



WWF

BRIEFING
PAPER

ZA

2019

In
collaboration
with



Energy

Residential investment in rooftop solar PV

What does it hold for the future?

A SNAPSHOT OF THE ISSUES

- The move away from centralised grid-supplied electricity is a significant step for sustainable development. More and more **households are installing rooftop solar photovoltaic (PV) systems** to generate their own electricity.
- Worldwide the cost of solar PV systems is falling, making them increasingly attractive to consumers. Households can reduce their **consumption of fossil fuel-based electricity**, the price of which continues to increase, and decrease their carbon emissions.
- If properly integrated into the municipal electricity grid, rooftop PV can help **cities to attain their emission reduction targets**.
- However, there are **financial implications for municipalities**, which are responsible for the electricity distribution network and the sale of electricity in their areas. The loss of income from electricity sales is a major challenge, especially as this revenue stream is used to maintain and invest in electricity infrastructure, subsidise free electricity to indigent households, and support other underfunded services.
- How consumers and municipalities respond to the energy transition is critically important to ensure the **reliable, safe and efficient provision of electricity**, and to the long-term financial sustainability of our cities and towns.
- The findings of the WWF-SA survey discussed in this paper, highlight the need for **municipalities and households to work together** to ensure that those of us who live in cities and towns are not faced with islands of electricity self-reliant households, surrounded by income-strapped metropolitan areas.
- Also evident from the WWF-SA survey is that investment by households in rooftop PV is highly dependent on disposable income. In practice this means increased investment in specific areas, putting the functioning of the overall electricity system at risk. This is especially challenging when there is a **concentration of unregistered PV systems on distribution grids that do not have capacity to absorb the excess electricity**.
- There is a cost to the system due to lost income. This impacts on the municipality's ability to maintain the grid for the benefit of everyone. **Municipalities can better manage the challenges** if they know where PV systems are connected to the grid and the size of these systems.¹

¹ Consumers can find out more about registering their solar rooftop PV systems by logging on to their relevant municipal website.

HOW THE SYSTEM WORKS

Municipalities buy electricity from Eskom and resell it to households.

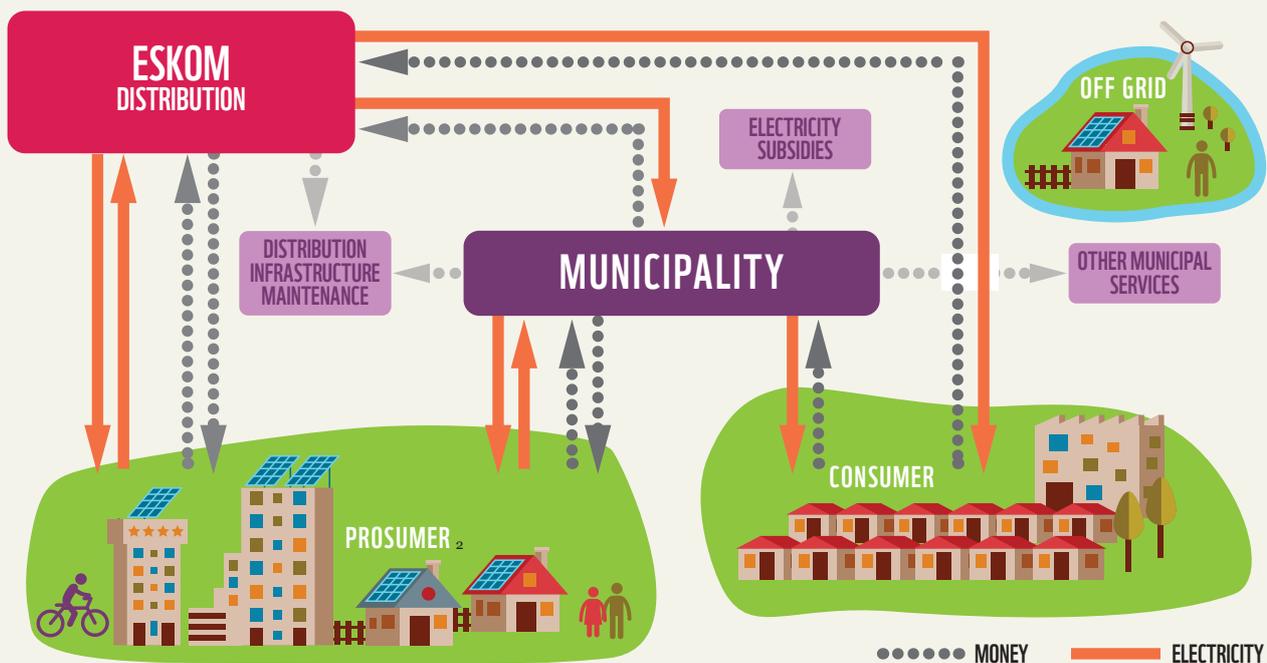
The more electricity sold, the higher the turnover. This is used to cover the municipality's fixed costs of the distribution infrastructure and to subsidise other services.

