



GRID FREEDOM GROUP

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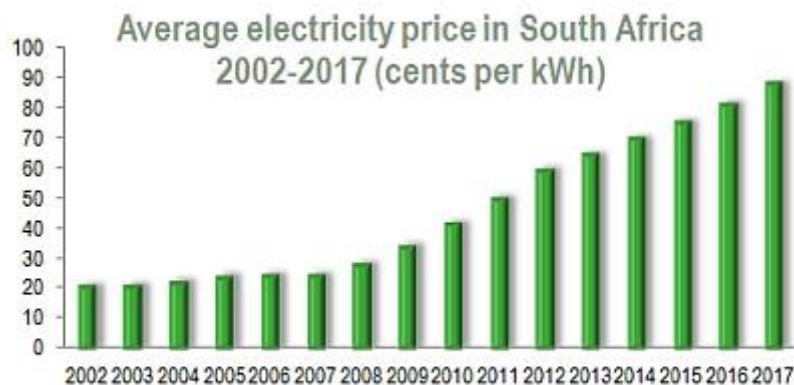
You are foolish not to harvest solar energy!

By Stirling Marais and Ross Muller – Grid Freedom Group

1. The hard facts

- The price of electricity is increasing at an alarming rate.
- Recent experiences show that services in South Africa are becoming increasingly unreliable. The load-shedding debacle hit industry very hard.
- Solar PV (Photo Voltaic) installation costs are decreasing.
- South Africa is blessed with high annual sunshine.
- Advanced solar harvesting technology is available locally.
- Drafted specifications safeguard installations.

2. Increasing cost of electricity



Source: Nersa

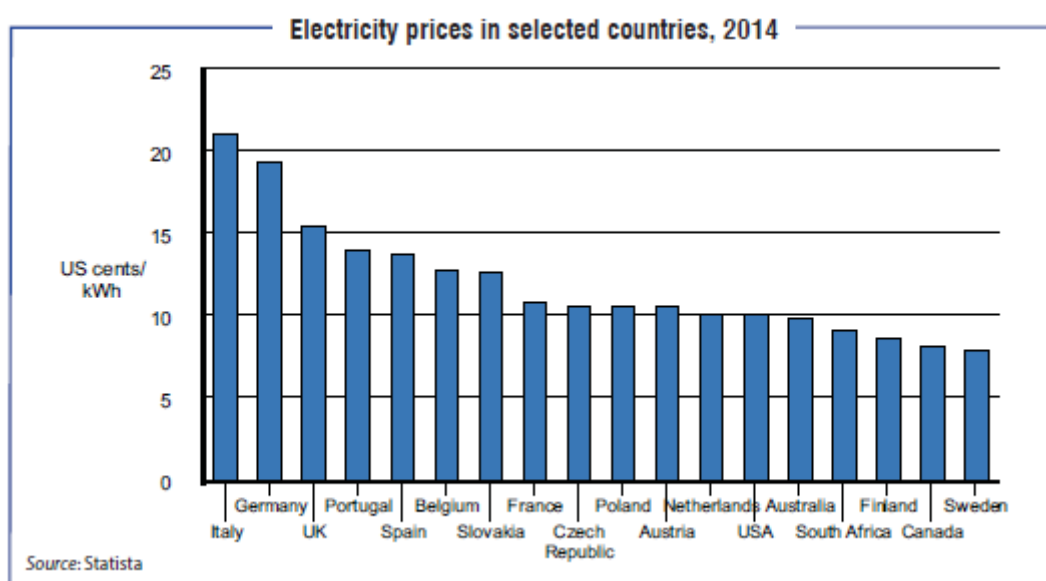
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The graph above (Courtesy UrbanEarth) shows the price increase of electricity in South Africa. This current average increase far exceeds the GDP of 2%. Since 2008, NERSA has approved average electricity price increases of over 20% each year to fund Eskom's expansion plans. There seems to be no end in sight and little indication from authorities where utility prices will be capped. How can we expect to improve growth when basic utility prices are soaring uncontrollably? The answer lies in alternative energy technologies. Us citizens must be more resourceful and remove the shackles of soaring utility costs by seeking alternative sources of energy and water. The water security issue (a serious issue on its own) has been ruthlessly exposed in the Cape.



The graph above (courtesy Politicsweb) shows our electricity prices versus other countries. We, at 2014, were paying the same as developed European countries!

