's a catch: enough entrepreneurs and workers to deliver the services.

Despite growing demand for clean, accessible and affordable energy solutions across Sub-Saharan Africa and Asia, there is a shortage of skilled workers who can install, maintain, operate and repair distributed solutions for household businesses. Closing this gap with skills and jobs training at the center of global energy access efforts will deliver an increase in income and employment for rural populations at the levels that are needed. The current access energy tool without a skilled workforce is incomplete.

#PoweringJobs is a global effort to galvanize such a workforce. It's a call to action for governments, the private sector, multilateral agencies, and national development partners to work together to strengthen their government and private sector institutions, to address their jobs and skills training needs, and to support the #PoweringJobs campaign.

Through education and training, a new energy workforce including engineers and technicians, utility staff, trainers and learning professionals, manufacturers and designers will be able to ensure a long-term business for off-grid renewable energy and household energy solutions. This workforce will also increase job creation in energy access services. It will help to create a new generation of energy access professionals, including utility staff, trainers, installers and service, could create at least 1 million jobs globally by 2020, according to IRENA. The #PoweringJobs campaign will be also helping IRENA's Global Education and Skills Center that will become a center.

#PoweringJobs October 2018



WE NEED SKILLS IN CLEAN, DISTRIBUTED ENERGY TO EMPLOY MILLIONS OF PEOPLE, INCLUDING WOMEN AND YOUTH, AND END ENERGY POVERTY.



#PoweringJobs Campaign Overview

As many as 4.5 million jobs and 20,000 new companies in off-grid renewable energy can be created if we build the necessary ecosystem of skilled labor and entrepreneurs. #PoweringJobs is the campaign to achieve this potential, and ensure workforce development is a central policy focus.

The campaign is supported by a broad-based coalition, including multilateral agencies, large and small companies, trade associations and research institutes. #PoweringJobs will conduct an annual energy access

Education and training shortage



Mobisol Academy: empowering Ethiopian partners and inspiring rural entrepreneurship

Main Body of Presentation

1. Research on education and training in the RE sector
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Required profiles in the solar sector

The three most wanted profiles PV companies are looking for are:

1. Technology researchers for manufacturing
2. Field technicians (Operations & Maintenance)
3. Engineers (PV system designer) for project planning

Required profiles in the solar sector

Technology researchers for manufacturing

Experience and skills required

- A doctoral degree is a necessity for scientists that conduct original research and develop new products. However, some workers may enter the scientific fields with a bachelor's or master's degree.
- Computer skills are essential to perform data analysis, integration, modeling and testing.

Required profiles in the solar sector

Field technicians (Operations & Maintenance)

Experience and skills required

- Working knowledge of troubleshooting electrical components and equipment.
- Effective written and verbal communications skills.
- A minimum of 1 to 2 years experience in the solar power operations and maintenance.

Required profiles in the solar sector

Engineers (PV system designer) for project planning

Experience and skills required

- Master's degree in an engineering related field or Master's degree in non-engineering field and 1 year of solar industry experience or a degree in design related field and 1 year of solar design (or 2 years of solar industry) experience.
- Proficiency in AutoCAD.
- Basic knowledge of residential construction techniques.
- Critical thinking and ability to solve problems.

Required profiles in the solar sector

The three most wanted profiles concentrated solar power (CSP) companies are looking for are:

1. Technology researcher.
2. Chief Sales & Marketing officer.
3. O&M Technician.

Required profiles in the solar sector

Technology researcher

Experience & skills required

- A PhD in a relevant field of science or engineering such as Mechanical Engineering, Chemical Engineering, Process Engineering, Electrical Engineering 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 (e.g. molten salts), high temperature engineering.

Required profiles in the solar sector

Chief Sales & Marketing officer

Experience and skills required

- Strong track record in technical sales/business development.
- Proven track record in building and leading marketing/technical sales teams.
- Experience managing the entire sales process and reporting relevant sales metrics.
- Negotiating skills.
- Strong organizational and public speaking/communication skills.
- Thorough understanding of a demand–supply perspective, and well-established relationships with potential customers.