A decrease in electricity demand results in reduced sales. Municipalities can try and offset the reduction in income by:

- **Raising their tariffs** – but they can only do this on application to the National Energy Regulator of South Africa on an annual basis; or
- **Amending their tariff system** to make provision for fixed connection charges; or
- **Providing additional energy services** for which they can charge.

All three options require careful management because consumers are resistant to price increases and to changes in their tariff structure.

Wealthier residents consume more electricity than less affluent households, and they are most often billed at a higher tariff. They thus make a higher contribution to the municipality's overall income from electricity sales. Their contribution is critical to subsidising other services that make our cities and towns functional and safe to live in. However, wealthier residents can also afford to invest in rooftop PV that will reduce their electricity consumption and their reliance on supply from municipalities, but also their contribution to municipal income.



2 A potential consumer.

ONLINE HOUSEHOLD ENERGY SURVEY

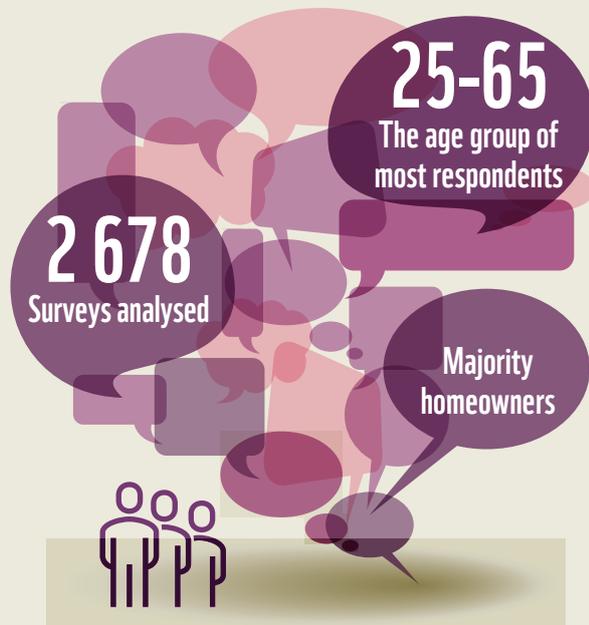
In 2018, WWF-SA and the Centre for Renewable and Sustainable Energy Studies (CRSES) at Stellenbosch University conducted an online Household Energy Survey to examine what influences a household's decision to invest in rooftop PV.

The survey made provision for three types of respondents:

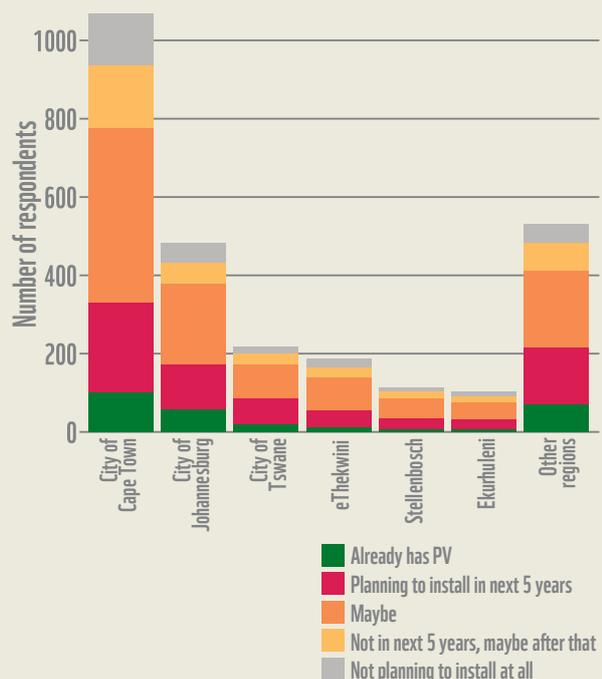
- Those who have already invested (PV-owners)
- Those that might install PV
- Those that are not planning to install PV at all.

