Developing the Skills in Energy for Emerging Economies through TVET

by François Milioni and Mathilde Dupré

Executive summary

Today, 1.06 billion people worldwide still live without access to energy. Electrification is a major challenge that cannot be met without developing adequate local skills. Thus, supporting Technical and Vocational Education and Training (TVET) is key to providing lasting solutions for access to energy. This white paper presents the current challenges of TVET development in developing countries and proposes a framework of actions to support skills development for energy-related careers, based on a case study of Schneider Electric and its Access to Energy Program.
Developing the needed skills to reach the Sustainable Development Goals

Training in the energy field is a key that offers an inclusive answer to several challenges of the Sustainable Development Goals (SDGs). The SDGs have been defined by the United Nations and set development priorities for the international community for the next 15 years. They notably aim at giving access to energy, education and employment to all.¹

In Goal 7 of the SDGs, the international community committed to provide “access to affordable, reliable, sustainable, and modern energy for all.”² This goal includes three sub-goals to be achieved by 2030:

- ensuring universal access to energy;
- doubling the share of renewables;
- and doubling the global rate of improvement in energy efficiency.

Access to affordable, reliable and sustainable energy is crucial for economic growth, people’s income generation and poverty alleviation. However, it remains a major challenge, especially for rural areas.³ Today, 1.06 billion people still live without access to energy.⁴ More than half of them are in sub-Saharan Africa, where the number of people without access to energy is rising, particularly in rural areas. With the anticipated demographic growth, the energy demand is estimated to double.⁵

If energy development requires taking substantial technical and financial actions, developing adequate skills within communities is also critical. Many companies in the electric field that operate in emerging countries notice that the local workforce lacks technical, financial and managerial skills. Often, members of communities in remote, off-grid areas have little knowledge regarding electricity and energy. Without local technicians and community awareness, the related equipment is not properly used and maintained and leads to large amounts of electronic waste.⁶

Thus, access to energy can be an opportunity to address other SDGs, as the international community also committed to take action to facilitate access to employment (Goal 8) and to provide an education for all (Goal 4).

This is crucial, as nearly 767 million people live below the poverty line of 1.90 dollars per day today,⁷ a situation that will only be solved through access to stable and well-paid jobs. Global unemployment increased from 170 million in 2007 to nearly 202 million in 2012, of which about 75 million are young women and men. Worldwide, 470 million jobs are needed for new entrants to the labor market between 2016 and 2030. In Africa, for example, 25 million youths will enter the labor market every year starting in 2019.⁸ To reach Goal 8, the international community

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¹ Goal 4, 7 and 8 of the SDGs
² United Nations, Sustainable Development Goal 7, Energy
³ Pueyo Anna, Training the next generation of electricity professional in order to achieve sustainable Energy for All, November 2016
⁴ S4ALL, Global Tracking Framework, 2017
⁵ IPCC report / IEA World Energy Outlook, 2015
⁶ Ibid
⁷ World Bank, 2013
⁸ Report Faber-Naidoo, Innover par la mobilisation des acteurs : 10 propositions pour une nouvelle approche de l’aide au développement, June 2014
notably committed to achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value by 2030, and to substantially reduce the proportion of youth not in employment, education or training by 2020.

This will only be possible through skills development. Around the world, 200 million people lack training, whilst 103 million youth worldwide lack basic literacy skills, more than 60% of them being women. This situation led the international community to set Goal 4 of an education for all. It notably includes the sub-goals of:

- ensuring equal access for all women and men to affordable and quality technical, vocational and tertiary education;
- substantially increasing the number of youth and adults who have relevant skills;
- including technical and vocational skills for employment;
- enabling decent jobs and entrepreneurship;
- eliminating gender disparities in education and ensuring equal access to all levels of education and vocational training for the vulnerable;
- including persons with disabilities, indigenous people and children in vulnerable situations by 2030.

The world population is expected to be 9.7 billion in 2050 versus 7 billion today, which will automatically increase the percentage of the population lacking access to employment and energy, making it imperative to drive actions for skill development.

**TVET as a key to securing sustainable access to energy and employment**

Technical and vocational education and training appears to be the cornerstone for addressing all these challenges. Through its competence-based approach, TVET offers the adapted schemes to develop and enhance skills needed to manufacture, select, install, operate, and repair electricity technologies, regarding both on-grid and off-grid solutions. Given the current energy conditions in developing countries, adequate training on these matters could unlock significant opportunities for local and sustainable employment.

However, to be efficient and provide tailored solutions, TVET in energy needs to be developed with a narrow understanding of the local needs through a wide stakeholders’ integration. Developing vocational training programs in this way leads to the creation of virtuous economic and social cycles that induce sustainable growth and economic sustainability.

