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EXECUTIVE SUMMARY

Clean captive power:
Understanding the uptake and growth of commercial and industrial (C&I) solar PV in Kenya

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Executive Summary

Industrialization has been gaining pace in Sub Saharan Africa (SSA), leading to a rapid growth in energy demand. However, most commercial and industrial (C&I) businesses are faced with unreliable electricity supply, expensive grid tariffs and diesel back-up systems, which impedes their efficiency, sales and competitiveness. Captive solar PV systems are rapidly emerging as an alternative for self-generation, for C&I consumers to complement the grid, switch from diesel generation or adopt fully off-grid solutions with battery storage. Kenya is among the few countries in SSA that has experienced the highest growth in captive PV instalments over the past years (see Figure 1). This report examines how the captive PV market for businesses has evolved, the key drivers, barriers and risks as well as how PV firms have leveraged on this marker. The report covers primary and secondary data on the captive PV installations in Kenya which total nearly 40 MW capacity (with 30.2 MW already installed and 9.2 MW under construction as of 2019).

The rapidly falling global PV prices combined with the increasing energy demand and availability of financial means and mechanisms have enabled this growth trend.

The energy demand for captive PV systems primarily stems from the high energy intensive consumers, i.e. industrial sector, commercial businesses, horticulture sector and the institutional segment, as shown in Table 1. The industrial sector is clearly the dominant user category (with 14.2 MW) for adopting grid-tied captive PV systems, however the commercial sector is also emerging as a very dominant category, particularly when we add the projects under construction as of 2019 (11.5 MW), followed by the horticulture sector (7.9 MW) and the institutional segment (5.7 MW). For the installed projects, the average system size is 175 kW.

What have been the main driving factors?

Energy cost savings: the most crucial driver for power consumers to invest in captive solar PV has been energy cost savings. By investing in solar they are not just eliminating their diesel generator expenses but also reducing their high grid tariffs burden. Overall, there is an expectation among captive PV power consumers that at least 3-5$ cents can be saved vis-à-vis current grid tariffs. For a difference between the baseline scenario (grid) and solar PV, some EPCs report a direct reduction of 20% to 30%

FIGURE 1. Cumulative Captive Solar PV Installations in Kenya

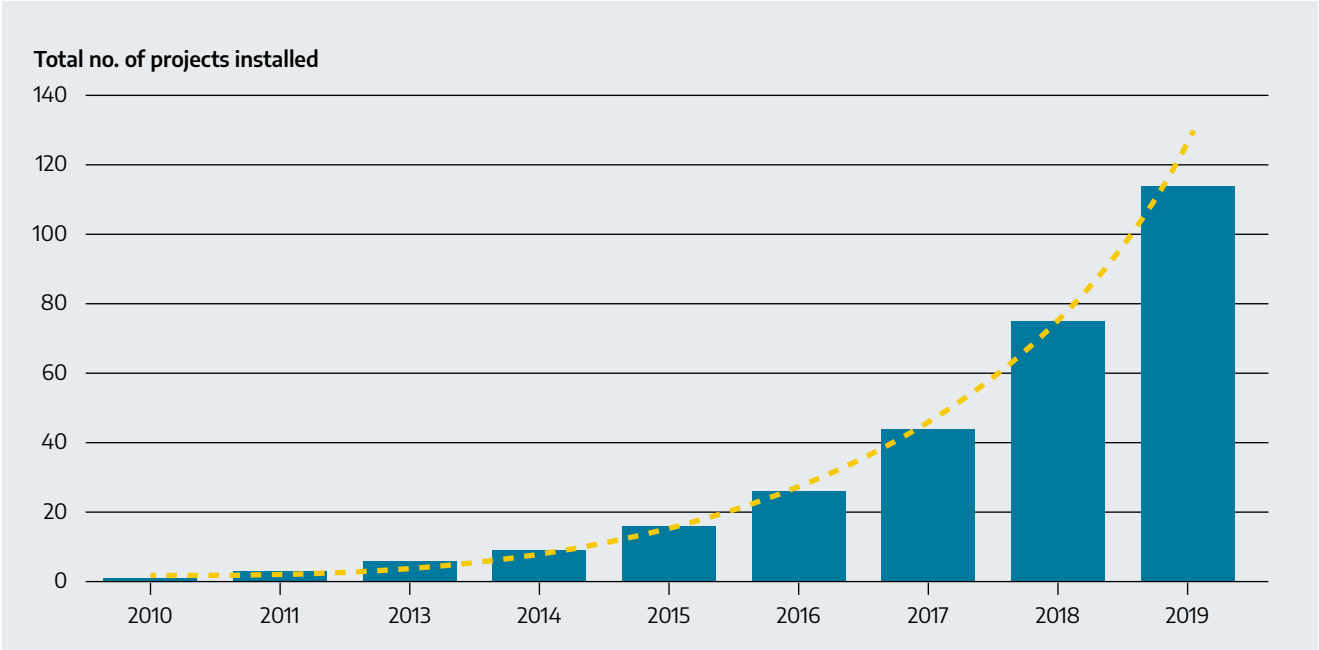

TABLE 1. Disaggregated power consumer categories and installed capacities

No.	Sectors	User categories	MW	%
1.	Industrial	small and medium-scale enterprises: rolling mills, steel pipes, glassware, plastics, salt, distillers, oil refineries etc.	14.2	36%
2.	Commercial	malls, lodges, hotels, safari camp sites, cargo facilities, airports, ware-houses, office buildings, food-processing units, petrol stations etc.	11.5	29%
3.	Horticulture	tea plantations, flower farms, coffee plantations etc.	7.9	20%
4.	Institutional	public institutions such as schools, hospitals, universities, embassy buildings, mosques etc.	5.7	15%
Total			**39,4**	**100%**

