nova economics

An assessment of funding models to enable rooftop Solar PV investment in South Africa

Part I: Market and gap analysis report

Final report prepared for Climate Neutrality Foundation

1 October 2024

Climate Neutrality Foundation

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Abbreviation	Description
AUM	Assets under management
BESS	Battery Energy Storage System
BRC	Broadcast Research Council
C&I	Commercial and Industrial
c/kWh	Cents per kilowatt hour
CATL	Contemporary Amperex Technology Co. Limited
CEO	Chief Executive Officer
CHP	Combined heat and power
CIPC	Company and Intellectual Property Commission
CPI	Consumer Price Index
CTO	Chief Technology Officer
DERs	Distributed Energy Resources
DFI	Development Finance Institution
DG	Distributed Generation
DMRE	Department of Mineral Resources and Energy
EAF	Energy Availability Factor
EBB	Energy Bounce-Back
EBBS	Energy Bounce-Back Scheme
EDGE	Excellence in Design for Greater Efficiencies
EE	Energy Efficiency
EPC	Engineering procurement and construction
EPCM	Engineering, Procurement, and Construction Management
ERA	Electricity Regulation Act
ESCo	Energy Service Company
EU	European Union
EV	Electric Vehicles
GHS	General Household Survey
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GW	Gigawatt
HOA	Homeowners' association
HVAC	Heating, ventilation and air conditioning
IES	Income and Expenditure Survey
IFC	International Finance Corporation
IPMVP	International Performance Measurement and Verification Protocol
IPP	Independent Power Producer
ITAC	International Trade Administration Commission
KfW	Kreditanstalt für Wiederaufbau
kW	Kilowatt
kWh	Kilowatt hour
kWp	Kilowatt peak
LCOE	Levelised cost of electricity
LGD	Loss Given Default
LSM	Living Standards Measure
M&V	Measurement and Verification
MAGC	Market Accelerator for Green Construction

MFC	Motor Finance Corporation
MW	Megawatts
MWp	Megawatt peak
MYPD	Multi-Year Price Determination
NCR	National Credit Regulator
NERSA	National Energy Regulator of South Africa
NGO	Non-governmental organisation
NSB	National Small Business
OEM	Original equipment manufacturer
PPA	Power purchase agreement
PV	Photovoltaic
R/kWh	Rand per kilowatt hour
RCA	Regulatory clearing account
REC	Renewable Energy Certificate
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
ROI	Return on investment
SAARF	South African Audience Research Foundation
SALGA	South African Local Government Association
SANS	South African National Standards
SAPVIA	South African Photovoltaic Industry Association
SARB	South African Reserve Bank
SARS	South African Revenue Service
SBC	Small Business Corporation
SEA	Sustainable Energy Africa
SEM	Socio-Economic Measurement
SME	Small and medium enterprise
SMME	Small, medium and micro enterprise
SPV	Special Purpose Vehicle
SSEG	Small-Scale Embedded Generation
ToU	Time of Use
TW	Terawatt
US	United States
VAT	Value Added Tax

1. Introduction

1.1 Background and context for the study

The Climate Neutrality Foundation has, in close collaboration with KfW and GIZ, commissioned Nova Economics to assess funding models to enable rooftop Solar PV investment in South Africa. The Foundation believes that there is significant potential for growth in the uptake of rooftop Solar PV systems among households and small businesses in South Africa. However, despite the introduction of incentives by the SA government to reduce barriers to adoption and the significant amount of capital raised by at least two rooftop Solar PV providers (Energy Service Companies (ESCos)) to provide subscription/rental models, uptake of Solar PV in this market segment remains relatively slow.

Solar PV installers and energy service companies (ESCos) have confirmed that one of the reasons they are finding it difficult to deploy the capital they have raised to finance Solar PV under a subscription model is the poor credit quality of the applicants, which generally does not meet the minimum credit quality requirements set by funders and investors. The Climate Neutrality Foundation believes, however, that there are some opportunities to de-risk investment in the sector, including:

i. **Technical interventions** to disable systems of non-paying customers.
ii. **Financial mechanisms** to further reduce the credit risk that funders/investors are exposed to.
iii. Revenue enhancement initiatives – such as revenue from **carbon offsets**
iv. **VAT exemptions** could bring down the monthly payments and improve the business case for Solar PV systems.

1.2 Purpose of this report

This report is the first in a two-part series commissioned by the Climate Neutrality Foundation. The purpose of this report is to provide insight into the market for distributed Solar PV and energy storage systems in South Africa, with a focus on the household and small business segments, including:

- An overview of recent trends in demand, key drivers, and barriers to uptake, with a focus on the limitations potential customers may face in accessing credit to finance rooftop solar PV and battery energy storage systems.
- Estimates of the potential size of the market for Solar PV and storage systems for households and small businesses.
- An overview of the supply side of the market for Solar PV and energy storage systems, including the overview of the banks and ESCos serving the residential and small business segments, including:
    - An overview of the product solutions and financing arrangements they offer to intermediaries and end-customers
    - The capital structure of selected ESCos servicing the market
- Feedback and insights on:
    - The challenges banks and ESCos serving the residential and small business market face in sourcing and funding deployment, including insights into the quality of credit applicants, credit approval rates, and default rates.
    - The impact of the Energy Bounce-Back Scheme has had its ability to extend credit.

- Potential initiatives that could be introduced to address barriers to the uptake of Solar PV systems and unlock more loans.

1.3 Structure of this report

This report comprises four further sections:

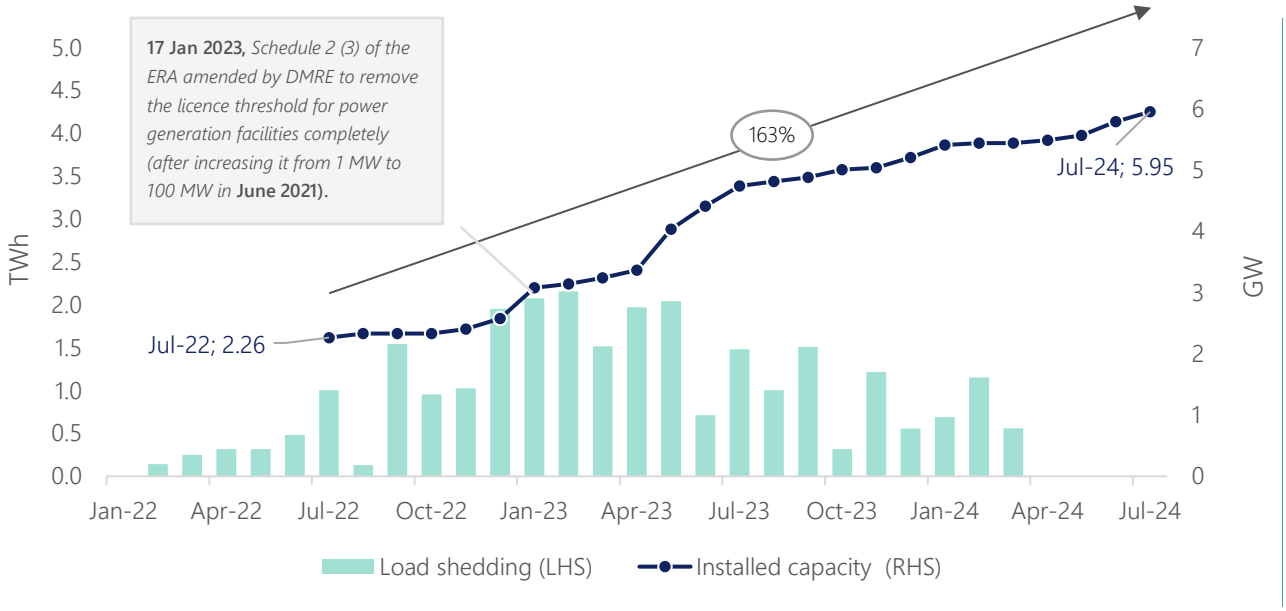
- **Section 2. The demand for Solar PV and energy storage systems.** This section begins with an overview of recent trends in the adoption of Solar PV capacity and battery energy storage systems (collectively referred to as "Solar PV systems" throughout this report). We then explore the key factors driving the uptake of Solar PV systems among (i) commercial and industrial customers and (ii) households and small businesses, along with the elements likely to influence future demand. The section concludes with an analysis of the barriers to adopting residential Solar PV systems, based on insights gathered from interviews with industry stakeholders.
- **Section 3. Sizing the potential market for Solar PV systems.** In this section, we estimate the potential size of the market for Solar PV systems in (i) the residential segment and then (ii) the small business segment. We begin by explaining our approach to the segmentation of the residential market, then present our estimates of the potential size of the market and current rates of market penetration. We also present our estimates of the number of small business enterprises in South Africa, but for this segment, it wasn't possible to size the market or estimate market penetration.
- **Section 4. The supply of Solar PV and energy storage systems.** This section provides an overview of our research into the firms that finance and supply Solar PV and energy storage systems, with a focus on those serving households and small businesses. We begin by explaining the value chain for the financing deployment of distributed energy resources. We then provide more detail about the firms supplying and financing the installation of Solar PV and energy storage systems for households and small businesses, the nature of their business and the type and cost of the product solutions they offer
- **Section 5. Incentives and price signals for investment.** In this section, we provide an overview of the insights and feedback we obtained during interviews with firms that supply and finance Solar PV systems to households and small businesses on (i) the availability and cost of capital, (ii) the quality of the credit applications they receive and approve, (iii) the ability of ESCos to generate revenue from carbon offsets, (iv) the performance of the Energy Bounce Back Scheme (EBBS), and potential areas for improvement (v) Other policy mechanisms or initiatives to promote the uptake of Solar PV systems.

