

# How to stimulate the South African rooftop PV market without putting electricity distributors' financial stability at risk

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### **INTRODUCTION**

Due to drastically reduced prices for Photovoltaic (PV) systems and significantly increased electricity tariffs recently, small scale embedded generators (particularly PV units) are now attractive for many electricity customers in South Africa. Rooftop Solar PV installations are already increasing in South Africa as seen in the policy mechanisms recently introduced by several municipalities for feeding electricity back into their distribution grids.

Alarge market uptake of Solar PV without any countermeasures will put the financial stability of electricity distributors (municipalities and Eskom) at risk because self-consumed PV energy reduces electricity sales which they need to cover their fixed cost of building, operating and maintaining the distribution grid, as well as cost of metering and billing.

There are other potentially serious implications of having a growing "below the radar" market of small-scale embedded generators including:

- Compromised safety within the distribution grid
- Difficulty with grid operations
- Difficulty regulating a market that is not monitored/quantified.

From a system perspective, however, promoting Solar PV for embedded generation can make a meaningful contribution to assisting with South Africa's constrained electricity supply situation in three important ways:

- Embedded Solar PV can be deployed very quickly
- Favourable lifetime costs (at 5.7–6.4 €/kWh) compared to other new build options
- Large amounts of capacity can be deployed.

This value cannot be unlocked because the business case for the PV Owner is not secure. There are three key drivers for this business case namely: financing costs, capital costs, and strength of revenue streams which underpin the return on investment.

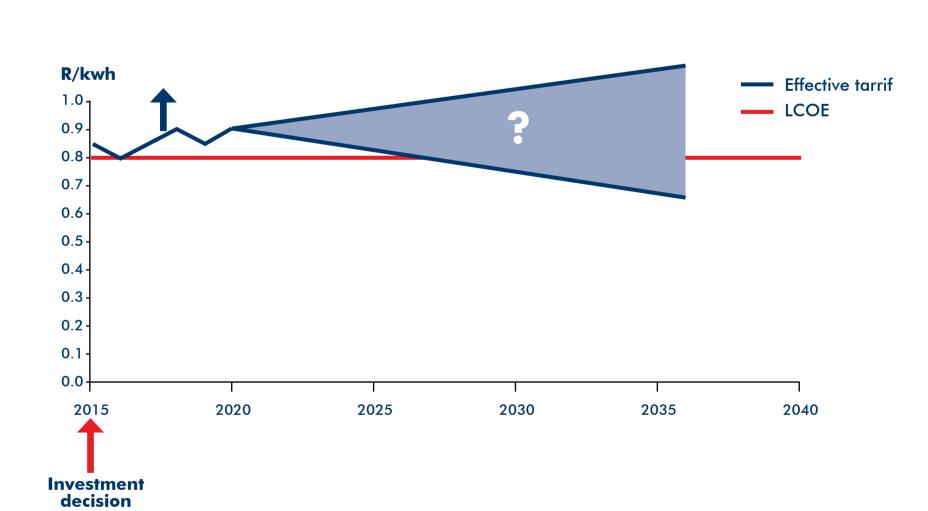


Figure 1: Effect of uncertainty about the tariff (or better: effective value of PV energy) to the required initial tariff level

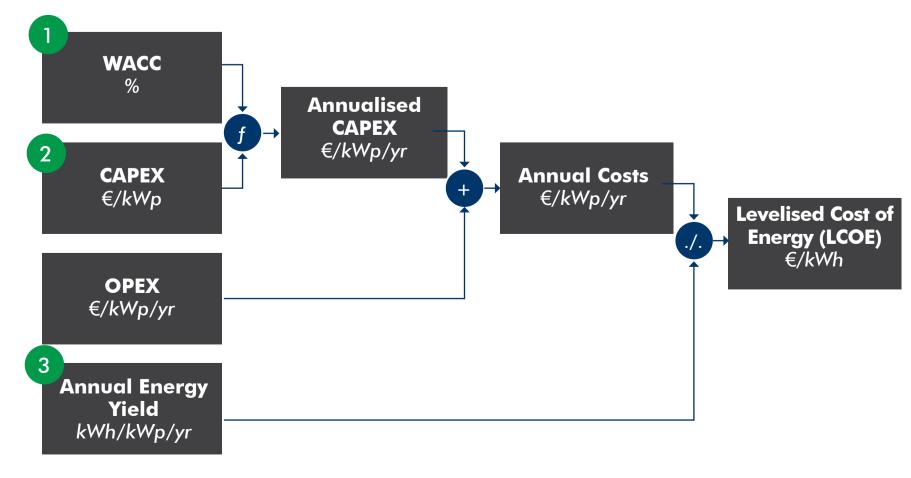


Figure 2: Cost drivers for a solar PV system

# METHODOLOGY

Municipalities and Eskom distribution fund the fixed cost associated with expanding, operating and maintaining their distribution grids