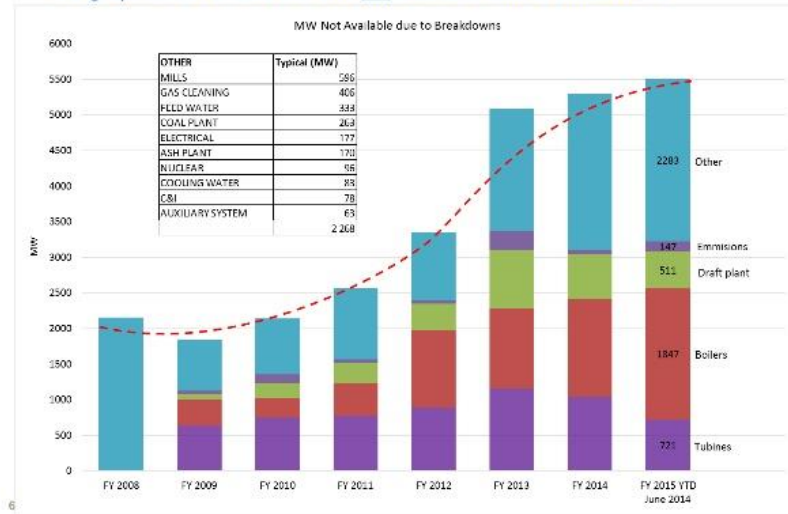
3. Electricity Reliability

The load-shedding crisis revealed a woeful lack of infrastructure planning. Under such chaotic circumstances in-efficient turbines were fired up and coal shortages dogged traditional power generation. Maybe this can happen again?

Breakdowns increased drastically from FY2009
We have slowed the trend but not yet arrested it.

