

SMALL SCALE ON-GRID SOLAR PHOTO
VOLTAIC EMBEDDED GENERATION IN
SOUTH AFRICA –
METHODOLOGIES TO STIMULATE THE
MARKET

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Introduction

- IRP 2010-30: estimates that residential and commercial Embedded Generation (EG) PV could reach 22.5GW by 2030
- Increased electricity prices
- Reduced Eskom reserve margin
- Opportunities for consumer export income
- Obstacles to roll-out of small scale PV
 - **Decrease in municipal revenues**
 - Risk of LV/MV system overloading
 - Safety
 - Absence of approved standards/legislation
- SSPVEG installations are occurring (next slide)

Current SSPVEG installations in SA

Project	Location	Province	Installed capacity (kWp)	When completed
Kriel Mine	Kriel	Mpumulanga	240	Aug.13
Med	Woodmead	Gauteng	31	Jul.13
BMS	Woodmead	Gauteng	36	Jul.13
BT	Woodmead	Gauteng	36	Jul.13
WTP	Witbank	Mpumulanga	30	2013
Mitchells Plain Hospital	Mitchells Plain	Western Cape	64	2013
Solar Irrigation System	Montagu	Western Cape	24	2013
GreenPeace Africa	Johannesburg	Gauteng	10	2013
Vodacom	Century City, Cape Town	Western Cape	500	2012
Dube Trade Port	Durban	Kwazulu Natal	220	2011
Pick n Pay distribution centre	Phillippe, Cape Town	Western Cape	300	2013
Vrede en Lust Wine Farm	Franschoek	Western Cape	218	2013
Novo Packhouse	Paarl	Western Cape	200	
Leeupan Solar PV project	OR Tambo Precinct, Wattville,	Gauteng	200	2012
Pick n Pay Distribution Centre	Longmeadow, Johannesburg	Gauteng	150	2011
Villera Winefarms Stellenbosch	Cape Town	Western Cape	132	2011
Standard Bank PV Installation	Kingsmead, Durban	Kwazulu Natal	105	Unknown
Pick n Pay Store	Hurlingham, Johannesburg	Gauteng	100	2010
BP Offices	V&A Waterfront, Cape Town	Western Cape	67	2011
Cavalli Wine & Stud Farm	Stellenbosch	Western Cape	51	2013
Oldenburg Vineyards	Stellenbosch	Western Cape	45	2013
Coca Cola water bottling plant	Heidelberg		30	Unknown
Glaxo Smith Kline	Cape Town	Western Cape	30	Unknown
Impahla Clothing	Maitland		30	Unknown
Khayelitsha District Hospital	Cape Town	Western Cape	25	2011
Stellakaya Wine Farm	Stellenbosch	Western Cape	10	Unknown
Lelifontein wine cellar and Gropfontein admin offices	Stellenbosch	Western Cape	88	2013
Eskom Megawatt Park Rooftop PV	Sunninghill, Johannesburg	Gauteng	358	2013
Eskom Megawatt Park carport PV	Sunninghill, Johannesburg	Gauteng	398	November 2011
Eskom Kendal PV (ground-mounted, fixed)	Eskom's Kendal coal-fired power station	Mpumalanga	620	November 2011
Eskom Lethabo PV (ground-mounted, 1-axis tracking)	Eskom's Lethabo coal-fired power station	Free State	575	November 2011
Eskom Megawatt Park CPV	Sunninghill, Johannesburg	Gauteng	26	November 2011
Cronimet Chrome Mining SA (Pty) Ltd	Thabazimbi	Limpopo	1,000 (PV)	November 2012
Black River Park	Cape Town	Western Cape	700	2013
Bosco Factory PV Plant	Edenvale	Gauteng	304	2013
Ceres Koelkamers	Ceres	Western Cape	505	2013
Rooibos Storage Facilities	Clanwilliam	Western Cape	511	2014
TOTAL			7 MWp	

CURRENT SITUATION

Several standards, grid codes, acts and guidelines in place or in the process of being implemented:

- Draft NRS097-2-1:2013, Edition 2
- NRS 097-2-3:2014, Edition 1
- Grid connection code requirements for renewable power plants (RPPS), 2012
- Distribution Network Code, Version 6, 2011
- Distribution standard for interconnection of embedded generation, DST 34-1765, 2008
- SABS (2012), SANS 10142-1:2012, The wiring of premises
- Small-scale Renewable Energy standards and Specifications, June 2012
- Standard Conditions for Embedded Generation within Municipal boundaries, NERSA, 2011
- Constitution of the Republic of South Africa

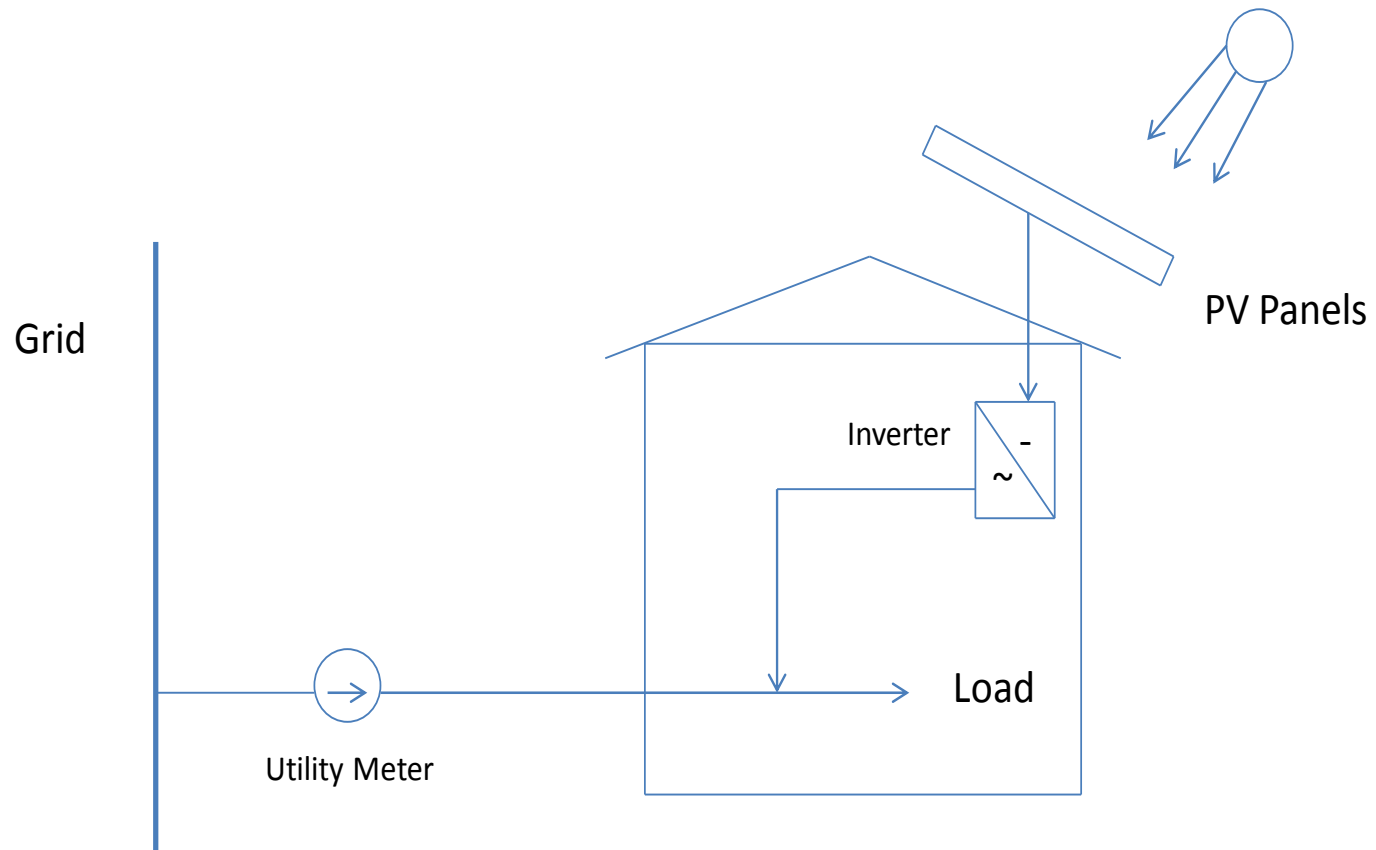
CURRENT SITUATION (contd.)