This white paper presents the current challenges of TVET development in developing countries and proposes a framework of actions to support skills development for energy-related careers, based on a case study of Schneider Electric and its Access to Energy Program.

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9 United Nations, Facts and Figures, Sustainable Development Goals
10 UN DESA, 2015
11 Pueyo Anna, Training the next generation of electricity professional in order achieve sustainable Energy for All, op.cit.
12 ibid
Defining Technical and Vocational Education and Training

TVET is defined by UNESCO as “those aspects of the educational process involving, in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupation in various sectors of economic life.”

TVET equips people not only with vocational skills, but also with a wide range of knowledge, skills and attitudes that are now recognized as indispensable for meaningful participation in work and life.

Thus, TVET refers to nonacademic technical education and practical training given in different technical vocational institutes, centers and schools. In the energy field, TVET provides youths with the adequate skills to install and maintain electrical systems or operate automated systems. They can then perform as electricians for residential or industrial installations or technicians in electrotechnics or automated systems, which are skill sets needed in developing countries.

TVET as a driver for countries’ socioeconomic development

In developing countries, TVET plays two major roles regarding social and economic development. The first role is to provide training and career opportunities for disadvantaged youth, especially those who do not complete their formal education. The second role is to help build a generation of skilled manpower, which is needed at all levels of the economies.

This bridging role is especially strong in the field of energy regarding the significant need to develop local careers for the development of national infrastructures and of decentralized energy solutions in rural areas.

Furthermore, TVET can be a valuable tool for sustainable development, as it allows the development of environmentally sound skills, critical for shifting toward a more sustainable energy future.
sustainable economic model. The energy transition and the new alternatives for energy imply new know-hows and new ways of acting that TVET can help to extend.

At both COP21 and COP22, the significance of building new skills for the shift toward a greener economy was underlined.\textsuperscript{15} The role of education in promoting sustainable development was also emphasized in Chapter 36 of Agenda 21: Promoting Education, Public Awareness and Training.\textsuperscript{16} TVET can help build technical skills, knowledge, values and attitudes to enhance the development of renewable energies and promote energy efficiency as a way to reduce negative impact on the environment.\textsuperscript{17}

**TVET challenges and opportunities in developing countries**

TVET in developing countries still has not reached its full potential, as it faces several challenges.

Despite significant needs, TVET appears to have been neglected by international and national institutions, which tend to focus more on purely academic education without any practical training. This results from widespread prejudices that TVET won’t provide people with valuable job opportunities and social status,\textsuperscript{18} although two-thirds of the jobs in developing countries are of TVET levels.\textsuperscript{19}

In turn, this neglect restrains TVET development and performance, as it implies a significant lack of financial and material support.\textsuperscript{20} Limited budgets hinder TVET institutions in conducting effective training for its personnel and in purchasing appropriate training facilities and technologies.

In the field of energy, this places restrictions on the quality of training. Firsthand experiences on didactic enclosures and quality electric material are needed to ensure that the trainees will then operate in a safe and adequate manner when installing or repairing electrical systems. The ability of the trainers to supervise and accompany trainees in their exploration of electrical installations is also considered insufficient today, even though it is a key element in the efficiency of TVET schemes. Improvements are needed for “training the trainers,” as this factor delivers strong results, given its multiplier effect.

Furthermore, equal access to training for all is not yet guaranteed; for example, women face significant difficulties when engaging in TVET in technical areas such as energy or building.

A strong cultural bias toward men remains, both regarding vocational training in energy, which can make women feel unsafe or uncomfortable, although they have the same potential to succeed in their career as electricians or technicians. Traditionally, TVET in energy is regarded as an educational tool reserved for the male gender, which results in a lack of efforts to incentivize and support women in this path.\textsuperscript{21} Enrollment data show a low percentage of women among the trainees of

\textsuperscript{15} UNESCO-UNEVOC, Education and training central in climate change agreements, 14-15 November 2016

\textsuperscript{16} Agenda 21, chapter 36

\textsuperscript{17} Pavlova MGreen skills as the agenda for the competence-movement in TVET. In Competence-based Vocational and Professional Education. Edited by: M Mulder and J. Winterton. Springer;

\textsuperscript{18} UNESCO-UNIVOC, Technical and Vocational Education and Training, Challenges and Priorities in Developing Countries

\textsuperscript{19} Ibid

\textsuperscript{20} Ibid

\textsuperscript{21} Ibid
vocational institutions in developing countries. Gender awareness in TVET needs to be raised, and institutions with a gender lens should be supported to ensure equal opportunities.

A mismatch also exists between the current training offer and the private sector’s real needs.