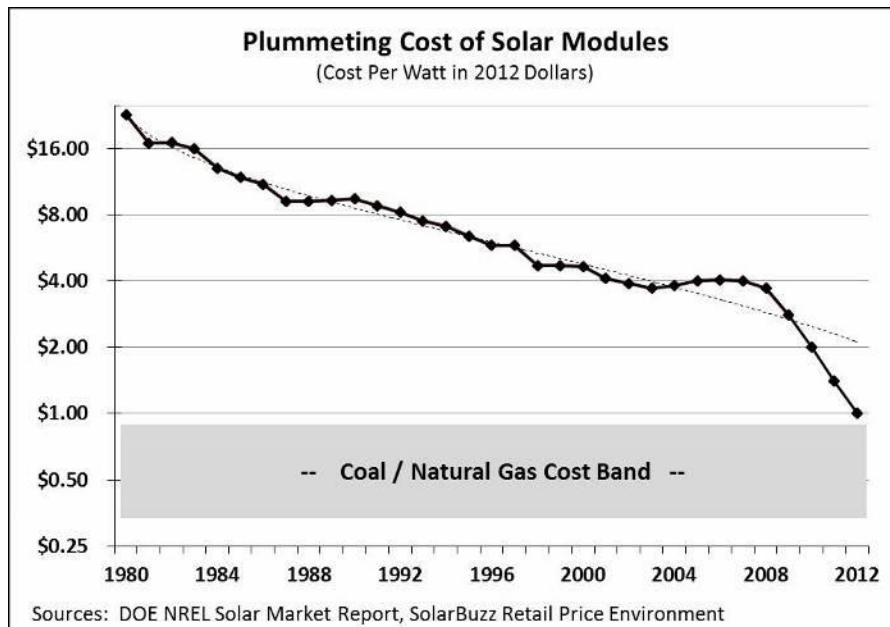


The graph below shows the MW not available due to breakdowns

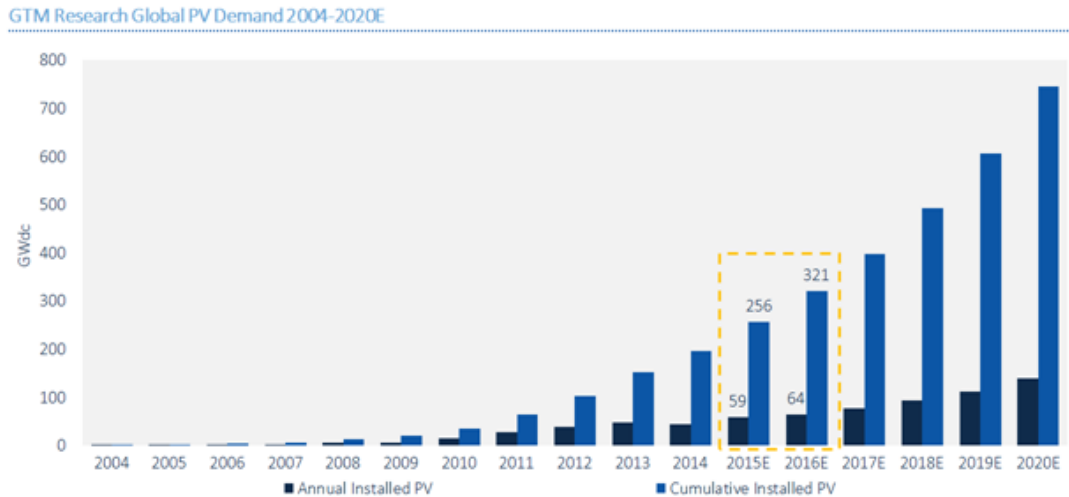


The graph above (courtesy Eskom) shows the generating capacity NOT available due to breakdowns. This is convincing evidence to seek alternative energies which must include battery backup. We need to become self-sufficient and not rely solely on traditional sources.

4. Decreasing solar installation costs

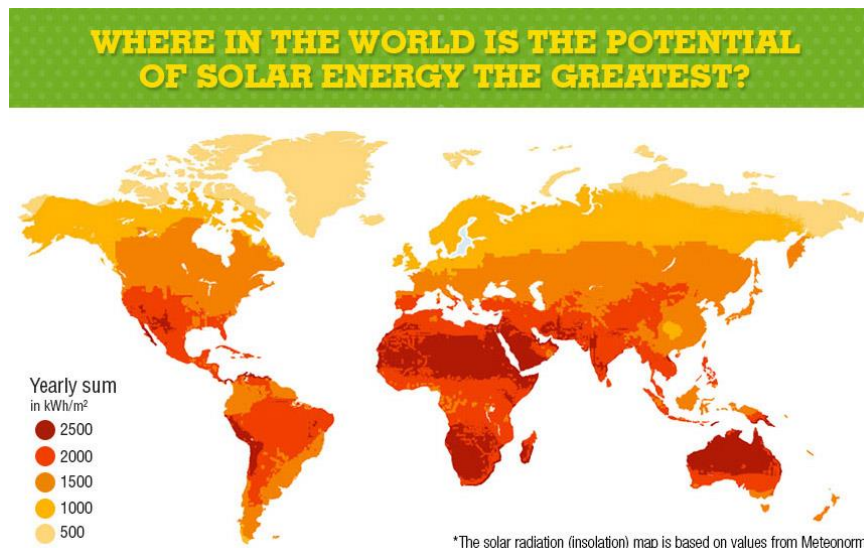


The graph above (courtesy DOE) shows the ever-decreasing costs of solar PV installations. These costs have, in the USA, dipped below the production costs of energy sourced from coal and natural gas. Yet another cogent reason for installing a solar energy system right now. Little has been mentioned thus far of other technologies because solar far outstrips others by cost, reliability and durability. Wind, for example, requires planning (will the area be suitable), high towers (to ensure wind laminar flow) and maintenance.



The graph above (courtesy GreenTech Media) shows the rapid growth of PV installations internationally. Quite clearly PV systems work well and will be part of our future.

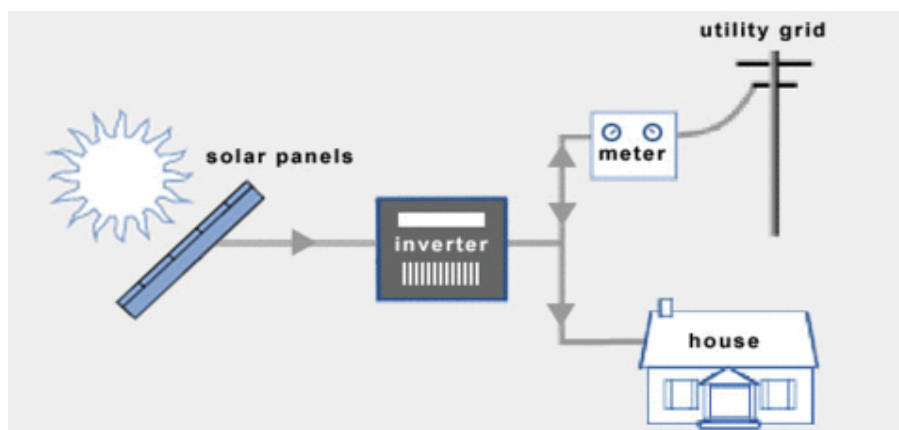
5. South Africa is blessed with high annual sunshine