The results of the survey tell us how households are making their investment decisions now and what will motivate their investments in the future.

Who responded?



Where do respondents live?



Is there a correlation between the installation of PV systems and the use of other energy saving devices?



65% also have solar water heaters

14% also have heat pumps



Most PV-owners also use other electricity saving devices and almost all respondents have energy saving lightbulbs.

Did households install batteries as well?

70% of PV-owners have batteries installed

30% of PV-owners do not have batteries



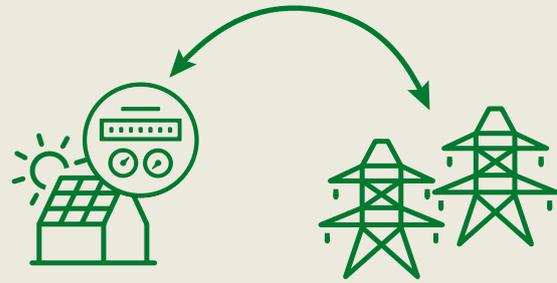
29% use the battery for essential lights only



33% use the battery for more than 2 hours of electricity



8% use the battery for up to 2 hours of electricity



57% of PV-owners have credit meters and can feed excess electricity back to the grid

Are municipalities aware of the PV installation? Is it legally installed?

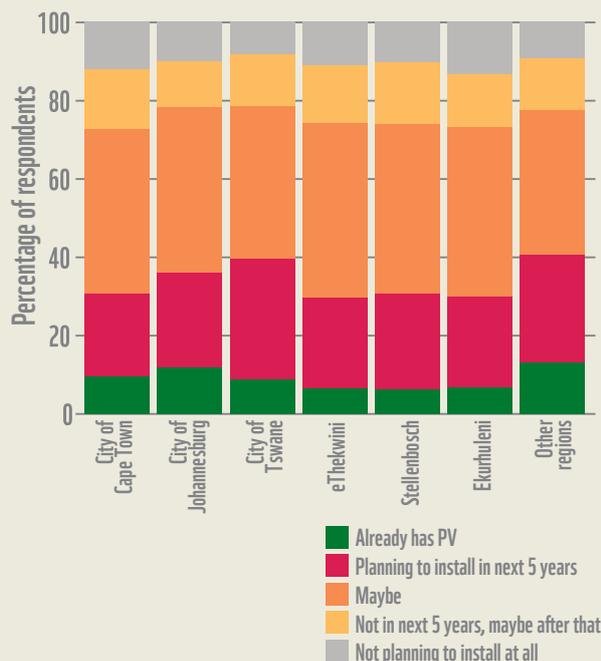


25% Yes, it is registered

Very few PV-owners had registered their systems at the municipality.

This was the case in all the municipalities.

Is there a pattern in the responses?



How do households make decisions to invest in PV systems?

Three potential motivations were put to respondents – financial factors, social influences and environmental concerns.

Financial factors



Finances are the biggest motivator and the biggest barrier. High upfront installation costs play a more significant role in the investment decision than the possibility of reducing the household's electricity bill or than rising electricity prices in the future.

Social influences



Social factors play a major role in decision-making to install rooftop PV. Respondents who had installed the system were more likely to have had some exposure to it, for example knowing someone who had installed rooftop PV – 74% of PV-owners knew people in their neighbourhood that had installed rooftop PV. This means there is a contagious affect which is interesting for cities in future planning. Respondents were also more likely to have done their own research, and/or read articles and advertisements for PV systems.