2. The demand for Solar PV and energy storage systems

2.1 Recent trends in the uptake of Solar PV by the private sector in South Africa

The amount of Solar PV capacity procured and installed by the private sector has increased sharply since 2022. According to estimates derived by Eskom, the amount of Solar PV capacity procured and installed by the private sector has more than doubled over the past two years, increasing by 163% between July 2022 and July 2024, from 2 265 MW to 5 952 MW (Figure 1).[3]

Figure 1. Cumulative installation of Solar PV capacity by the private sector and incidence of load shedding



Source: Nova Economics based on data from Eskom's weekly system status reports and Eskom's Manual Load Reduction data.

2.1.1 Removal of the requirement to obtain a generation license from NERSA

One of the pivotal factors that has enabled the adoption of Solar PV by the private sector was the government's decision on 17th of January 2023, to make further amendments to Schedule 2 of the Electricity Regulation Act (ERA) that eliminated the requirement for independent power producers (IPPs) to obtain a generation license. These changes built on earlier amendments made in 2021, which had raised the generation license threshold from 1 MW to 100 MW.[4] This enabled the private sector to invest in larger, utility-scale plants and to enter into bilateral contracts with other power users to wheel power over the grid.

This amendment to Schedule 2 (Section 3) of the ERA exempts any generation facility with or without storage, irrespective of size and capacity, from the requirement to obtain a generation licence from the National Energy Regulator of South Africa (NERSA), provided that:[5]

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[3] National Transmission Company of South Africa, *Weekly System Status 2024 Week 34* (2024), https://www.ntcsa.co.za/wp-content/uploads/2024/08/Weekly_System_Status_Report_2024_w34.pptx.

[4] "South Africa exempts private generators from Generation Licence requirements," White & Case, 2023, accessed 11-09-2024, https://www.whitecase.com/insight-alert/south-africa-exempts-private-generators-generation-licence-requirements.

[5] Department of Mineral Resources and Energy, *Electricity Regulation Act (4/2006): Correction of Government Notice No. 2875, published on 15 December 2022* (Government Gazette No. 47757: Licensing Exemption and Registration Notice, 2023), https://www.gov.za/sites/default/files/gcis_document/202212/47757gon2875.pdf.

- "*the generation facility is operated to supply electricity to one or more customers by wheeling and the generator has entered into a connection agreement with an entity that holds a transmission or distribution licence in respect of the power system over which the electricity will be wheeled; or*"
- "*the generation facility has a point of connection to the grid but does not import or export any electricity onto or from the transmission or distribution power system.*"
- The electricity generator registers the facility with NERSA.

Furthermore, the amendment to the ERA notes that an electricity generation facility (with or without storage) can be exempt from both licensing and registration with NERSA, provided that:

- The purpose of the facility is solely to provide a backup electricity supply in the event of an electricity supply disruption, or;
- The facility is not connected to the grid, or;
- The facility is used to supply electricity to one or more customers, but the power is not wheeled over the grid, or;
- The facility of capacity of less than 100 kW complies with the Code, has a point of connection to the distribution network, and the distribution entity has prescribed the conditions under which the generation entity will continue to use the grid connection and has added the facility to its register.

2.2 Proportion of total Solar PV capacity procured by the private sector

The estimated total installed capacity of Solar PV in South Africa reached 8.24GW at the end of July 2024. The 5 952.6 MW of Solar PV capacity that has been procured and installed by the private sector, therefore, accounts for approximately 73% of the total 8 239 MW of capacity that has been installed (Figure 2).[6] The remaining 2 287.1 MW (~28%) was procured by the Department of Mineral Resources and Energy under the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), which the government first launched in 2011.

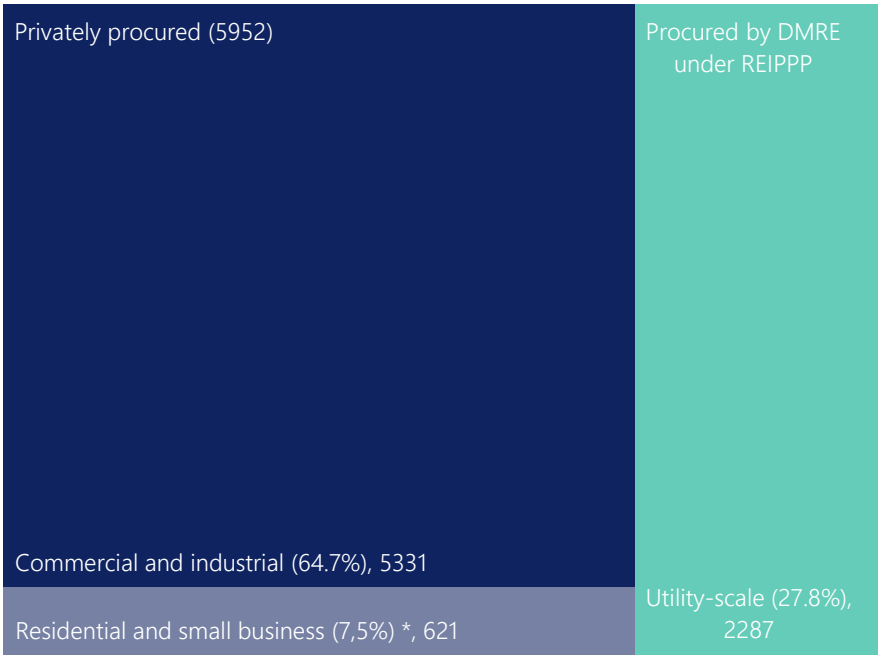
Of the 5 953 MW of capacity procured and installed by the private sector, approximately 10.4%, or 621 MW, consists of small rooftop PV systems of between 0 and 30 kWp that have likely been installed by private households and small businesses. This is based on estimates published by the South African Photovoltaic Industry Association (SAPVIA) on its Solar PV capacity dashboard which are for the first quarter of 2023 and, as such, likely underestimate the proportion of panels installed by households and small businesses.[7] SAPVIA estimates were, in turn, produced by GeoTerra Image, a firm that analyses satellite imagery to estimate the amount of Solar PV installed in South Africa. Updated estimates based on an aerial survey conducted in 2024 have not yet been made publicly available (and are only available from 2024 Q4), but can be purchased from GeoTerra Image on request.[8]

[6] National Transmission Company of South Africa, *Weekly System Status 2024 Week 34*.

[7] "SAPVIA solar PV installed capacity data dashboard," SAPVIA, 2024, http://sapvia.co.za/dataportal.

[8] Elsie Zwennis (GeoTerra Image), email discussion with authors, 6 September 2024.

Figure 2. Privately procured Solar PV capacity as % of total capacity installed, July 2024



*Note: * Residential value is based on data from SAPVIA on its Solar PV capacity dashboard (March 2023); Residential and SME rooftop systems <30 kWp in size*

Source: Nova Economics based on data from Eskom Weekly System update week 34 (2024) and SAPVIA on its Solar PV capacity dashboard (2023).

2.3 Key drivers of uptake of Solar PV among commercial and industrial customers

As discussed above, large commercial and industrial (C&I) firms have procured nearly 65% of the total Solar PV capacity installed in South Africa and 90% of the capacity installed by the private sector (Figure 2).

Sakhile Ngcongwane from Solar Africa, an Energy Service Company (ESCo) that serves large and medium C&I firms, said that the vast majority of their customers install Solar PV to **realise energy cost savings** [9] He noted, *"We are in the business of selling cheaper electricity tariffs*". He said that the firms that approach them are seldom interested in owning the assets or having to incur significant upfront costs. As such, the majority of their customers enter into a power purchase agreement with Solar Africa to install a rooftop Solar PV system and provide agreed energy services. They are often given the option to purchase the depreciated assets at a later date. He noted that tax incentives provided by the government to businesses for the investment in assets that generate renewable energy under Section 12B and Section 12BA of the Tax Act have also stimulated demand, and some of their customers elect to co-finance their rooftop systems so they can directly benefit from this incentive.