TABLE 2. Summary of the strategies pursued by solar PV firms

Types of strategy	Description	Examples of firms pursuing this strategy
Building on strong interactions, networks, partnerships and collaborative operations	Strong/unique partnerships and working models – formal partnerships, SPV models, implementation agreements.	• OFGEN-Mettle SPV • Solar Century-Crossboundary • Greenspark-Hortigreenhouse • Questworks-Sunfunder
	Tie-ups with other EPCs for additional resources	• Ofgen – SPS Kenya • Harmonic Systems – Azimuth • Astonfield-Knights
Targeted business strategy to capitalize on niche advantages	Niche markets and/or targeted clients i.e. corporates, lodges, institutional clients	• CP Solar • Solarise Africa • Greenspark
	Targeted markets – (only below 200 kW or beyond 500 kW or 1 MW)	• Solar Century • CP Solar • Astonfield
Innovative and/or diversified service offering	Providing a host of integrated services - energy audits, ICT, data support	• OFGEN • Harmonic Systems • Knights Energy
	Innovative product offering – custom rooftop PV tiles	• Strauss Energy

in energy bills compared to grid connection. However, conservative estimates also indicate a maximum of 10% overall savings (as solar accounts for only 25%-30% of the total power consumption).

Financing availability and investment opportunities: the availability and opportunity for financing for solar PV is a critical factor. According to our findings, over 50% of power consumers have self-financed their PV systems, either by balance-sheet finance or by taking out local bank loans for capital expenditure. While the number of self-financed projects are relatively high, these are mostly smaller sized (on average nearly 54 kW). Several projects have achieved external funding from financiers and ESCOs including donor finance (e.g. AFD, USAID), dedicated investment funds (e.g. Crossboundary Energy), asset management companies (e.g. Ariya Leasing, Mettle, responsAbility) and solar financing companies including crowd funding sources (e.g. Sunfunder, Ecoligo). There are around 15 financiers/ESCOs active in the market. Of these, two most important financiers with large portfolios are AFD SUNREF Program and Crossboundary Energy.

Strong existing PV firms have leveraged the market expansion: many strong long-term as well as newly emerged PV firms (including 21 EPC and O&M firms) have largely driven the uptake of solar PV in the Kenyan market. These firms aggressively pursued the C&I market, mainly through 3 key strategies as shown in Table 2.

Indirect policy drivers: a range of local indirect policies and regulations have also played a role in creating a favourable and stimulating enabling environment for the solar PV market. This includes the mandatory energy audits (for most businesses) that led to increased consumer awareness pertaining to their energy consumption, energy bills, and employing solar PV system for cleaner generation and reduced bills. This also includes incentives for manufacturing industries to claim investment deductions through solar PV equipment purchases.

Other factors: a growing trend of cleaner, greener policies and practices being adopted by multinational corporates (such as Unilever, GlaxoSmithKline, Toyota), and lodges, resorts, and basecamps (eco-tourism) has also provided an impetus to the market. In addition, higher international prices for flower exports with greater eco-ratings have also led to a surge in captive PV systems among the horticulture sector in Kenya.

What are the constraints and risks?

- Limited skills and expertise (human resources), specifically pertaining to designing the grid-tied systems optimally, and in carrying out operation and maintenance of systems, leading to complaints and dissatisfaction among the power consumers.
- Overwhelming consensus on the limited options for external finance for the power consumers as well as for the local solar PV firms. This includes constraints for securing working capital with limited collateral, and lack of flexible debt options for inventory loans.
- Unrealistic proposals and price offerings by the solar PV firms to the power consumers due to a highly competitive environment. This has also resulted in distrust and negative perceptions of the market with regard to energy cost savings and quality of the installations.

Recommendations

1. The regulator could and should act as an important bridge between the PV firms, financiers, ESCOs and power consumers to work jointly towards standardizing the contractual and legal conditions, as well as easing entry barriers.
2. There is a need for more independent advice and standardized presentations of costs, billing calculations, payback periods, performance ratios, penalties etc. in order to induce trust among power consumers and also to reduce information asymmetries in the market.
3. International financiers/ESCOs must work towards offering financing instruments which are flexible and better suited to the demand, factoring in the differences between short-term and long-term financial needs.
4. There is a need for national utilities and planning bodies to integrate grid-tied captive PV systems into the assessments of demand and supply, and electricity projections for future.
5. The solar SMEs should strive to optimize PV systems in line with the specific customer type and their specific requirements, to avoid one-size-fits-all approach.
6. There is a need for more disaggregated data on high energy-intensive consumers to supplement better market analysis.