- Municipal Structures Act 1998, Section 84 (1) page 32 states:
 - “A district municipality has the following powers: [...] Bulk **supply** of electricity which includes for the purposes of such supply, the transmission, distribution and where applicable, the generation of electricity.”
- Generation license from NERSA?
- Prevailing meter technologies:
 - Electromechanical
 - Digital
 - Pre-paid
- No compensation for surplus of export power

SSPVEG Mechanisms

- 1 - Self-consumption solar PV EG
- 2 - Net metering
- 3 – Feed-in tariffs

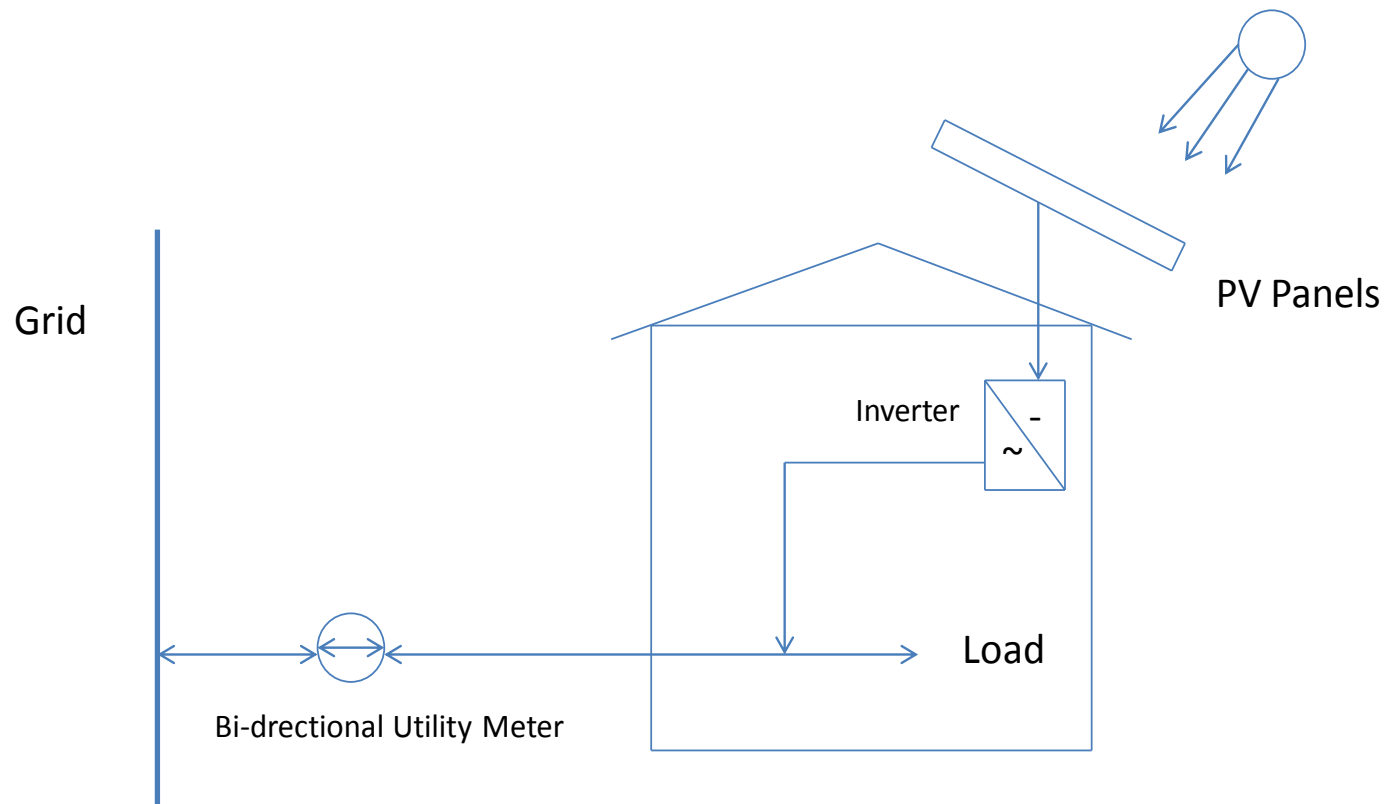
1 – Self-consumption



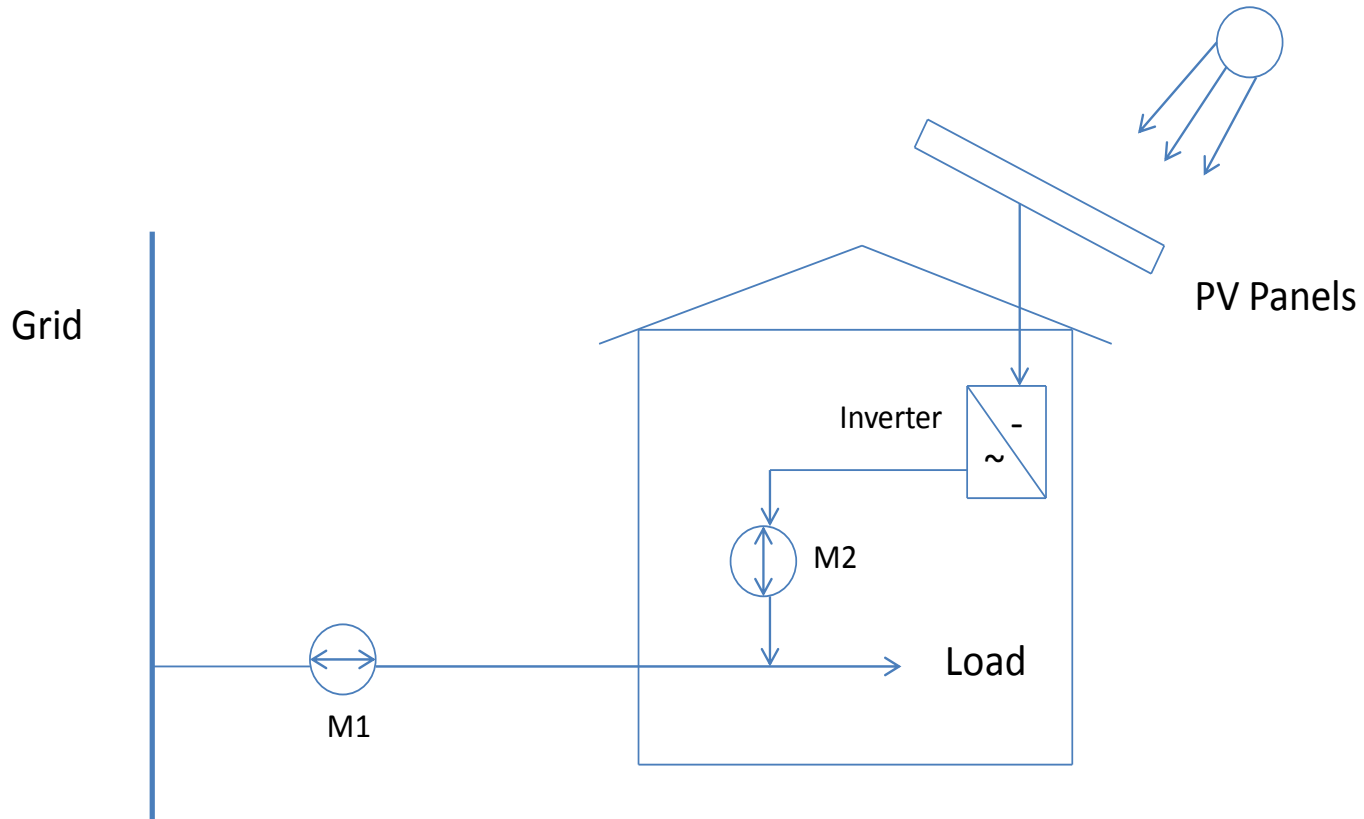
1 – Self Consumption

- Solar PV electricity is self-consumed
- SSPVEG installation conservatively sized to supply portion of Prosumer load only
- Inadvertent export is not compensated
- NRS097-2-3 recommends 25% of NMD for individuals EGs will support penetration level and safeguard system without complex approvals/analysis
- Prosumer notifies municipality

2 – Net-metering



3 – Feed-in tariffs (FITs)



Two-part tariff

- **Fixed network/service charge applied when EG:**
 - Notifies utility of intention to self-consume
 - Requests bi-directional meter (Net)
 - Requests 2 x bi-directional meters (FIT)
- **Calculated:**
 - Pro-rata return on assets based on NMD or circuit breaker size
 - Pro-rata O&M costs based on NMD
 - Capital charge on bi-directional meters
 - Connection charges
 - Sales and customer service charges
 - Subsidies for Life-Line or low-income consumers

Two-part tariff (contd.)