2.3.1 Factors likely to affect future demand for Solar PV among commercial and industrial customers

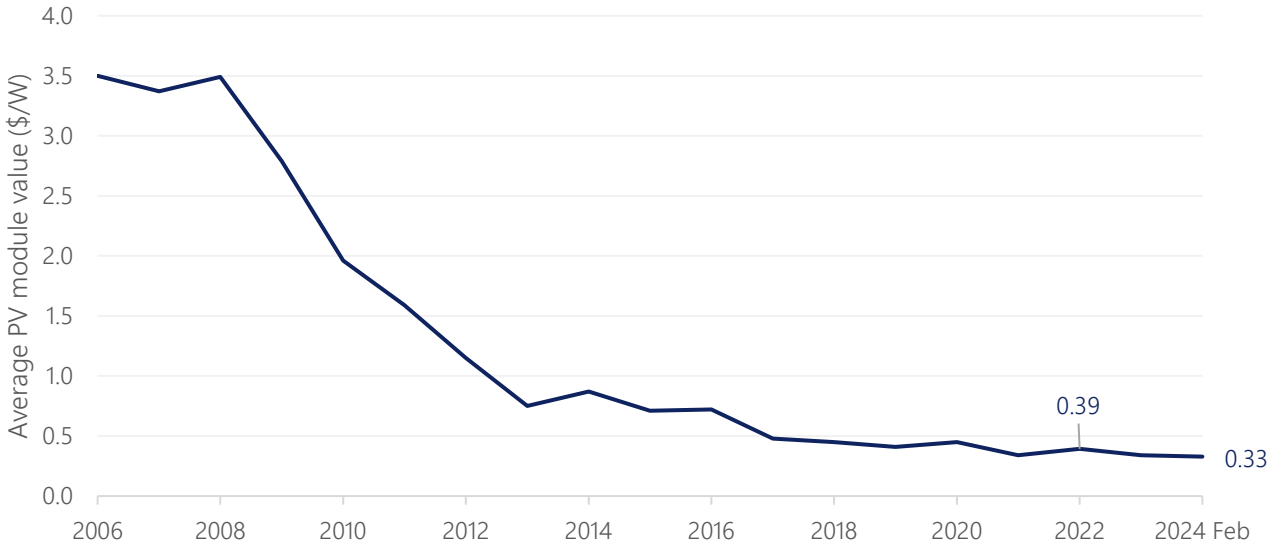
2.3.1.1 Further decline in average costs of solar PV modules and increases in the real price of grid-supplied power

[9] Sakhile Ngcongwane (Solar Africa), interview by authors, 10 July 2024.

Mr Ngcongwane noted that the **demand for installation of Solar PV for large C&I customers remains robust** and continues to be **driven by sharp above-inflation increases** in the average cost of grid-supplied energy and a further **decline in the average costs of Solar PV**. Eskom recently submitted its sixth multi-year price determination (MYPD6) application to NERSA in which it has applied for a 32.6% increase in the average electricity tariff it charges its direct customers (including municipal redistributors) for the 2026 financial year, 11.81% in 2027, and 9.10% in 2028.[10]

The exponential growth in global Solar PV installations has resulted in a sharp and persistent decrease in the price of Solar PV panels.[11] The spot prices for Solar PV modules nearly halved on a year-on-year basis in 2023, with manufacturing capacity tripling from 2021 levels. At the current production expansion rates, the supply of Solar PV will reach 1.1 TW by the end of 2024. China still accounts for 80-95% of production. Although developing a domestic manufacturing sector would increase supply security (which is what the US, India, and the EU are pushing for), it will increase prices.[12] The price of Solar PV modules for shipment to the U.S. has declined dramatically over the last two decades (Figure 3).[13]

Figure 3. Trend in the value of Solar PV modules for shipment to the USA



Source: US Energy Information Administration – 2024 Monthly Solar Photovoltaic Module Shipments Report

Two factors that could negatively impact the demand for Solar PV in the C&I segment are the proposed restructuring of Eskom's electricity tariffs and the introduction of import duty on the import of Solar PV panels.

2.3.1.2 Proposed restructuring of Eskom's electricity tariffs

The proposed restructuring of Eskom's electricity tariffs will *reduce the implicit tariff subsidy* that firms and households who have installed Solar PV currently enjoy. At present, Eskom and municipal electricity tariffs are

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[10] Ray Mahlaka, "Eskom wants an increase in electricity tariffs of up to 44% next year," news release, 2024, https://www.dailymaverick.co.za/article/2024-06-20-eskom-wants-an-increase-in-electricity-tariffs-of-up-to-44-next-year/#:~:text=In%20motivating%20for%20the%20proposed,end%20its%20100%2Dyear%20monopoly.

[11] "How did solar become the 'cheapest energy source in history'?," WTS Energy, updated 2023-04-17, 2023, accessed 08-05-2024, https://www.wtsenergy.com/solar-cheapest-energy-source-in-history-factor/.

[12] IEA, *Renewables 2023*, IEA (2024), https://www.iea.org/energy-system/renewables/solar-pv.

[13] US Energy Information Administration, *2024 Monthly Solar Photovoltaic Module Shipments Report: August 2024* (2024), https://www.eia.gov/renewable/monthly/solar_photo/pdf/renewable.pdf.

structured so that most (~90%) of the costs of supplying electricity, including the fixed costs of maintaining the distribution and transmission networks are recovered via the volumetric R/kWh "energy charge", despite that Eskom reported in its 2023 Retail Tariff Plan that only 24% of the total cost of supplying electricity are variable.[14] As such, firms that install Solar PV systems can significantly reduce their consumption of grid-supplied energy and also reduce their contribution to the costs of maintaining fixed network infrastructure and benefit from an implicit cross-subsidy.

In other words, firms that have installed Solar PV systems do not currently pay their fair share of the network costs, as they are cross-subsidised by electricity users who have not installed a Solar PV system. However, distributed Solar PV systems can provide valuable grid support, most notably, peak-shaving, provided they are given the incentive by distribution companies to do so. Currently, there is a very limited incentive provided by municipal distributors (in the design export tariffs) for C&I customers that own distributed PV to export power to the grid.

Eskom's proposed tariff restructuring (which has not yet been made public but will include the unbundling of distribution charges) will decrease the proportion of fixed costs that are recovered via the energy charge. It is, however, highly unlikely that Eskom will propose that all the utility's fixed costs (which account for ~76% of total costs) are recovered through fixed charges, but rather that a higher fixed charge is phased in to protect the financial sustainability of the utility.[15] It is also worth noting that if NERSA approves the significant increases in tariffs that Eskom has applied for over the MYPD6 application period, the energy component of Eskom tariffs is likely to increase despite the proposed tariff restructuring, continuing to improve the investment case for Solar PV.

2.3.1.3 Introduction of an import duty on solar panels imported into South Africa

On 28 June 2024, the International Trade Administration Commission (ITAC) announced that it had decided to introduce a 10% tariff on solar panels imported into South Africa.[16] ITAC noted that the import duty has been introduced together with a temporary rebate provision, which will be made available in the form of a rebate permit on any volumes imported above what domestic producers can supply. The import duty was gazetted and signed by Mr Enoch Godongwana (Finance Minister) on 28 June 2024 and came into effect immediately.[17] SAPVIA, an industry association, noted that the demand for Solar PV panels currently exceeds the local supply, which they estimate 620 MW annually, with current demand at ~3 100 MW (five-fold current production). This is also only for larger format modules, typically used for utility-scale and large-scale installations. In the absence of a well-functioning rebate mechanism, the duty may also increase the cost of all panels installed in South Africa by 10%.[18]

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[14] Eskom, *Eskom Retail Tariff Plan 2023-24* (2023), https://www.eskom.co.za/distribution/wp-content/uploads/2022/08/RTP-2023-detailed-presentation-version-2.pdf. pg. 6

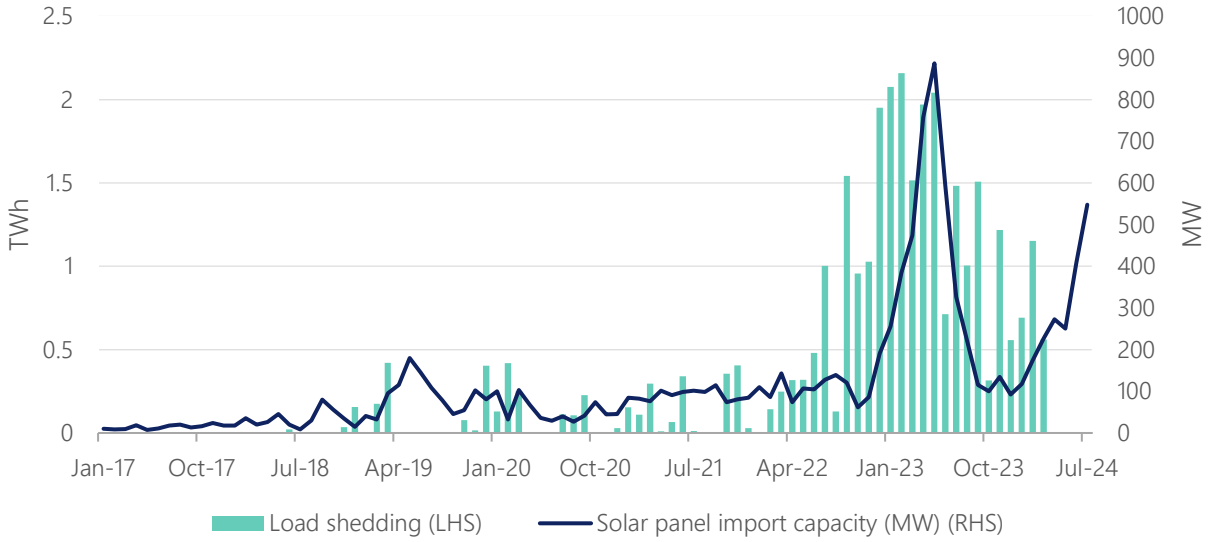
[15] Mutenda Tshipala (Eskom Distribution), in conversation with authors, 6 August 2024.