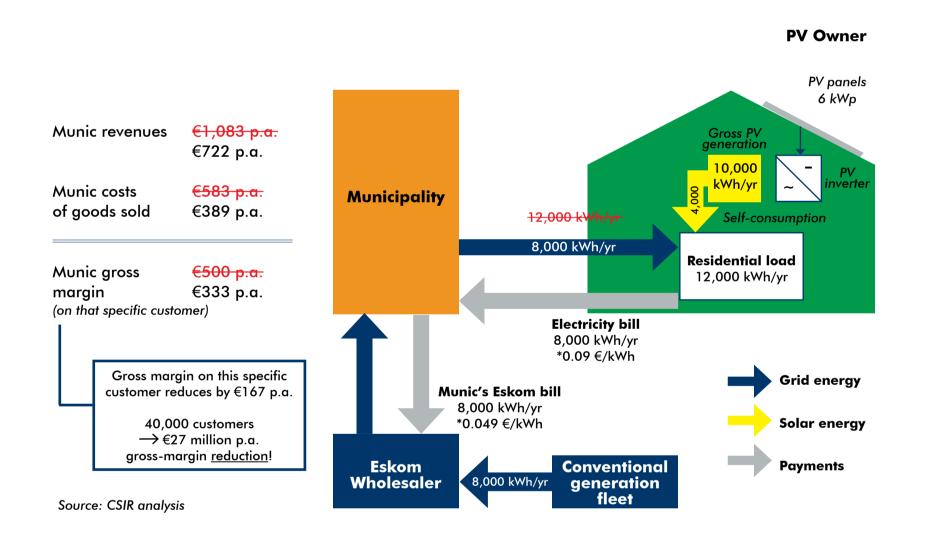
through electricity sales. Because PV is most attractive for those customers that pay the highest tariffs and consume the highest amounts of energy, there is a huge risk that municipalities/Eskom will lose out on electricity revenues due to self-consumption of PV-generated energy.

For example, a 6 kWp PV system is installed at a customer's residence, where the customer has a load of 12,000 kWh/yr. The residential customer in this case is able to consume 4,000 kWh/yr (40% of annual supply) therefore municipality sales are reduced by this amount (down from 12,000 kWh/yr to 8,000 kWh/yr). This reduces the municipality's gross margin which is the difference between revenues from electricity sales and the money the municipality pays in order to buy the redistributed electricity.

This gross margin on the assumed individual customer was €583 per year. With self-consumed PV energy reducing the sales volume by 4,000 kWh/yr, the municipality now makes only €333 per year in gross margin on that specific customer. The loss of €167 per year in gross margin must be compensated from somewhere.

### The PV Owner

The NETFIT will address this problem while securing the business case for the PV investor or owner. This will be done through a feed-in tariff for all excess electricity fed into the grid. The feed-



**Figure 3:** Reduction of municipality's gross margins due to self-consumed energy of a behind-the-meter PV system

in offer should have several main features including having to be: long term, legally binding, with a highly predictable revenue trajectory. Ideally, the PV Owner would enter into a Power Purchase Agreement (PPA) with a counterparty with high credit rating to ensure low financing costs for the PV investment.

# Central Power Purchasing Authority (CPPA)

An entity needs to be established to ensure payment to the PVOwner as well as to ensure compensation to the electricity distributor for lost gross margins. Within the NETFIT, an aggregating entity or CPPA is needed to play a key coordination role. This entity will conduct all payments while also measuring the excess electricity fed into the grid from individual embedded generation units. The figure below shows all relevant monetary and energy flows.

