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TOPIC 7: PV Economics, Markets and Policies

Solar Electricity In Africa: Overcoming Barriers And Lessons Which May Be Learnt From Previous Experiences in Europe

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Summary

At today's prices, and with a steadily declining price trend, solar photovoltaic (PV) electricity is increasingly perceived as one of the key-enabling technologies potentially leading to the achievement of this single target in those parts of the word where the access to electricity is still extremely limited. As for example in sub-Saharan Africa where 70% of the population (i.e. 600 million person) has no access to this form of energy.

Nevertheless, the diffusion of rooftop PV installations in developing countries is often hindered by: (a) a poor perception about the reliability of this technology, and (b) by the relatively high up-front capital and financing costs, combined with a difficult access to credit. To tackle this, a promotion and diffusion of solar electricity in developing countries cannot take place if adequate control mechanism and quality checks (at component and system level) are not set in place. We therefore focus our attention on what constitute today the largest barrier for a "sustainable" diffusion of solar electricity in Africa, targeting particularly the rooftop segment of the market (i.e. residential and commercial/industrial systems).

Barriers include:

1. Poor focus on **quality** and lack of standardization;
2. Lack of adequate **training** for professionals (system-developers and installers) is often reported.
3. **Access to finance**. The focus on quality, standardization and training should prospectively have a strong impact in risk mitigation and consequently reduce financing costs, provided the relevant financing institutions are involved in the loop.
4. Lack of **incentives** or of clear regulations.

We then drive a parallel to what has happened in European countries 10-15 years ago, where often poorly designed incentives schemes in the first decade of the century (e.g. feed-in tarifs in Spain, Italy and other countries) have created unhealthy market dynamics. Overgenerous feed-in tariffs, combined with non-optimal timing and sharp year-end rate reduction mechanism have in fact generated distortions in the market, caused non-healthy temporal dynamics and considerably increase local market prices for solar PV; and, not ultimately, caused the flow of often below standard components to the domestic markets.

Keywords: reliability, testing, international cooperation, emerging markets

Purpose of the work, relevance and approach

Discuss barriers that hinder a diffusion of solar electricity in the African continent, drive a parallel to the situation in Europe 10-15 years ago, and analyse which lessons can be learned from the recent history of solar PV in Europe that could benefit African markets, avoiding the replication of some of the most relevant mistakes observed in Europe.

Scientific innovation and relevance

Evidence-based experiences on the quality of solar PV installations in European and African countries.

Relevance to Sustainable Development Goals (SDGs): Affordable and Clean Energy (i.e. ensuring access to affordable, reliable, sustainable and modern energy for all) is one of the 17 SDGs, officially known as *Transforming our world: the 2030 Agenda for Sustainable Development*, set by the United Nations in 2015 [1].

Results and conclusions

At today's prices, and with a steadily declining price trend, solar photovoltaic (PV) electricity is increasingly perceived as one of the key-enabling technologies potentially leading to the achievement of this single target in those parts of the word where the access to electricity is still extremely limited [2]. As for example in sub-Saharan Africa where 70% of the population (i.e. 600 million person) has no access to this form of energy [3].

In recent years, however, with a total (all Africa) cumulative capacity reaching over 2 GW in 2015, the market for new solar PV installations in Africa is expanding very rapidly [3]. Most of the new additions in capacity are covered by the utility-scale segments (e.g. South-Africa and Algeria in 2015), but rooftop (i.e. residential, industrial and commercial) as well as micro/pico-solar PV installations are experiencing similar growth rates, though official statistics covering these market segments are by far less reliable.

The diffusion of rooftop PV installations in developing countries is often hindered by: (a) a poor perception about the reliability of this technology, and (b) by the relatively high up-front capital and financing costs, combined with a difficult access to credit [4, 5]. To tackle this, a promotion and diffusion of solar electricity in developing countries cannot take place if adequate control mechanism and quality checks (at component and system level) are not set in place. We therefore focus our attention on what constitute today the largest barrier for a "sustainable" diffusion of solar electricity in Africa, targeting particularly the rooftop segment of the market (i.e. residential and commercial/industrial systems).