[16] Patrick Jowett, "South Africa imposes 10% import tariff on solar panels," *PV Magazine* 2024, https://www.pv-magazine.com/2024/07/04/south-africa-imposes-10-import-tariff-on-solar-panels/.

[17] William Brederode, "SA slaps solar panels with new import tariff," news release, 2024, https://www.news24.com/fin24/economy/sa-slaps-solar-panels-with-new-import-tariff-20240702.

[18] Jowett, "South Africa imposes 10% import tariff on solar panels."

Figure 4. South African solar panel imports from China (in MW)



Source: Nova Economics based on data from EMBER on China's Solar PV exports and Eskom's Manual Load Reduction data

2.3.2 Future demand for battery storage among commercial and industrial customers

Demand for battery energy storage in the C&I segment decreased as the risk of load shedding receded. This is despite a significant reduction in the cost of battery energy storage systems (BESS) over the past year. Contemporary Amperex Technology Co. Limited (CATL), the world's largest battery manufacturer, announced that lithium battery cell pricing had plummeted by approximately 50% in the nine months to March 2024.[19] Prices for battery energy storage are expected to fall further into 2025 supported by improvements in energy density, an increase in production capacity, declining material costs and slower-than-expected Electric Vehicle (EV) adoption.[20]

While there is a strong economic case for distribution network operators to encourage C&I customers to invest in complementary BESS due to the range of flexibility services they can provide to the grid (such as peak shaving, load shifting, and tariff arbitrage), electricity distributors in South Africa are currently not offering tariff structures and/or other financial incentives that make the investment sufficiently attractive. While almost all large and medium C&I users are on time-of-use-based tariffs, there are strict limits on credits for exports of power to the grid (based on the amount of electricity consumed). Without tariffs or other financial incentives that provide sufficient return on investment (ROI), C&I entities are likely to continue to be reluctant to deploy BESS (Battery Energy Storage System) in the absence of load shedding.

[19] John Weaver, "Battery prices collapsing, grid-tied energy storage expanding," 2024-03-06 2024, https://pv-magazine-usa.com/2024/03/06/battery-prices-collapsing-grid-tied-energy-storage-expanding/.

[20] Dan Shreve, "What goes up must come down: A review of battery energy storage system pricing," 2024-03-11 2024, https://www.energy-storage.news/what-goes-up-must-come-down-a-review-of-battery-energy-storage-system-pricing/.

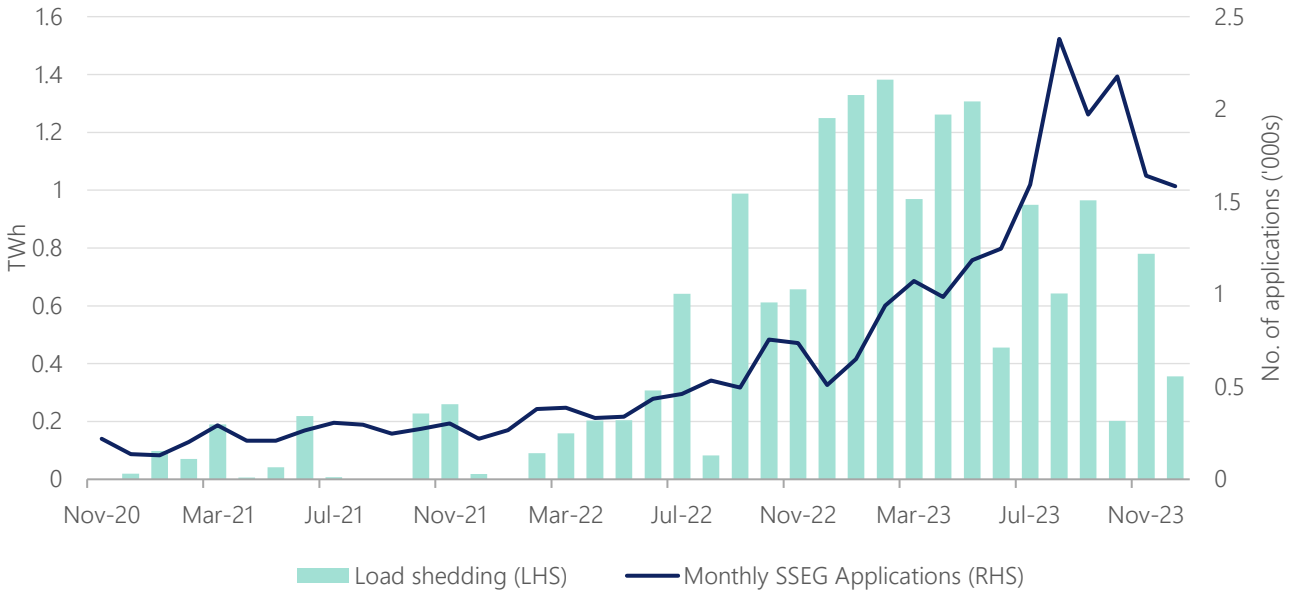
2.4 Key drivers of uptake of Solar PV among households and small businesses

2.4.1 Load shedding was the main driver of the uptake of Solar PV and energy storage by households and small businesses

The key driver of demand for Solar PV systems in the residential and small business segment over the past 12 months has been load shedding.[21] ESCos and solar installers report that demand accelerated sharply when load shedding intensified in 2022 and 2023. Representatives of SAPVIA maintain that **residential demand for solar is currently linked directly to load shedding and slows down as soon as load shedding stops.**[22]

This is evident in the strong positive correlation between load shedding and the number of applications for Small-Scale Embedded Generation (SSEG) in the City of Cape Town (Figure 5).[23] As one would expect, monthly applications for registration of SSEG systems appear to lag the change in the frequency and magnitude of load shedding by three to six months – the number of applications started to decline in September 2023 as the severity of load shedding decreased (Figure 5).

Figure 5. Monthly applications for small-scale embedded generation, City of Cape Town



Source: Nova Economics based on data from CoCT on SSEG applications and Eskom's Manual Load Reduction data.

However, Eskom has not implemented load shedding since 26 March 2024. They noted that the suspension of load shedding could be partly attributed to an improvement in the energy availability factor (EAF) of its generation fleet which rose steadily from a low of 49% in the first week of 2024 to ~67% in August 2024.[24, 25] It is suggested that

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[21] Solar PV systems refer to the solar panels, battery, inverter, and all other equipment required for the system to function. The panels could either be roof- or ground-mounted.

[22] Tasneem Bulbulia, "South Africa's solar PV market expected to become one of the world's largest this year," 2024, https://www.engineeringnews.co.za/article/south-africas-solar-pv-market-expected-to-become-one-of-the-worlds-largest-this-year-2024-03-05.

[23] Adrian Stone, Event Horizon at the Load Centres: Dealing with load shedding accelerated business disruption at Cape Town's electricity distribution utility., (City of Cape Town, 2024).

[24] Eskom, *Weekly System Status Report – 2024 Week 1* (2024), https://www.eskom.co.za/wp-content/uploads/2024/01/Weekly_System_Status_Report_2024_w1.pdf.

[25] National Transmission Company of South Africa, *Weekly System Status 2024 Week 34*.

the improvement in the EAF can be attributed to accelerated execution of planned maintenance, partnerships with the original equipment manufacturers (OEMs), and the dedication of power station managers and their teams.

Furthermore, Eskom notes that the outlook is positive, and they expect a load-shedding-free summer in 2024/25, provided unplanned outages remain below 13 000 MW. They are currently working to add ~2 500 MW of generation capacity by January 2025, including the return to service of Unit 2 at Koeberg Nuclear Power Station (adding 930 MW) and the synchronisation of Unit 6 at Kusile into the grid in December 2024, adding a further 800 MW of capacity. The return of Medupi Unit 4 from an extended outage could add another 800 MW before the Eskom financial year-end (March 2025).[26]

2.4.2 Recent trends in the demand for Solar PV by households and small businesses – feedback from banks and ESCos

2.4.2.1 Suspension of load shedding has contributed to a significant decline in demand for Solar PV systems

ESCos and banks financing Solar PV systems for the household and small business sector noted that the reduction in power outages has led to a significant decline in the demand for these systems in this segment. Vincent Maposa, the CEO of Wetility, noted that the market is not growing as quickly as it was in 2023 and that it might be more accurate to say it was in decline - particularly the demand for Solar PV systems in the residential and small business segment where, the feedback he received from suppliers and competitors alike, was that the average number of units sold per month had been falling since December 2023. He noted that while they, as an ESCo, were still achieving positive growth (~20 to 30% month-on-month), they were still behind on the more aggressive growth targets they had set themselves.[27]

Travis Clarke, a representative of Investec, confirmed the decrease in demand for financing for Solar PV systems among residential and small business customers since the suspension of load shedding. He noted that this was to be expected as uptake was largely driven by the desire to guarantee energy security.[28]

2.4.2.2 ESCos serving households and small businesses are starting to emphasise potential energy cost savings as a way to counter the decline in demand and some shifting focus to the C&I segment.