Required profiles in the solar sector

O&M Technician

Experience & skills required

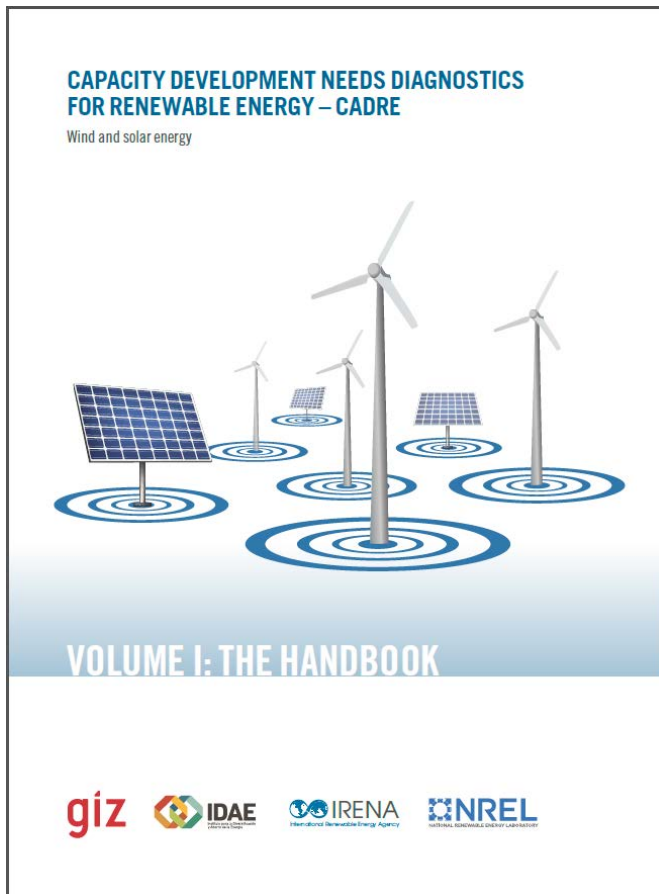
- Good physical condition.
- Ability and willingness to work in hot, dry and dusty environments.
- Interest in the practical application of technology and hands-on work.
- Ability and knowledge to use maintenance tools effectively.

Main Body of Presentation

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Policy recommendations

Strategic planning for skill needs, education and training



RENEWABLE ENERGY TRAINING NEEDS ASSESSMENT IN PACIFIC ISLAND DEVELOPING STATES

SOPAC Technical Report 363

Prepared by

Rupeni Mario
Community Lifelines Programme
SOPAC Secretariat

December 2003

The Renewable Energy Training Needs Assessment is part of the Pacific component of the UNESCAP project on Increased Access of Rural Populations to Clean and Affordable Energy Services entitled "Institutional Capacity Building on Renewable Energy Training". The project aims are to build-up the training capacities of sub-regional institutions and developing a long-term plan for sustained provision of training on renewable energy in the Pacific.

The SOPAC Technical Report 363 consists of all details on the Renewable Energy Training Needs Assessment.

The Renewable Energy Training Needs Assessment was implemented by SOPAC with funding provided from UNESCAP, Bangkok.



Policy recommendations

- Incorporating renewable energy into technical and tertiary curricula.
- Developing training institutes and centers of excellences.
- Financial support (grants and fiscal measures).
- Public Private Partnerships.
- Support to train in the job activities, in particular the dual education.
- Regulatory demand driven measures

Policy recommendations

Standardization and accreditation of qualifications

- Harmonised 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 programmes in an accreditation process against a set of defined requirements for competency, quality management, required resources and qualification.



4. Concluding Remarks

Concluding remarks

- The work force 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 assessments.
- There is a need for more technology specific and hands-on training.
- In addition to increasing, improving solar education and training, attracting female workers to renewables will facilitate to reduce scarcity of professionals.

5. Further Reading

Taylor Hopkinson - Tackling skills shortage in the renewable energy sector by 2020 (2017).
<https://www.taylorhopkinson.com/wp-content/uploads/Skills-shortage-Report-Taylor-Hopkinson.pdf>

Hugo Lucas; Stephanie Pinnington; Luisa F. Cabeza – Education and training gaps in the renewable energy sector (2018). <https://www.sciencedirect.com/science/article/pii/S0038092X18307266>

IRENA; CAPACITY DEVELOPMENT NEEDS DIAGNOSTICS FOR RENEWABLE ENERGY – CADRE (2012).
<https://www.irena.org/publications/2012/Jul/CaDRE-handbook>

CESC; Education and Skills Needs in the Renewable Energy Sector (2014).
<https://cleanenergysolutions.org/training/education-and-skills-needs-renewable-energy-sector>

U.S. Department of Energy (DOE); Solar Training and Education for Professionals (STEP).
<https://www.energy.gov/eere/solar/solar-training-and-education-professionals-step>

Solar Energy International; Professional Solar Training.
<https://www.solarenergy.org/>

Renewable Energy Jobs; Renewable Energy Jobs Guide to Training and Education.
<http://www.renewableenergyjobs.com/content/complete-guide-to-renewable-energy-training-and-education>

6. Knowledge Checkpoint: Multiple Choice Questions