There is a crucial lack of training schemes targeting the missing middle of qualified operators and technicians in electricity in developing countries (qualified operators perform most of the maintenance and installation activities, whilst technicians undertake more complex interventions to provide continuity of service and teams’ supervision).

Even for the existing TVET schemes targeting these professions, a gap exists between the skills and level of training of trainees and the needs of enterprises in the energy sector.

The lack of qualified midlevel technicians increases the price of electricity projects, which often requires recruiting foreign technicians at a high cost and increases technological dependency from a developing region toward others. Links between training and employment should be enhanced for TVET to deliver professionally successful trainees. Significant work needs to be done to develop appropriate infrastructures, curricula, market linkages and training skill.

Furthermore, there remains a wide lack of understanding of the current employment conditions in developing countries. To ensure employment, understanding the current features of labor needs to be enhanced. For example, the educational system prepares youth for formal employment, despite the fact that the informal sector often hires more than the formal in developing areas. In Africa, for example, 95% of the jobs are available in the informal sectors. More generally, high levels of unemployment in developing countries make it unrealistic to expect that all students will automatically get a job after finishing their training.

Training programs that provide entrepreneurship skills can help tackle this issue by offering electricians the opportunity to create their own businesses. This issue is particularly significant in rural areas where access to employment is more difficult. Therefore, it is critical to provide trainees with the essential keys to being self-sufficient and to be able to set up, maintain, develop and sell solutions. In the case of electric and energy, entrepreneurship can also help bridge gaps, both by providing a path toward access to reliable, affordable, and clean energy, and by opening the door to employment and a step out of poverty for people earning 1 to 2 dollars per person per day.

A wide stakeholders’ engagement in TVET is crucial to ensure the sustainability of the delivered training. To be efficient, TVET schemes should not be stand-alone projects, but must instead be strongly interconnected with national policy processes. Thus, particular attention should be paid to integrating a training

22 Ibid
23 Ibid
24 Pueyo Anna, *Training the next generation of electricity professional in order to achieve sustainable Energy for all*, op.cit.
26 Ibid
27 Ibid
scheme in national education ecosystems and providing certificates that will be recognized by future employers.

**Schneider Electric’s long-term experience with TVET in executing its Access to Energy Program**

Schneider Electric has always placed a strong focus on TVET, as the company wished to concentrate its social initiatives on its core competencies. Thus, when Schneider Electric set up its Access to Energy program in 2009, developing energy training seemed to be the natural expansion of existing programs.

In 1929, Schneider Electric created its own school, Paul Louis Merlin, to improve workforce skills in the energy field. The school promotes vocational training and classroom practice, which arms youths with the knowledge and skills for energy-related jobs.

Schneider Electric is recognized as the reference for vocational training, as it is deeply anchored in the company’s culture and history. Whenever skills and expertise are required by partners all over the world, Schneider Electric’s school serves as real-world support. In addition, the company has always worked and partnered with the public sector on the creation of adapted trainings in the energy field: a didactic equipment line has been developed and a strong partnership with the French Ministry of Education has existed for many years.

This knowledge has been integrated in the Access to Energy Program through an adaptation of tools and methods to this new area of activities. The entire program
aims to ensure safe and reliable access to energy in emerging countries for low-income populations, through three pillars pertaining to the electrical trade:

- **Offers and business models:** Schneider Electric designs and deploys adequate electrical distribution offers to enable access to energy for all.
- **Investment:** Two investment funds support local mature and innovative energy entrepreneurship. Already, 14 ventures have benefited from this funding.
- **Training and entrepreneurship:** Schneider Electric and its Foundation support the training of disadvantaged people and trainers in energy and automation and the design and implementation of inclusive solutions regarding training. This includes mentoring and funding for entrepreneurs who wish to launch their ventures at all the stages of the chain of energy.

The training aspect is totally financed by the Schneider Electric Foundation under the aegis of the Fondation de France, providing tools to support training and thus to participate in the countries’ development.

### How it works

**Supporting the development and the implementation of tailored training programs**

The Access to Energy training and entrepreneurship pillar relies on strong principles, which are:

- **Offering equal opportunities** for women and men through collaborations with key actors that offer training with a gender lens.
- **Adapting to local specificities** on the ground by providing training in formats suitable for local lifestyles and by analyzing the realities of local employment.