Mr Maposa noted they were trying to sell a different story to consumers, putting more emphasis on electricity cost-savings that can be realised by installing bundled products that include energy-efficiency technologies with their Solar PV systems and by targeting customers who were previously excluded during the 'boom'. He noted that they bundle their Solar PV systems with a smart geyser (water heater) control and encourage the consumer to cook using an air fryer that they supply free of charge, rather than use an electric stove. He confirmed, however, that the residential and small business market for Solar PV systems is in a delicate space and that they do not assume they will be able to sustain current growth.[29]

Ross Mains-Sheard of Versofy confirmed that the residential demand for Solar PV systems had diminished significantly since July 2023 and that this was due to reduced load shedding. He noted that as an ESCo that primarily

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[26] Eskom, "Eskom's loadshedding-free winter enables a likely scenario of a loadshedding-free summer outlook due to structural generation improvements," news release, 2024, https://www.eskom.co.za/eskoms-loadshedding-free-winter-enables-a-likely-scenario-of-a-loadshedding-free-summer-outlook-due-to-structural-generation-improvements/.

[27] Vincent Maposa (Wetility), interview by authors, 15 July 2024.

[28] Travis Clarke (Investec), interview by authors, 24 July 2024

[29] Vincent Maposa (Wetility), interview by authors, 15 July 2024.

services the residential market, they had shifted their focus somewhat and were starting to pursue business in the commercial and industrial (C&I) segment, where demand for Solar PV remains robust.[30, 31]

Mr Mains-Sheard further noted however, that when they went to market in 2021 there were only 21 days of load shedding, and that the original narrative to their residential customers was that if they installed a Solar PV system, they could shield themselves from rising energy prices and would eventually realise significant energy cost savings, "*So our narrative has almost gone full circle around the cost-saving*". He also pointed out the irony that the more a household is currently spending on electricity, the more likely it is they will achieve "*grid parity*" (i.e., be able to generate power from a Solar PV system (including a battery) over the life of the assets at a levelised cost of electricity (LCOE) less than or equal to the price of power from the electricity grid).[32]

Similarly, representatives from banks interviewed noted the shift required in the narrative away from the need for energy security towards one of energy cost savings. Rashveer Manilal, a representative from ABSA Bank, confirmed that since the risk of load shedding has reduced, clients are now focusing more on the commercial viability of systems. Mr Manilal believes that there is likely to be a marked increase in the demand for solar energy by C&I customers as a result of the latest increase in municipal electricity tariffs effective from 1 July 2024.[33]

2.4.2.3 Currently, most households that install Solar PV systems can expect their total electricity expenditure to increase.

Ross Mains-Sheard (Versofy) noted that a household currently spending R3 000 per month on electricity can install a Solar PV system that can deliver power at grid parity. But at this point, a household spending under R1 000 a month on electricity who subscribes to or leases a Solar PV system is not going to achieve grid parity (or realise energy cost savings) as the smallest system available on a rental basis (3.6 kW hybrid inverter, 4 kWh battery without solar panels but "solar-ready") would cost R1 000 per month to rent on a subscription basis and R1 399/month to rent-to-own.[34]

Part of the reason for this is that there appears to be a mismatch between the tenure of loans or lease agreements available to households and small businesses to finance Solar PV systems and the useful life of the underlying assets. While the typical useful life of Solar PV systems is 20 to 30 years and battery storage assets are expected to last 10 years (when cycled daily), the tenures of loans offered directly by banks or indirectly via ESCos who offer subscriptions are typically much shorter, ranging from three to eight years.

The net result is that middle-income households and small businesses that obtain finance to install Solar PV systems on their premises, particularly if they install complementary energy-efficiency technologies, can currently realise significant energy cost savings over the life of the assets. In the short to medium term (0 to 5 years), they can expect their overall energy expenses (including loan repayments for the Solar system) to increase by more than 50% (see illustrative example in Box 1), based on 2023 system pricing.

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[30] Solar PV refers to a Solar PV system without storage.

[31] Ross Main-Sheard (Versofy), interview by authors, 16 July 2024.

[32] Ross Main-Sheard (Versofy), interview by authors, 16 July 2024.

[33] Rashveer Manilal (ABSA), interview by authors, 7 of August 2024

[34] Ross Main-Sheard (Versofy), interview by authors, 16 July 2024.

Box 1. Illustrating why a residential electricity consumers will struggle to grasp the financial benefits of investing in a Solar PV system

A household consuming an average of 1 000 kWh of electricity per month at a cost of R2.73/kWh is spending roughly R2 730 a month on electricity before the installation of a Solar PV system.

If they enter into a subscription agreement with an ESCo like GoSolr to provide them with a Solar PV system that will cover most of their essential electricity requirements during the morning and evening peak periods (or for power outages lasting up to ~3 hours a day), it will cost approximately of R2 900 per month on a subscription model. This system consists of approximately 6.3 kWp of Solar PV capacity, an 8 kW inverter, and ~10 kWh lithium-ion battery (See www.gosolr.co.za).

Based on results of detailed modelling conducted as part of a previous study, we estimate that a system of this size however will only meet ~50% of the household's monthly total energy requirements. As such, the household would still need to purchase roughly 400 to 500 kWh of electricity per month from the utility at a cost of ~R2.73/kWh and ~R1 300 per month.

This means that after entering into the subscription, the household would be paying roughly 50% more for energy services per month than they were before the installation of the system. At a monthly rate of R2 900 households are likely to have paid off the system within six years and will have the option to purchase the underlying assets from the ESCo at this significantly depreciated value (close to zero) - after which they will realise significant electricity cost savings. But because of the initial increase in the cost of energy services, households fail to grasp the future financial benefits of the investment.

Electricity costs before and after a Solar PV system installation for a customer consuming 1 000 kWh per month

	Before system installation	After system installation	% change after system installation
Consumption of grid-supplied power (kWh)	1 000	450	-55%
Power generated and consumed from rooftop PV +BESS system (kWh)	0	550	
Cost of grid-supplied power @R2.73/kWh	R2 730	R1 229	-55%
Cost of a monthly subscription to Solar PV + BESS energy service @R2999/month		R2 999	
Total cost of electricity services	R2 730	R4 228	55%

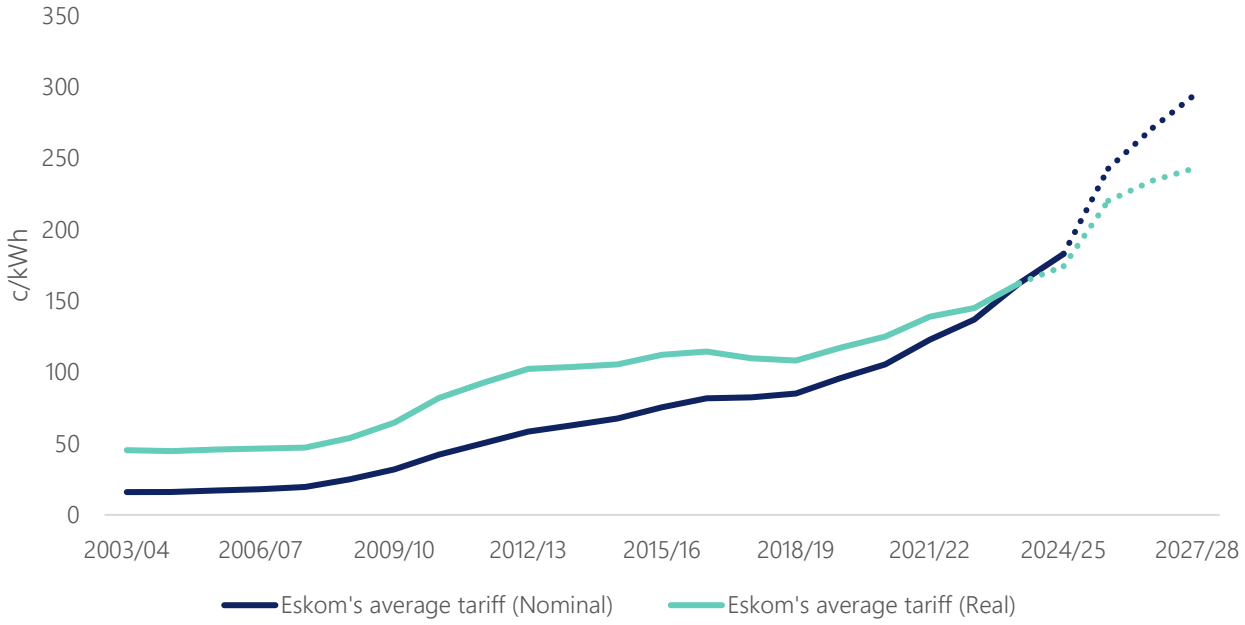
Source: (i) GoSolr's website (www.gosolr.co.za); (ii) Walsh *et al.*, A pre-feasibility study to assess the options for Eskom to accelerate the uptake of distributed energy resources - Part I: Rooftop Solar PV and storage (2023).

2.4.3 Factors likely to affect future demand for Solar PV and storage in the residential and small business segment

2.4.3.1 Further increases in the cost of grid-supplied power and a decline in PV and battery costs should support demand.

The demand for **Solar PV systems by households and small businesses may begin to recover as the average cost** of grid-supplied power continues to rise, and a further **decline in the average costs of solar panels** and batteries. As noted in Section 2.3.1, Eskom recently submitted its sixth multi-year price determination application to NERSA in which it has applied for a 32.6% increase in the average electricity tariff it charges its direct customers (including municipal redistributors) for the 2025/2026 financial year, 11.81% in 2026/7 and 9.10% in 2027/8.[35]

Figure 6. Average price of electricity in real and nominal terms, real prices expressed in 2024 values



Note: CPI is assumed to increase at a rate equivalent to the 2023 level.