Barriers include:

5. Poor focus on **quality** and **standardization**. Quality should be achieved through standardization (including the adoption of the relevant international standards) and include the optimal selection of components, the adoption of best-practices for the design, commissioning, and O&M phases. The implementation in the different countries of testing laboratories (for components and system), allowing the implementation of verification means, would also provide a strong trigger for quality

6. Lack of adequate **training** for professionals (system-developers and installers) is often reported. The development of adequate training/qualifications schemes for professionals is therefore of primary relevance.

7. **Access to finance**. The focus on quality, standardization and training should prospectively have a strong impact in risk mitigation and consequently reduce financing costs, provided the relevant financing institutions (banks, insurances, microcredit agencies, etc.) are involved in the loop.

8. Lack of **incentives** or of clear regulations.

We then drive a parallel to what has happened in European countries 10-15 years ago, where often poorly designed incentives schemes in the first decade of the century (e.g. feed-in tarifs in Spain, Italy and other countries) have created unhealthy market dynamics. These evidences from European experience about the correlation of overall PV quality with market dynamics and incentives could hopefully provide a constructive feedback to the several countries (particularly in sun-belt regions) that are about to design incentive schemes to promote a domestic diffusion of solar electricity.

Overgenerous feed-in tariffs, combined with non-optimal timing and sharp year-end rate reduction mechanism will in fact generate distortion in the market, cause non-healthy temporal dynamics and considerably increase local market prices for solar PV; and, not ultimately, possibly cause the flow of often below standard components to the domestic markets. Further, long learning processes for PV professionals have often been reported in Europe too.

Fig. 1 (a) shows the picture of PV module available for sale on the street of a local market in Dakar [5]. Currently in Africa, most of the PV modules available for individual users or small installers are distributed through retailers with often a very limited knowledge about PV, who cannot offer any traceability about the origin of the products.

Fig. 1(b) shows a defect caused by arching on a below standard module installed on a industrial rooftop PV installation in Italy.

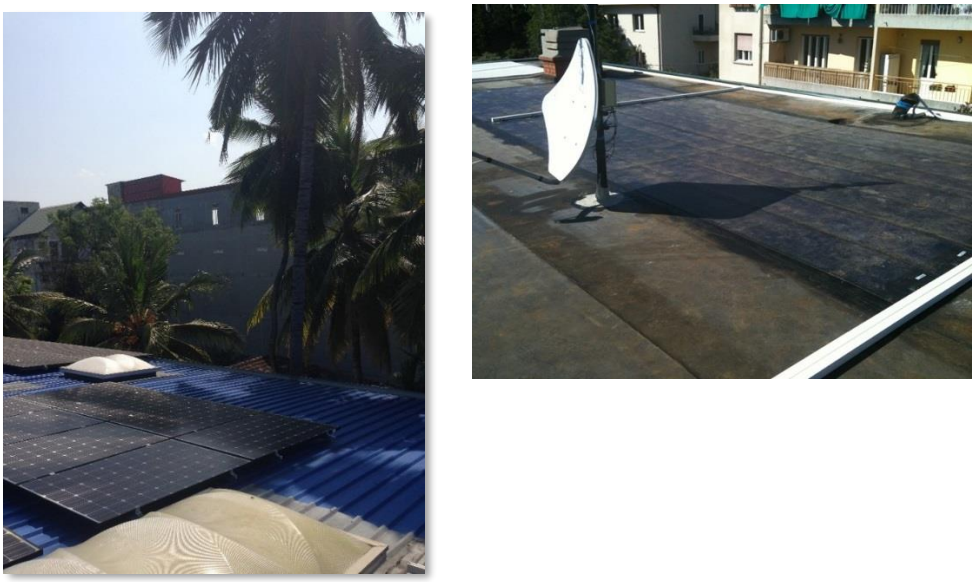

Fig. 2: small shading, big losses: evidence of poor design in (a) Lagos, 2016, and (b) Italy, 2009.

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