Based on the assessment of local needs, the Access to Energy Training Program supports three types of energy-related training, which are designed and implemented by our partners and range from three months to three years for underprivileged people, trainers, and entrepreneurs:

- **Short certifying training**, three to six months, enabling access to employment opportunities for electrification of residential and commercial buildings.
- **Longer qualifying courses** leading to a level of technician or senior technician, some taking place in centers of excellence with the involvement of local Ministries of Education.
- **Trainers’ training** to support effective and quality dissemination of knowledge transfer for the long run.
- **Entrepreneurship training** to enable trainees to develop the appropriate skills and to benefit from mentorship in starting their own economic activity, and to empower local communities in acquiring long-term competencies to maintain and develop access to energy solutions.²⁸

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²⁸ For more information, see the white paper, “Addressing the Needs of Micro and Social Entrepreneurs in the Energy Field in Developing Countries” by Diane le Goff and Mathilde Dupré, 2017
Schneider Electric and its Foundation support these training courses by various means, mobilizing a large panel of their services to address the different needs of their partners. The company is deeply committed and contributes widely through:

- **Financial support** to fund facility renovation and supply didactic material.
- **Development of didactic benches** to learn residential and industrial electricity, adapted to local reality and international standards.
- **Support for entrepreneurs** through an Entrepreneurship Program that ensures follow-up with trainees and assists them in developing their careers through mentoring and commercial development support.
- **Technical expertise**, shared by developing and providing tailored training contents as well as training for trainers, thanks to the commitment of our collaborators.

Since 2012, current and retired employees from Schneider Electric have volunteered through the NGO “Schneider Electric Teachers” to offer short sessions of training at the partners’ location. More than 1,000 missions have been achieved in 2017.

The idea of this organization is to help match skills to concrete needs, to provide solutions, and to make a significant contribution to programs developed throughout the world for the most disadvantaged young people.

**Building strong partnerships for sustainable projects**

Schneider Electric’s approach to training relies on the support of local partners who have developed an expertise in TVET and knowledge of the local needs. Thus, Schneider Electric works with various TVET, institutions, nongovernmental organizations and states.

Schneider Electric has set many projects in partnership with various entities around the globe. Since 2009, the program has trained more than 125,000 people for energy-related jobs. With the support of more than 50 training partnerships in 25 countries, the program has trained 1,000 trainers, supported 700 entrepreneurs,
and created nine centers of excellence with quality equipment. In addition, the company has developed a dedicated didactic offer.

Schneider Electric’s ambition for 2025 is to reach the objectives of training 1 million people and 10,000 trainers, and supporting 10,000 entrepreneurs. To achieve these goals, Schneider Electric has developed partnerships with global and local actors worldwide.

These commitments are measured within the Planet & Society Barometer of Schneider Electric. Since 2005, this barometer has highlighted advancements realized by the company on sustainable development. It is based on three pillars: planet, profit and people. Within these three pillars, 16 indicators monitor the evolutions of Schneider Electric actions regarding five important trends impacting its activities: climate, circular economy, health and equity, development, and ethics.

Altogether, Schneider Electric has trained more than 135,000 youths, trainers and entrepreneurs worldwide.

Figure 4
Countries of action of the Access to Energy Training & Entrepreneurship Program since 2009

Some examples of Schneider Electric training projects include:

- The “Green Electrician” short training courses at the Ly Tu Trong Technical College at Ho Chi Minh, Vietnam, in partnership with the German Development Bank and ASSIST. Through various means, 500 people will be trained for electricity, sustainable energy management, and entrepreneurship: free basic full-time course for students from underprivileged backgrounds; an evening course for existing electricians; and trainers’ training to disseminate knowledge to other training centers.

- Longer qualifying training courses at the Centre of Excellence at Vaal University of Technology in Johannesburg, South Africa. This partnership was signed in 2014 to support training 353 people. In 2016, a new agreement was signed for the support of four other training centers in South Africa: the Cape Peninsula University of Technology, the Sedibeng TVET College Gauteng, the University of Johannesburg and the College of Cape Town.

- The Seeds of Hope program launched by the European Institute for Cooperation and Development (IECD) in 2013 aims at developing vocational training in the Don Bosco Cairo and Alexandria centers. Schneider Electric offered training of trainers over the last three years through Schneider Electric Teachers to share knowledge. To date, 575 youths have benefited directly from this partnership.
Conclusion

TVET has a bridging role to play for securing access to energy worldwide and providing vulnerable population with skills enabling them to participate in the labor market. The skills and know-how acquired by local trainees enable them the opportunity to master a profession and provide essential services to their communities. This is also the best way to ensure that the energy supply fits the local context and needs.

However, TVET has not yet reached its full potential in emerging economies, as it faces several challenges that include: prejudice regarding the quality of the training outcomes; significant lack of resources, inadequacy within the current labor market; and the lack of integration of women in the training.

Thus, actions need to be taken to help TVET develop itself with a strong focus on the construction of lasting partnerships for tailored solutions. With its activities in support of energy-related training, Schneider Electric commits on that matter and plays an active role in the social and economic development of local communities in emerging countries.

More information is available in the white paper, “Providing Sustainable Access to Energy.”

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