Source: Eskom, Historical average prices and increases (2023) and Statistics South Africa, CPI history.

In October 2007, when South Africa experienced its first episode of load shedding, the government acknowledged that electricity prices did not reflect the true cost of generating, transmitting, and distributing electricity – they were implicitly subsidised and were unsustainably low.[36] Ageing infrastructure, underinvestment in maintenance, escalating coal prices, and the need to finance new power stations led to rising operational costs and reinforced the need to increase tariffs. Eskom's deteriorating financial position has been exacerbated by a mounting municipal debt burden – municipal distributors now owe Eskom over ~R74.52bn (as of April 2024).[37]

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[35] Ray Mahlaka, "Eskom wants an increase in electricity tariffs of up to 44% next year," *Daily Maverick* 2024, https://www.dailymaverick.co.za/article/2024-06-20-eskom-wants-an-increase-in-electricity-tariffs-of-up-to-44-next-year/.
[36] Sean Moolman, "2022 update: Eskom tariff increases vs inflation since 1988 (with projections to 2024)," (2022). https://poweroptimal.com/2021-update-eskom-tariff-increases-vs-inflation-since-1988/.
[37] Codera Analytics, "Historical Eskom electricity tariffs increases in SA," (2024). https://codera.co.za/historical-eskom-electricity-tariffs-increases-in-sa/.

It is not clear, however, whether NERSA will approve or at least phase in all or some of the increases in revenue that Eskom has applied for. On 29 June 2020, the High Court set aside NERSA's decision on Eskom's regulatory clearing account (RCA) application for the three years from 2014/15. The court ruled that NERSA's decision to disallow Eskom to recover the balance it had claimed due to lower-than-expected sales had been "*premised on a fundamental factual error*" and that in failing to process Eskom's application within a reasonable time had "*acted in a manner that was inconsistent with the constitution*".[38]

This, however, is only one of the six instances since 2018 where Eskom has taken NERSA to court to challenge the Regulator's decision on its revenue (tariff) and RCA applications. In each case, the court ruled in Eskom's favour, noting that the decisions taken by NERSA were either irrational, unlawful or procedurally unfair and ordered that they be set aside. Several stakeholders have expressed concern about the quality of decisions the Energy Regulator has made on Eskom's revenue applications, which has created an environment of regulatory and electricity price uncertainty.

2.4.3.2 The price of Solar PV panels and lithium-ion batteries has fallen by more than 50% in the past year.

As discussed in Sections 2.3.1 and 2.3.2, the global price of both Solar PV modules and lithium-ion batteries has fallen significantly in the past year – the spot price of PV modules almost halved in 2023 while the price of lithium-ion batteries fell by ~50% in the nine months to March 2024. This has also translated into a significant reduction in the price of batteries and PV imported and distributed in South Africa. As Vincent Maposa from Wetility noted, the cost of both solar panels and batteries they procure has more than halved in the past 6 to 18 months:

> *"At the beginning of this year, we were buying panels at about R2 000 a unit for a 450-watt panel. We're buying them at under R1 000 rand right now. Just that on the PV side…Batteries … have also become significantly cheaper and it's happening at a rapid rate. To give you a good example, a five-kilowatt-hour battery, which we were purchasing for anything close to R30 000 last year we can now get for under R15 000." – Vincent Maposa, CEO of Wetility.*[39]

The fall in the price of lithium-ion batteries is particularly relevant as in January 2023, a 10 kWh battery cost ~R50 000 which accounted for ~23% of the total cost of installing a Solar PV system designed to meet the essential load (~55% of total monthly consumption) of a household consuming an average of 1 050 kWh/month (Table 1).[40]

38 Eskom Holdings SOC Limited v National Energy Regulator of South Africa and Others, No. 74870/2019 (South Africa: South Gauteng High Court, Johannesburg 2020).

39 Vincent Maposa (Wetility), interview by authors, 15 July 2024.

40 Kay Walsh et al., *A pre-feasibility study to assess the options for Eskom to accelerate the uptake of distributed energy resources - Part I: Rooftop solar PV and storage* (2023).

Table 1. Base Costs for complete Rooftop Solar PV system (excl. VAT), January 2023

Component	Cost (Rands)
Solar PV panels (18 x 550 W panels)	54 000
Inverter (8 kW)	35 000
Mounting structure - Flat roof	18 000
Smart meter	10 000
Balance of System	39 120
Installation costs	15 000
Batteries & Cables and related installation costs (10 kWh)	50 000
Total base costs before sensitivity	**231 120**

Source: Walsh *et al.*, A pre-feasibility study to assess the options for Eskom to accelerate the uptake of distributed energy resources - Part I: Rooftop Solar PV and storage (2023).

2.4.3.3 ESCos serving the residential and small business markets may soon be able to offer households who adopt solar PV bill-neutrality or even guaranteed cost savings.

Vincent Maposa of Wetility maintained that in the context of the rising cost of grid-supplied power and falling Solar PV and battery equipment costs, the prospect of being able to offer households and small businesses Solar PV systems that can deliver guaranteed energy cost savings, or "bill-neutrality", was becoming more of a reality. He noted that their product development team is currently working on a "guaranteed savings" offering and is hoping to produce a white paper by October 2024 on the tariff design (in terms of SSEG tariffs that incentivise households to export surplus power to the grid) that would make this a reality.[41]

Wetility is aiming to install Solar PV systems in households that will be electricity "bill-neutral" from day one. They believe this will be possible with the installation of smart user controls and the retrofitting of homes with energy-efficient technologies. As Vincent Maposa noted, "*Guaranteed savings, we reckon, are probably two [Eskom] rate increase cycles away*".[42]

2.4.3.4 Other factors that could pose a risk to the future uptake of Solar PV

In addition to the suspension of load shedding, the two factors that could pose a risk to the continued uptake of Solar PV systems among households and small businesses (similar to the C&I segment) are (i) the recent introduction of import duty on the import of Solar PV panels, and (ii) the proposed restructuring of Eskom and municipal redistributor's electricity tariffs to include higher fixed charges.

Introduction of duty on imports of Solar PV panels

As discussed in Section 2.3.1.3, in June 2024, the International Trade Administration Commission (ITAC) of South Africa introduced a 10% tariff on solar panels imported into South Africa. While there is a rebate on volumes imported in excess of those produced domestically, there is a risk that it will result in a 10% increase in the price of solar PV panels if the rebate is not effective or domestic producers significantly ramp up production.

[41] Vincent Maposa (Wetility), Interview by authors, 15 July 2024.

[42] Vincent Maposa (Wetility), Interview by authors, 15 July 2024.

Vincent Maposa, the CEO of Wetility, however, remarked that he was not concerned about the impact of the new import duty on PV prices, at least not for the next 12 months, as he had recently visited a few warehouses, and it was clear that suppliers of panels were holding a lot of inventory.[43]

Restructuring of electricity tariffs and proposed shift to higher fixed charges

Mutenda Tshipala, a senior manager of strategy development at Eskom, noted that the utility is consulting NERSA about a proposal to revise the structure of wholesale and retail electricity tariffs.[44]

Eskom's current tariffs are designed so that 90% of its revenue is recovered through a volumetric R/kWh charge, while ~76% of its costs (in 2021/22) are fixed. This tariff is often referred to in the literature as the "distorted two-part tariff" as it is misaligned with the utility's underlying cost structure and results in an inefficient allocation of resources and unstable utility revenues.[45] There are several negative consequences for both Eskom and its customers of this tariff structure, but in particular:[46]

- *Customers who install distributed generation (e.g., Solar PV) can avoid their fair share of fixed costs*; when they self-generate, they reduce their consumption of grid-supplied energy. But because fixed costs are recovered via the volumetric "energy charge", the utility also recovers a much lower proportion of the fixed costs of building and maintaining its generation and network infrastructure. This is even though the self-generating customer still relies on the grid for both importing power from the grid and exporting power to the grid, and for other grid services. The upshot is that the utility usually continues to recover all its fixed costs but from other non-self-generating customers (who are often, on average, less well-off than self-generators), which could ultimately lead to a spiral where the higher rates incentivise more customers to self-generate.

- *It can contribute to unstable utility revenues – when most of the utility costs are recovered in the volumetric charge,* any reduction in a utility's sales of electricity results in a commensurate reduction in revenue, but the majority of its costs are fixed costs and remain unchanged. This exposes Eskom to significant volume risk and increases its reliance on revenue-decoupling mechanisms such as the regulatory clearing account to compensate it for the under-recovery of fixed costs if sales decline.

While the details of Eskom's current proposal have not been released to the public, we understand that similar to the previous proposal presented in the Eskom Retail Tariff Plan 2023-24. In its 2023/24 retail tariff plan Eskom proposed to increase the proportion of revenue it recovers through fixed charges to ~24% up from 10% and reduce the proportion it recovers through the volumetric charges (usually expressed in R/kWh) from 90% to ~76% (Figure 7).[47] It is also proposing to unbundle the tariff into separate generation, distribution and transmission charges.