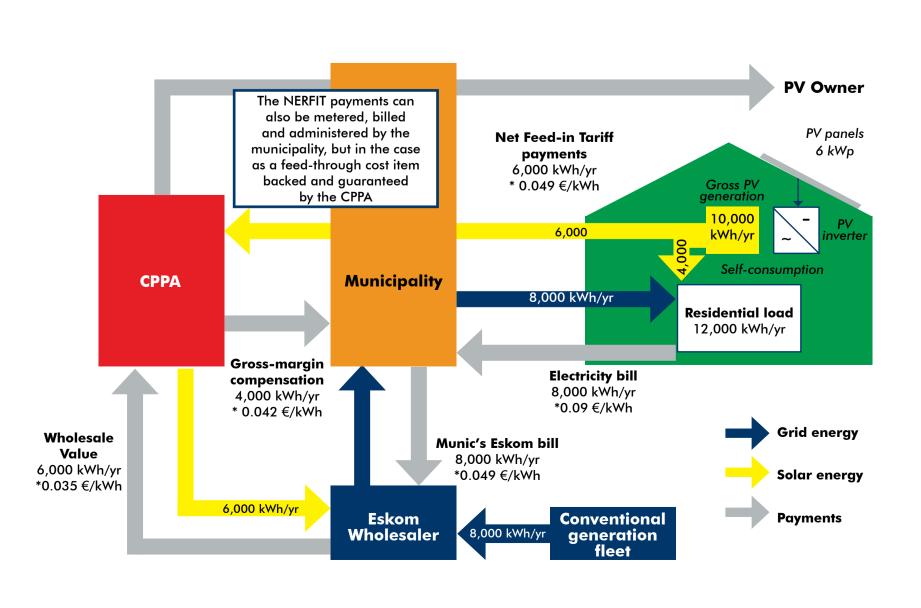
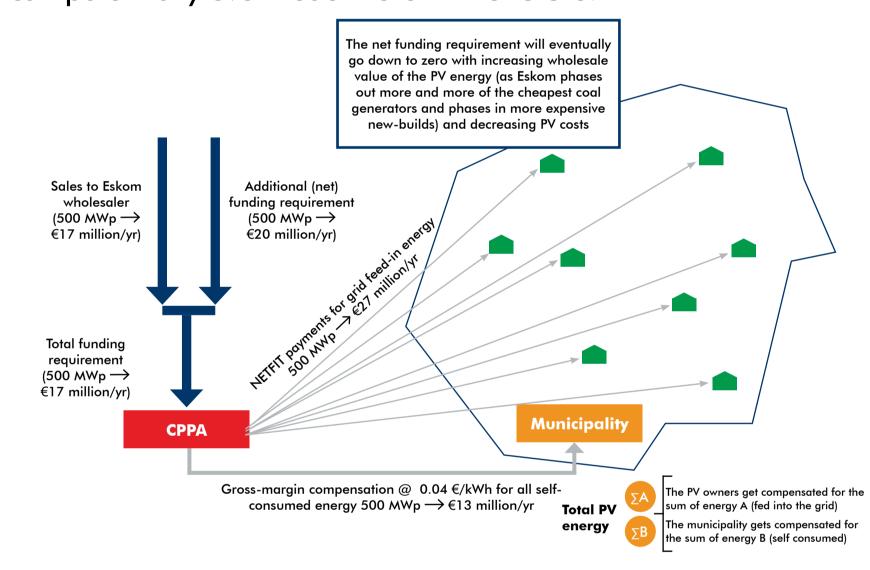


Figure 4: Mechanism of the proposed NETFIT concept

### **FUNDING THE CPPA**

The CPPA will have a total funding requirement of approximately €37 million per year for every 500 MWp of embedded PV that are built under the scheme. This is shown in the figure below, assuming preliminary assumptions on tariff levels and cost for illustration purposes. CPPA will have two sources of funding: 1) Onward sales of the PV energy that CPPA buys from the PV Owners to the Eskom Wholesaler. 2) Residual funding to come from either tax money or from a mark-up on all kWhs sold in the electricity system (similar to the funding of large-scale Independent Power Producers).

The net funding requirements are estimated to be €20 million per year for every 500 MWp of PV capacity installed under the scheme, which translates into an increase of the average tariff of approximately 0.01 €-ct/kWh (for every 500 MWp of PV under this regime). This value will very likely go down over time with reduced PV system costs and increasing fuel costs on the conventional fleet (and therefore increasing wholesale value of the PV energy bought by the CPPA from the PV owners). The net funding requirements can potentially even reach zero in the future.



**Figure 5:** Monetary streams under the proposed NETFIT concept

# KEY COMPONENTS OF THE STANDARD OFFER

Standard offer from CPPA to the electricity distributor

The CPPA makes a standard offer to all holders of an electricity distribution license (municipalities and Eskom) that will make the electricity distribute or indifferent to embedded PV generators from a pure financial perspective.

# Offer

- CPPA guarantees the distributor financial compensation for losses on gross-margins due to energy from embedded PV generators that is self-consumed on the customer's site.
- Meter reading
  - CPPA or electricity distributor reads the feed-in meter and in addition reads the consumption meter for purposes of determining payments.

# Standard offer from CPPA to the PV owner

The CPPA makes a standard offer to all customers that are in supply areas of distributors that have signed up to the "standard offer from CPPA to the electricity distributor". This standard offer will provide very high investment security to the PV owner.

# Offer

- CPPA guarantees to off-take any percentage (between 0% to 100%) of the energy from the embedded PV generator that the PV owner decides to feed back into the grid
- CPPA guarantees the PV owner a predefined tariff at a predefined annual escalation rate for the energy that is fed back into the grid for a period of 20 years.

# CONCLUSION

The NETFIT scheme offers a mechanism through which electricity distributors can be compensated for gross margin losses that occur as a result of embedded generation. In addition, the NETFIT simultaneously provides a meaningful incentive for mass investment into rooftop PV which is a cost-competitive new build generation option for South Africa compared to conventional large scale central power plants.