The future of grid tied rooftop solar PV in South Africa

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Grid tied rooftop solar PV systems are being installed extensively in countries such as Germany and Japan. In these countries, legislation and various incentives are in place to support and promote this technology. Grid tied rooftop solar PV systems have the potential to make a significant contribution to renewable energy programmes in South Africa. Despite this potential, there are at present no real incentives and only a very limited policy in place to enable or promote this technology. This paper looks at the potential and viability of grid tied rooftop solar in South Africa and makes recommendations regarding the policy needed to enable and promote this technology.

An integrated resource plan (also called the IRP 2010), initiated by the department of energy (DoE) and promulgated in parliament on 6 May 2011, outlines plans to meet the long-term electricity demands of South Africa. According to the IRP 2010, the South African generation capacity is expected to rise from the present 44 535 MW to 89 532 MW in 2030. The IRP 2010 specifies that renewable energy will be 18 800 MW (of which Solar PV will be 8400 MW) by 2030 [1].

Following the promulgation of the IRP 2010, a renewable energy power procurement programme for independent power producers (called REIPPPP) was unveiled in August 2011. This programme initially focused only on large-scale power generation (i.e. > 5 MW). Smaller scale generation (i.e. between 1 MW and 5 MW) is also part of the REIPPPP, and the DoE issued the request for proposals (RFP) for these smaller IPP projects on 21 August 2013.

Grid tied systems smaller than 1 MW do not form part of the REIPPPP and there are at present no real incentives and only a very limited policy in place to enable or promote these systems. A decision taken by NERSA in September 2011 [2] makes it the responsibility of the municipalities to decide whether to allow small scale (<100 kW) embedded generation within their area. The municipalities are responsible for taking all the necessary steps to ensure the safety of their operating personnel and they must also ensure that the NRS 097-2-1:2010 specification for grid interconnection of embedded generation is complied with.

In countries such as Germany and Japan, legislation and incentives are in place to support and promote rooftop solar PV. In Germany, a renewable energy act (called EEG) came into force in April 2000. Under the EEG, feed-in tariffs (FITs) were introduced that were very positive for PV and they were also guaranteed for 20 years. This coupled with a well-functioning administrative process and a clearly regulated grid connection, led to a huge increase in installed capacities. In addition, a highly dynamic industry covering the entire solar PV value chain became firmly established in Germany.

Despite the fact that there are no incentives and only a very limited policy in place, there is a groundswell of support in South Africa for the inclusion of rooftop solar PV in renewable energy roll-out programmes [3]. Some research has confirmed the viability of grid tied domestic solar PV in South Africa [4]. However, only limited research has been done in this area and there is a need to fill this gap and do further research on the future of grid tied rooftop solar PV in South Africa.

Support mechanisms to promote grid tied rooftop solar PV

A variety of policies such as tax and investment incentives, feed-in tariffs (FITs), net metering, quota-based mechanisms and tender systems have been developed and implemented to promote the use of renewable energy. Investment incentives such as capital grants, tax credits, and soft loans, were the major support mechanisms for renewable energies in the 1980s and 1990s. Today, net metering and FITs are the most common support mechanisms for grid tied solar PV, and they are sometimes supplemented by additional tax and investment incentives.

Net metering

Net metering is a support mechanism that allows owners of renewable energy systems to feed excess power produced by their systems into the grid. The name “net metering” refers to the energy meter, measuring the electricity consumption. In the case of most net metering schemes, the meter starts turning “backward” once excess electricity is fed into the grid [5]. The same meter therefore measures both imported and exported electricity and the consumer is credited for the electricity exported to the grid at the same price of electricity imported from the grid. The advantage of net metering is that it is easy to set up and implement and no actual payment is made by the utility. Of all the support mechanisms it also requires the least amount of administrative effort.

Feed-in tariffs (FITs)

The most common policy instrument used in support of renewable energy technologies by the private sector is feed-in tariffs (FITs). The idea behind FITs is to guarantee private producers fixed tariffs for power from renewable energy sources over a period.
of time. This creates a basis for long-term investment planning, since revenues are known and guaranteed in advance. The tariffs are usually differentiated according to the type of renewable energy technology supported. A tariff that is too low will not encourage investment and a tariff that is too high might cause unnecessary costs for customers. The tariff or rate should therefore reflect the actual power generation cost of the renewable energy technology plus a reasonable rate of return to encourage investment. FITs are usually guaranteed for a long period of time (e.g. 15 – 20 years) and require grid operators to purchase all renewable electricity, independent of total electricity demand. They are generally financed via a small top-up on the electricity price for final consumers, that is, additional costs are distributed between all consumers via national burden-sharing mechanisms [5].