Eskom's proposal to shift a higher proportion of its costs to the fixed portion of its tariff will better reflect the nature of its costs, but it will (*all else equal*) reduce the implicit tariff cross-subsidy that customers who own or are planning to invest in distributed generation currently enjoy (and the incentive to invest).

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[43] Vincent Maposa (Wetility), Interview by authors, 15 July 2024.

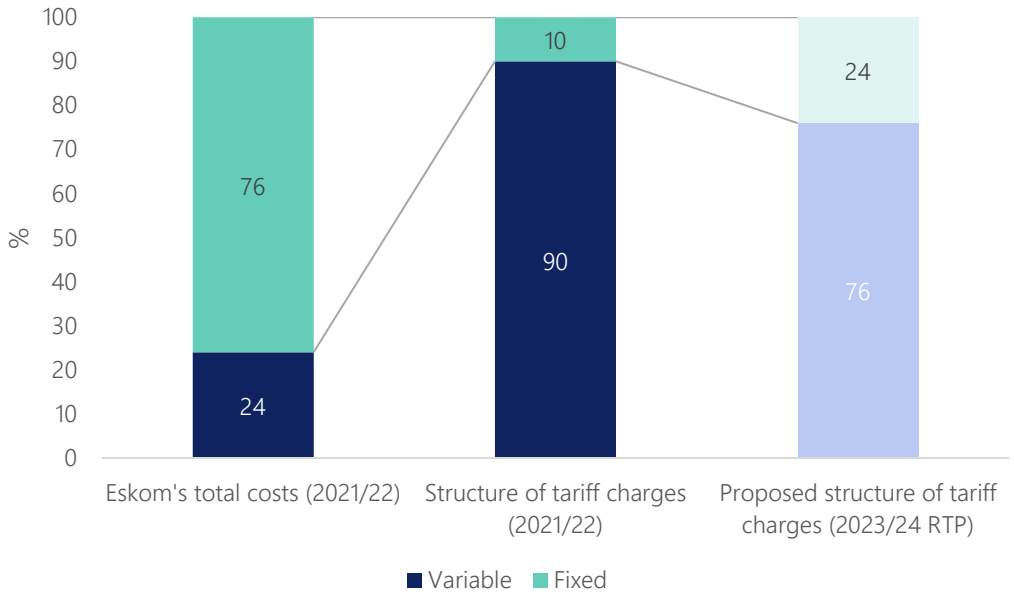
[44] Mutenda Tshipala (Eskom Distribution), in conversation with authors, 6 August 2024.

[45] Agustin J Ros, *Volumetric Residential Rates: Socially Regressive or Progressive* (Presented at the Harvard Electricity Policy Group, 2019), https://www.brattle.com/wp-content/uploads/2021/05/16563_volumetric_residential_rates_-_socially_regressive_or_progressive.pdf.

[46] Branko Terzic, Kenneth Costello, and Kay Walsh, *Alternative approaches to the regulation of electric utilities (Part 2): Principles and processes to support the effective restructuring of electricity tariffs in South Africa*, Nova Economics (2020).

[47] Eskom, *Eskom Retail Tariff Plan 2023-24* (2022), https://www.eskom.co.za/distribution/wp-content/uploads/2022/08/RTP-2023-detailed-presentation-version-2.pdf.

Figure 7. Comparison between Eskom's cost structure, the 2021/22 tariff structure and the proposed tariff structure for 2023/34



Source: Author's own creation, based on Eskom's 2023/24 Retail Tariff Plan.

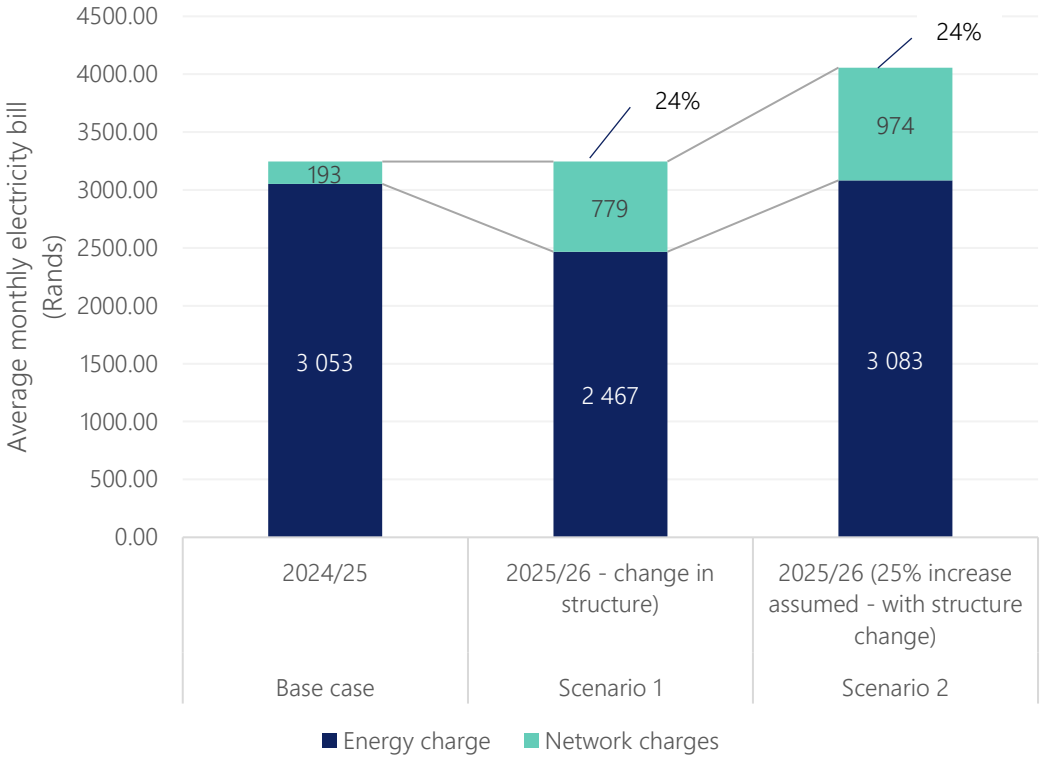
However, as we illustrate in Figure 8 because the changes in the structure of the tariff are likely to coincide with significant increases in Eskom's real average tariff, the net effect is that the average electricity consumer's energy charges may not decrease by very much in absolute terms (and as such neither does the incentive to invest in grid-tied generation).

For example, a household that currently consumes an average of 1 000 kWh of power per month and is on Eskom's HomePower 4 tariff, will currently be spending a total of R3 246 per month on electricity of which 5.9% or R192.90 is recovered by Eskom as a fixed charge, and the remaining 94.1% of their bill (R3053) is recovered via a R/kWh volumetric charge.

If we assume, in Scenario 1, that Eskom restructures its HomePower 4 tariff so that it recovers 24% via the fixed charge and 76% and there is no real increase in the electricity tariff in 2025/26, the energy charge will decrease to R2 467 while the fixed portion will increase to R779. The decrease in the energy charge reduces the incentive for the customer to invest in grid-tied Solar PV relative to the base case, as the installation of the system can only contribute to a reduction in energy charges (Figure 8).

However, if we assume in Scenario 2 that Eskom restructures its HomePower 4 tariff so that it recovers 24% via the fixed charge and 76% and NERSA approves a 25% y/y real increase in the electricity tariff in 2025/26 (Eskom has applied for an increase of 35.6%), the energy charge will increase to R3 083 while the fixed portion will increase to R974. In this scenario, the decrease in the energy charge due to the restructuring of the tariff is completely offset by the overall increase in the real tariff, and the financial incentive to install Solar PV is more or less the same as it was before the tariff restructuring.

Figure 8. Impact of a tariff restructure, with and without a 25% increase in tariffs



Source: Author's own creation, based on Eskom's 2024/25 Tariff booklet.

Municipalities are encouraged to follow suit and implement well-structured "SSEG tariffs" as part of the readiness to incorporate SSEG into the distribution grid. This will help municipalities recover the fixed costs of maintaining the grid while avoiding significant revenue losses due to SSEG uptake.

Experts in economic regulation and rate design, Kenneth Costello and Ross Hemphill, recommend that utilities or distributors that are moving away from the volumetric rates or the "distorted two-part" tariff introduce a three-part tariff for residential customers.[48] A three-part tariff would include:

i. **A demand charge** that reflects the maximum amount of power (kW) drawn for any given time interval (typically 15 minutes) during the billing period, multiplied by the relevant demand charge (R/kW).

ii. **A volumetric charge** that reflects the contribution of that customer to the variable costs of supplying power, and preferably time-of-use based.

iii. **A fixed charge** which recovers fixed costs associated with serving that customer (e.g., billing and metering).

It is demand on an electric distribution system rather than electricity consumption that drives network costs, as transmission and distribution network operators incur capacity costs to meet peak demand and provide reserves. As such, demand charges provide incentives for customers to both reduce and smooth their electricity consumption and reduce the costs to the network provider of serving them. Costello and Hemphill note that tariffs that include

[48] Kenneth W. Costello and , Ross C. Hemphill (2022) It's high time to transition away from volumetric distribution rates: Why not a 3-part tariff?. The Electricity Journal.

a demand charge affect the economics of self-generation, such as rooftop solar PV, but that moving to three-part rates and away from volumetric rates will make utilities less resistant to self-generation.