- **Energy or kWh charge**
 - Recover electricity charges from Eskom as incurred (pass-through charge)
 - Compensate Prosumer for kWh purchases from Prosumer at same blended Megaflex energy tariff from Eskom

Advantages of two-part tariff

- Municipality compensated for UoS costs even if no energy is imported by Prosumer
- Municipality compensated when Prosumer uses utility network to export power
- Energy or kWhs are recovered as incurred
- Non-Prosumer customers not affected
- Municipality or utility is aware of the SSPVEG installations

Disadvantages of two-part tariff

- Lower import kWh charge may encourage inefficiency
- Revenue shortfalls to municipality (unless surplus calculated and included in the fixed charges)

“Net Feed In Tariff” (NFIT) – Tobias Bischoff-Niemz

- Proposes a Central Power Purchasing Agency (CPPA) – nation-wide sole off-taker for all surplus energy from EGs
- EG or Prosumer installs 2 x bi-directional meters
- When self-consuming, Prosumer saves R1.20/kWh
- CPPA compensates Prosumer with a FIT of R0.70/kWh
- CPPA compensates municipality for lost revenue at R060/kWh
- Funding for the NFIT based on R0.002/kWh on all nationwide energy sales for customers larger than 200kWh/month
- Only registered NFIT Prosumers will be compensated for surplus energy

Advantages of NFIT

- Munics are compensated for fixed costs and revenue surpluses from CPPA at R0.60/kWh
- R1.20/kWh versus R0.70/kWh differential may incentivise load-shifting behaviour
- Munic and utility operators will be ware of embedded SSPVEG installations
- Socialised tax on all electricity users (R0.002/kWh)
- Subsidies to Life-Line users maintained

Disadvantages of NFIT

- Increased tariff for all consumers (R0.002/kWh)
- Setting up of another government run structure
- Municipalities are subsidised by society for lost revenues or to maintain their revenue surplus

Net-metering versus FIT

- Net-metering simpler: 1 x bi-directional meter, no Time of Use (ToU) metering
- Aggressive implementation of FITs (e.g. Italy) can put strain on entire economy
- Paper proposal: compensation to Prosumers = energy kWh purchase price from Eskom e.g. R0.60/kWh

Conclusions

- SSPVEG installations are being carried out in the absence of a finalised regulatory and legal framework
- Degree of frustration that not enough is being done to encourage SSPVEG industry
- One obstacle: revenue risk to municipalities
- Three types of SSPVEG connections mechanisms:
 - Self-consumption
 - Net-metering
 - Feed in Tariffs (FITs)

Conclusions (contd.)

- Two financial approaches to compensate Prosumers:
 - Two-part tariff (Fixed and Energy charge)
 - “Net Feed In Tariff” (NFIT)
- Fixed charge covers UoS costs, not dependent on kWh usage
- Energy charge can be calculated using a blended Megaflex energy tariff

Recommendations

- All three SSPVEG connection mechanisms are introduced:
 - Self-consumption
 - Net-metering
 - Feed in tariffs (FITs)
- Finalisation of standards e.g. NRS097-2 to be expedited
- Self-consumption and Net-metering can be implemented immediately?
- Feed-in Tariffs can be introduced after industry experience and where metering systems are sophisticated to manage ToU metering
- SSPVEG roll-out can actually expedite the uptake of ToU metering

Acknowledgements

- The author is grateful for comments and advice from:
 - Jarrad Wright
 - Gerhard Botha
 - Maree Roos
 - Davin Chown
 - Andrew Janisch
 - Chris Haw
 - Jaco Botha
 - Frank Spencer