FITs can also be tailored and adapted in order to channel investment into desired sectors or projects. However, FITs are often perceived as a subsidy and have a relatively complex regulatory aspect i.e. FITs require close management in order to leverage investment while avoiding market distortions. Dual metering is required because the power sold to the grid must be measured separately from the power purchased from the grid.

Best practices in other countries

A review of best practices in other countries such as Germany, Japan and the US, clearly shows that a feed-in tariff (FIT) policy is the most effective in promoting rapid growth in grid tied rooftop solar PV installations. The superiority of FIT is related to the high degree of investment security by guaranteeing an investment-friendly fixed tariff payment for a long period of time. A well-designed FIT calculates the tariff payment based on the generation cost of each technology and normally assumes a reasonable internal rate of return (IRR) for the investor. In this way, windfall profits can largely be avoided [5]. However, a well-designed FIT scheme is not enough to guarantee the expansion of rooftop solar PV. The administrative process constitutes a major risk factor i.e. the more permissions that are needed and the more authorities involved, the higher the risk for project delays and failures. Typical administrative barriers include long lead times for project approval, a high number of involved authorities, and a lack of coordination among government departments involved in the procedure for licensing. It is therefore important to streamline the various aspects of the licensing procedure.

The present status of grid tied rooftop solar PV in South Africa

The PV industry in South Africa is in an early stage of development compared to the European, Japanese and USA markets. At the end of 2012, an estimated 30 MW of solar PV was installed in South Africa (see Fig. 1). The majority of residential solar PV systems installed in the past few years were off-grid systems with some form of battery storage. The PV market is expected to pick up significantly from 2014 onwards due to the REIPPPP. During bid windows 1, 2 and 3 of the REIPPPP, a total of 33 utility scale solar PV projects were approved with a combined capacity of 1484 MW.

The decision by NERSA to delegate the regulation and licensing of small scale embedded generation to municipalities provides very little guidance regarding implementation, and many municipalities have not yet defined or streamlined their procedures. Workshops have been convened by sustainable energy africa (www.sustainable.org.za) in partnership with the South African local government association (www.salga.org.za) in response to a call from a number of cities for working sessions to establish small scale embedded implementation procedures for municipalities. Eskom has been a participant in many of these workshops. A list of these workshops and presentations can be found on the city energy support Unit website (www.cityenergy.org.za). On 28 November 2013, the association of municipal electricity utilities (AMEU) issued a draft guideline on the installation of embedded generation and the impact it may have on the revenue of municipalities [7].

The main concern for municipalities is a loss of revenue that may occur if there is large growth in grid tied rooftop solar PV generation. Electricity revenue and city financial survival is closely linked in many South African municipalities due to the municipalities operating as electricity distributors. Typically 10% of annual electricity revenue generated is fed into city coffers, subsidising a range of other important municipal services. In addition, revenue from certain “high-end” users (i.e. larger residential and other consumers) is routinely used to cross subsidise the losses from providing power to poor households [8].

Policy recommendations for South Africa

It is clear that the present situation, i.e. where NERSA has delegated the responsibility to the municipalities to decide whether to allow small scale embedded generation, is not at all conducive to promote the rapid growth of grid tied rooftop solar PV in South Africa. The main reasons are summarised below:

- There is very little guidance provided and this has resulted in each municipality having its own approach and procedures for dealing with applications to feed power back into the grid.
- The NERSA decision does not make any provision for a FIT that would encourage investment in solar PV. The NERSA decision suggests that smart metering is installed to be able to handle bidirectional power flows and Time of Use (TOU) metering but that the tariffs should be set by the municipalities.
- There is no guarantee or implied guarantee that the power will be purchased for a fixed period of time.
- Due to the concerns about a potential loss of revenue, the municipalities are unlikely to take steps and implement procedures that will actively drive the growth in grid tied rooftop solar PV installations.
It may be argued that large utility type solar PV plants are more cost-effective due to economies of scale, and that the administrative burden is much less i.e. it is easier to manage the administration for one 50 MW installation than for one thousand 5 kW households. However, rooftop solar PV has some advantages that are often overlooked when making such a comparison. They are:

- The mounting structure already exists and therefore no EIA is required and no additional land usage is involved.
- Connection to the distribution network already exists so no new connection is involved.
- A wide range of system sizes can be accommodated i.e. from several kW on residential sites to 1 MW or larger on commercial and industrial properties.
- Rooftop solar PV is quick to install and therefore provides a fast and effective way to decrease energy consumption from the grid.
- Power is generated where it is needed and the majority of the power is actually used by the site. The close proximity of the load to the generator may actually reduce the overall transmission and distribution losses in the utility grid.
- The nature and size of small-scale rooftop PV projects will provide opportunities for numerous small and medium businesses throughout the country. Provided that there is sufficient uptake of rooftop PV technology in the future, such businesses will be more sustainable and will offer long-term employment opportunities.
- The owner of a grid tied system (i.e. this could be a home owner or a company) is likely to be more “energy aware” and will be more likely to use energy wisely and participate in national energy saving initiatives.

There is a great amount of interest and support for solar PV in the residential market, and the potential is significant. This potential can be fully realised if the right policy and incentives are put in place to enable households to sell their power back to the grid. A recent report [6] estimates that the potential of residential PV is between 1665 MW and 6184 MW by 2035, depending on the rate of adoption (see Fig. 2). The updated IRP that was issued for public comment by the DoE on 21 November 2013 includes a scenario for Rooftop PV. In this scenario it is estimated that the potential of rooftop PV could be as high as 21 617 MW by 2030.

It is recommended that the following are put in place to promote grid tied rooftop solar PV in South Africa:

- A policy on national level (i.e. similar to the REIPPPP) that sets clear policy guidelines and incentives for the promotion of grid tied rooftop solar PV.
- A feed-in tariff (FIT) that is high enough to encourage investment and is guaranteed for a long period of time i.e. 15 to 20 years. The FIT will require close management to keep on leveraging investment while avoiding excessive profit and market distortions. The FIT should include learning rates and the tariff should therefore decline over the 15 to 20 year period.
- Feed-in tariffs require dual metering and the roll-out of smart meters will therefore have to be prioritised on a national level.
- The policy should be based on the shared burden principle i.e. the additional costs are distributed equally amongst all electricity customers in South Africa i.e. as is presently the case with the REIPPPP.
- An initial cap can be set on the total MW allocated i.e. in the same manner as is presently done for the REIPPPP.
- The policy needs to include clear technical and equipment specifications. These should include specifications for the grid tied inverter, the safety of the installation, etc. The system needs to be checked for compliance before connection to the grid is allowed.
- Establish effective certification and monitoring mechanisms. There should be a certification authority established so that technical and safety standards can be maintained.
- A simple and fast application process to apply for a grid connection and to obtain a power purchase agreement (PPA) from the utility. This should include standard customer agreements as well as performance targets set to ensure short lead times for project approval.
- The resources and systems should be put in place at all the relevant government departments to manage the additional administration and customer service requirements.

Conclusions

The decision by the government through NERSA to shift the responsibility for small scale embedded generation to the municipalities, does not make room for any real incentives to promote grid tied rooftop solar PV systems. The municipalities are unlikely to actively drive the growth of grid tied rooftop solar PV i.e. mainly due to concerns about the potential loss of revenue. To drive rapid growth, a policy on national level is required that sets clear policy guidelines and incentives for the promotion of grid tied solar PV. Some critical aspects that need to be included in such a policy has been presented in this paper.

The IRP 2010 specifies that 18,8 GW of renewable energy will be generated by 2030 and that 8,4 GW of that total will be from Solar PV. The REIPPPP only makes provision for systems larger than 1 MW and this therefore excludes all residential and most small commercial grid tied rooftop PV systems. If nothing is done to actively promote the growth of grid tied rooftop solar PV in South Africa, then it is likely that the full total of 8,4 GW will be allocated to utility scale solar PV systems under the REIPPPP. The real issue is whether we are going to allow all of our solar PV electricity to be generated only by large utility scale PV installations owned and operated by large companies, and thereby eliminate home owners and smaller enterprises from participating?

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References


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