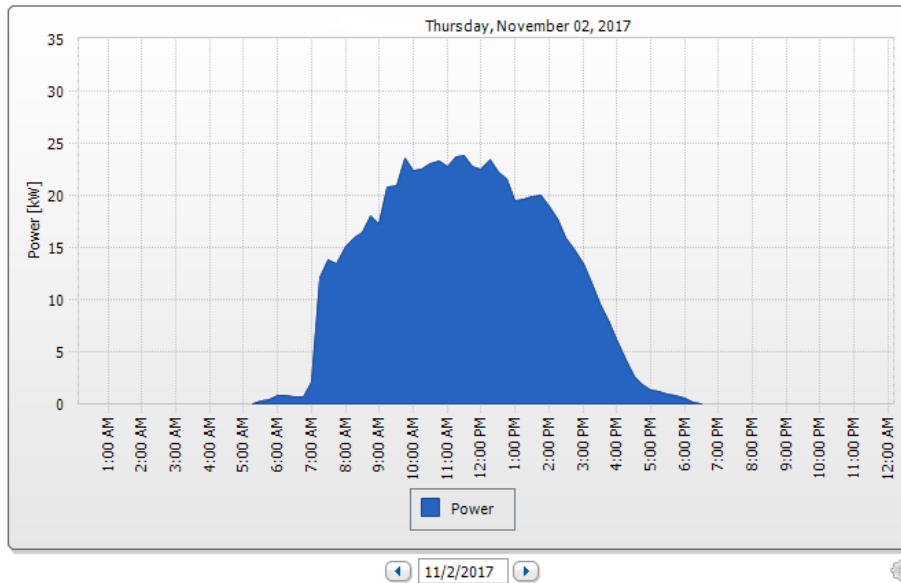
The graph above (courtesy Meteonom) shows the annual sunshine across the globe. We are better suited to solar installations than many other countries, including Germany, who this year recorded a noteworthy day where their production of renewables outstripped their demand – unbelievable! We could do far better if we tried.

6. Typical solar technology and installations

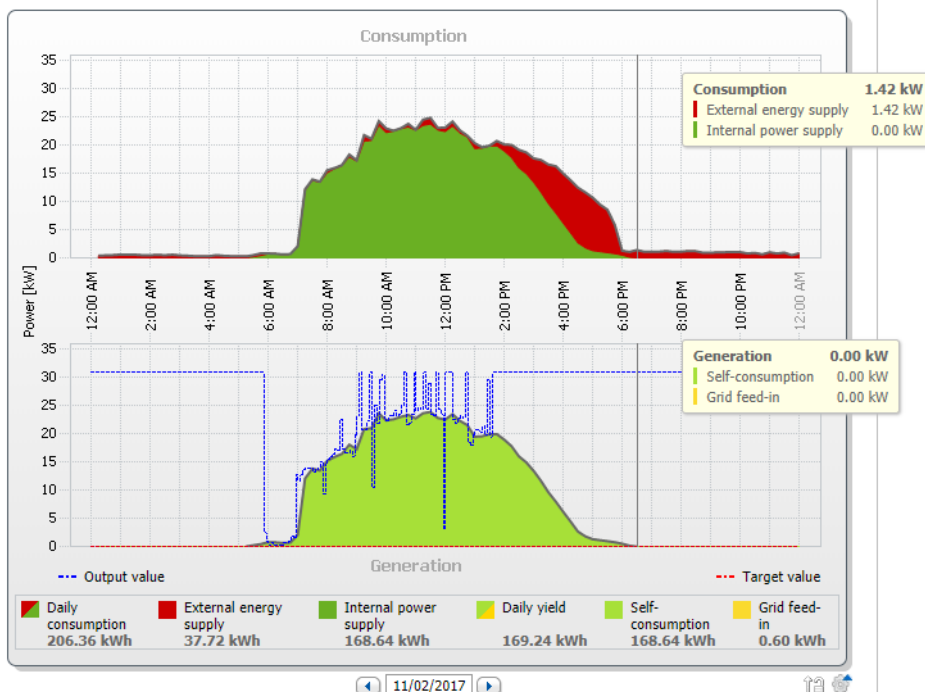
The best option is a grid-tie system where the solar system is connected directly onto mains. The solar energy reduces your demand from the utility and, during full sunshine, energy may be routed back onto the grid. In this way you will be exporting energy (and getting paid) to the national grid. It is important to check with your local utility provider if such installations are allowed. Cape Town is in the forefront here encouraging and regulating injected energy. Durban (Ethekewini) has recently facilitated a similar program.