Many PV-owners (71%) and those that might install PV in the next five years (68%) mentioned their lack of trust in government and/or Eskom as an important motivation in their decision to invest in rooftop PV.

Environmental concerns



Although most respondents care about the environment, realise that electricity from coal contributes to climate change, and want to reduce their environmental impact, these were not significant motivators for investing in PV. There was no difference between respondents that invested, want to invest and do not contemplate investing in PV systems.

Key messages from online Household Energy Survey

- The price of PV continues to drop worldwide. As high upfront cost is shown as a deterrent to investment, this **price drop will increase the rate of investments in rooftop PV.**
- Similarly, as leasing structures for rooftop PV become more readily available to homeowners and provide them with **the opportunity to pay off the capital costs over time, investments in rooftop PV will increase.**
- **Investment in rooftop PV is, and will continue to be, area-specific.** This trend will become more pronounced in the future because of the interplay between affluence and familiarity.
- The **very low level of residential PV system registrations makes it impossible for municipalities to optimally plan and operate their distribution grid.** This has an impact on overall system effectiveness and safety. It also **affects municipalities' tariff design**, which in turn **affects their income**, and as such their financial sustainability going forward.

ACTION POINTS

Striking a balance for a sustainable future

A new way of operating: The transition of the centralised electricity sector to decentralised, sustainable energy production is leading to a structural change in the electricity industry. The new challenges require municipalities to re-evaluate how they generate enough revenue to ensure long-term sustainability of our cities and towns.

Ensure sustainable municipalities: To manage, grow and maintain the electrical infrastructure, municipalities need to plan with knowledge of all generation systems on the electricity grid.

Create a safe grid: The concentration of unregistered PV systems could have major consequences for a municipality's finances, grid maintenance, safety and reliability. Registered PV systems which are properly and safely integrated into the electricity grid, ensure safety and can support overall system resilience.

Achieve emission reduction targets: If properly integrated into the municipal electricity grid, rooftop PV systems can help cities to attain their emission reduction targets.

Fair play: Municipalities and consumers need to work together to ensure that increased private investment in rooftop PV benefits us all.



The WWF-SA survey, undertaken with the Centre for Renewable and Sustainable Energy Studies (CRSES) at Stellenbosch University, is part of an in-depth investigation into the impact of increased investment by the private sector in decentralised renewable energy technologies on the existing electricity distribution system at municipal level in South Africa.

At risk is the long-term financial sustainability of municipalities as increased private rooftop PV investments and self-electricity generation results in diminished revenue for municipalities. Municipalities will need to adapt and re-adjust their revenue and service models to ensure a secure grid and long-term financial sustainability. This will require of them to develop new workable models that can address both technical and financial challenges in the short-, medium-, and long-term.

A key output of this project is a decision-making tool that is under development and will be refined and tested with municipalities to assist them in understanding the systemic dynamics of electricity provision at municipal level and support their decision-making.

This publication is the first in a series of briefing papers aimed at raising awareness about the opportunities, challenges and solutions for municipalities and consumers alike to ensure that increased private investment in rooftop PV benefits all of us.



CRSES

The Centre for Renewable and Sustainable Energy Studies at Stellenbosch University was established in 2007 as the national hub for postgraduate programmes in renewable and sustainable energy (RE) through a grant from the Department of Science and Technology. The Centre has a dual purpose: the training of scientists and engineers with the required technical expertise to unlock the country's RE resources, and the implementation of appropriate technologies for the sustainable use of RE.

The Centre acts as a central point of entry into Stellenbosch University for the general field of RE. The work of the Centre focuses on contract research, postgraduate modules in RE and the coordination of other training courses in RE. Some contract research projects are completed within the Centre while others are channelled to the relevant academic departments or research groups of the University.

<http://www.crses.sun.ac.za>

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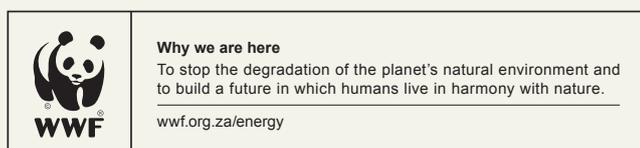
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