In the case of your Municipality not allowing you to grid feed-back there is the option of limiting solar energy for local demand only. The grid-tie inverter will then throttle down the solar energy production to supplant grid demand. This system is perfectly suitable for most businesses where demand for, say, air conditioning is during normal office hours with full sunshine bathing the solar panels.

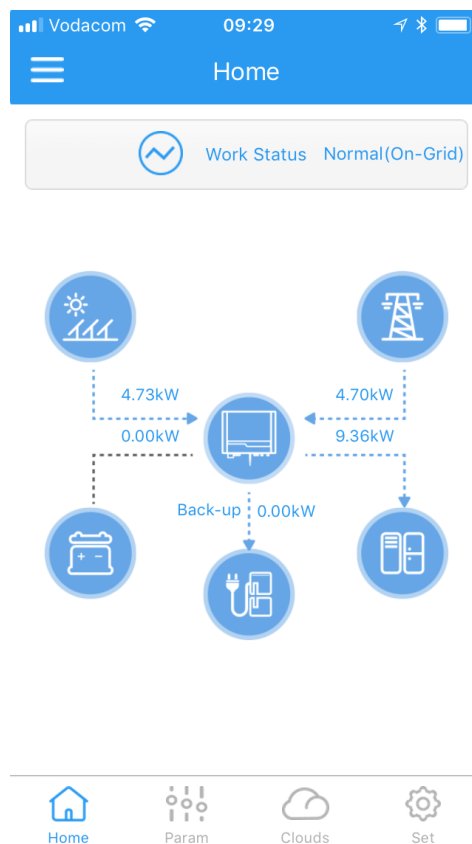


The graph above is an example of measured power harvesting over time. The total capacity of the system is 30 kW and the graph is showing a near peak of 25 kW. In this case the building demand profile (mainly air conditioning) matched the solar production profile peaking at noon. In eThekweni business currently pay R1.57 per kWh with annual increases. A properly installed solar system could cap the bill to R0.4 per kWh, including the amortization of the installation cost over 20 years (typical solar panel life).



The graph above shows both solar power harvested (green) and grid demand (red). On this day little grid energy was used (the integral of the red portion = 37.72 kWhr). This is a small commercial grid tie system. 118 x 260W Tier 1, A Grade PV Polycrystalline panels and a 30 kW Inverter. The system has been equipped with an energy limitation device to cap solar production to load demand.

Domestic Solar is growing at a rapid rate in South Africa due to intermittent power outages and escalating electricity prices. However, it is important to remember there is often not much domestic power being used during sunlight hours so if the export of excess power onto the grid is not allowed then a self-consumption hybrid option with batteries will be more suitable. This type of system will provide will both reduced electricity bills and energy security - during grid outages or load shedding.



The iPhone screen shot above shows a 6 kW domestic grid-tie system on a single phase configuration, without batteries. In this snap shot solar power was 4.73 kW and grid demand 4.70 kW. This data is available live on smart phones.

7. Legal requirements

Any grid-tie system must conform to stringent requirements (presently only City of Cape Town and eThekweni accommodate buy-back energy). Conformance to these

specifications is vital. Non-conformance can result in electrocution, grid wave-form distortion or reticulation over-voltage. Electrocution of grid staff could occur if grid feedback occurs during a grid outage. These specifications include:

- Electricity Regulation Act, Act 4 of 2006 and Electricity Regulation Amendment Act, 28 of 2007.
- South African Distribution Code (all parts).
- South African Grid Code (all parts).
- South African Renewable Power Plants Grid Code.
- Occupational Health and Safety Act 1993 as amended.
- Electricity Supply By-Laws.
- SANS 10142- Parts 1 to 4: The Wiring of Premises.
- SANS 474/ NRS 057 Code of Practice for Electricity Metering.
- NRS 048: Electricity Supply– Quality of Supply.
- NRS 097-1: Code of Practice for the interconnection of embedded generation to electricity distribution networks.