Sustainable Energy Africa (SEA), an NGO in the industry, has created an SSEG tariff tool for municipalities, which has enabled significant progress in municipal SSEG tariff setting. The South African Local Government Association (SALGA) reports that as of Q12023, 43 municipal distributors (26%) had implemented SSEG tariffs.[49]

Although significant progress is being made in this regard, many municipalities have made the mistake of implementing higher fixed charges for SSEG customers only, which has not been well-received by customers. This is due to the negative impact the fixed charge has on the Solar PV and BESS payback period. Customers view this as a "penalty" for installing embedded generation and create the impression that SSEG owners are being discriminated against. This, in turn, prevents SSEG customers from registering their systems with the municipality. Ideally, all tariffs should include a fixed component, which will prevent SSEG customers from feeling discriminated against.[50]

2.5 Barriers to the uptake of Solar PV systems among households and small businesses

As discussed in Section 2.4.2, while the worsening of load shedding in 2023 and increases in real average electricity prices greatly accelerated the uptake of Solar PV systems among households and small businesses in South Africa, the suspension of load shedding in March 2024 has resulted in a sudden drop-off in demand. By contrast, demand in the C&I sector has remained relatively robust. Industry stakeholders highlighted some of the barriers that are inhibiting the uptake of distributed energy resources by households and small businesses (especially relative to the C&I sector).[51] These are summarised in Table 2 but are discussed in more detail in the sub-sections that follow.

Table 2. Barriers to the uptake of rooftop Solar PV and storage among households and small businesses

Barrier to uptake			Description
1		**Upfront system costs of Solar PV and battery storage, limited access to and cost of credit**	Data from the National Credit Regulator indicates that household credit approval rates have been declining. High interest rates and low growth in real income in South Africa have eroded the disposable income of many middle-income households, which has made them reluctant to take on additional debt, including for Solar PV systems. Data from the National Credit Regulator indicates that only 33% of household credit applications (for all types of credit) are currently approved.
2		**The mismatch between loan terms and the life of underlying assets, the high cost of finance**	The structure and cost of finance (loan or lease agreements) available means that households and small businesses are only able to realise monthly electricity cost savings towards the end of the finance period. Specifically, there is a mismatch between the terms of the loans offered by banks/ESCos and the useful life of the underlying asset. This creates a significant barrier for households and small businesses to invest in distributed energy resources (DERs) because, while most can benefit from energy cost savings over the long term, their short-term energy costs (including the cost of finance) are likely to increase.

[49] SALGA, *Status of Embedded Generation in South African Municipalities* (2023).

[50] SALGA, *Status of Embedded Generation in South African Municipalities*.

[51] Walsh et al., *A pre-feasibility study to assess the options for Eskom to accelerate the uptake of distributed energy resources - Part I: Rooftop solar PV and storage*.

3		**Suboptimal tariff design for owners of distributed generation**	The current tariff structures offered by municipal distributors to residential customers are not time-of-use based and do not provide them with a sufficiently strong financial incentive to invest in Solar PV systems to (i) reduce consumption of grid-supplied power in peak period, nor (ii) export surplus power to the grid.
4		**Upfront costs of grid connection & smart meter**	The majority of residential and small business customers who have installed distributed generation are not exporting power to the grid. This is because they are expected to cover the upfront costs of grid connection and the replacement of their existing utility-side electricity meters with smart meters, and under a suboptimal tariff design, which provides limited credit for power exported to the grid, they are unlikely to be able to recoup the costs in under 5 to 10 years.
5		**Limited government incentives**	The government has provided limited incentives for the purchase of Solar PV systems by households and small businesses. The only direct incentive for households was the tax rebate that expired in March 2024; however, registered small businesses are still able to access a tax incentive. The government is also providing some indirect support via the Energy Bounce-Back Scheme, which was set to expire at the end of August 2024 but will be available to customers until between February 2025 and May 2025, depending on when the bank first entered into the scheme.

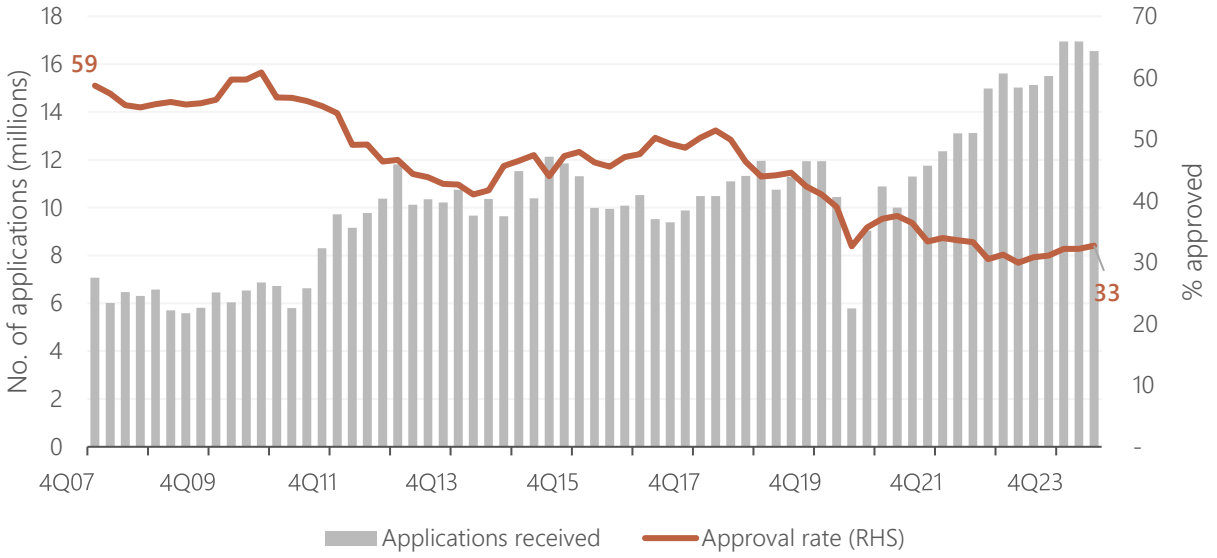
2.5.1 Significant upfront costs of Solar PV and battery storage systems relative to household income, limited access to and cost of credit

The upfront cost of an entry-level Solar PV system for a home consuming an average of 450 kWh/month is ~R90 000 but the costs of a system that can meet an essential load of a household consuming an average of 1 000 kWh/month during peak demand periods (or during load shedding) would currently cost ~R219 000 (see Table 1 Section 2.4.3.2).[52] This upfront cost of these systems is substantial relative to the disposable income of most middle and low-income households in South Africa (90% of whom spend less than R30 000 per month) and as such the vast majority need to obtain credit to finance the installation. While commercial banks and ESCos serving this segment offer a range of financing mechanisms (see Sections 4.2.1.2 and 4.2.3), 66% of household credit applications (all types of credit, not specifically solar finance) are currently declined.

Data from the National Credit Regulator shows there has been a consistent trend of decline in household credit approval rates since 2007. Household credit approval rates have fallen from ~60% in the fourth quarter of 2007 to 33% by the first quarter of 2024 (Figure 9). The decline in credit approval rates, however, was driven mostly by an increase in the number of applications rather than a decline in the number of applications approved – the number of applications approved per quarter has increased by ~30% over the 17 years.

[52] Walsh et al., *A pre-feasibility study to assess the options for Eskom to accelerate the uptake of distributed energy resources - Part I: Rooftop solar PV and storage*.

Figure 9. Household credit approval ratings (all credit applications), 4Q07 to 1Q24



Source: Nova Economics based on data from the National Credit Regulator's CCMR Web-Dataset 2007Q4 to 2024Q1.

Clive Spitz (Head of Climate Solutions) and Tony Anderson (Head of Home Services) from Standard Bank, noted that the decline in household credit approval rates also reflects the prevailing macroeconomic environment, which is characterised by relatively high real interest rates (and low growth in real household disposable income).[53] The real (inflation-adjusted) prime lending rate, which we calculate is currently at ~6.2%, is well above the 15-year average of 4.2% and significantly higher than it was in the two years post the Covid-19 pandemic (it was an average of 1.8% in 2021 and 2022).[54] As such, while commercial banks are offering customers a range of solar-financing options, the ability of many middle-income households to take on additional credit is quite limited. All licensed financial service providers (which include banks and microfinance institutions) are regulated in terms of the National Credit Act and must apply the standardised credit assessment approach and criteria and comply with regulated limits on what a credit provider can charge.

The emergence of several ESCos that offer Solar PV systems to the household segment on a lease or subscription basis has helped to make Solar PV systems more accessible to lower-middle-income households. These are defined by ESCos as those who currently spend more than R1 000 a month on electricity (or consuming a minimum of 450 kWh of power a month). An entry-level system that would cost roughly ~R90 000 upfront can be provided by ESCos to qualifying households on a subscription basis for between ~R1 500 and R1 999 per month (see Section 4.2.1.2). Since ESCos are not licensed credit providers and retain ownership of the Solar PV system assets (at least until the end of the rental agreement), they can adopt their own credit assessment criteria, and some can offer near-instant credit assessments. Wetility, for example, has an API with a credit bureau and, based on the information they provide, can grant credit approval in under two minutes. Versofy promises to assess credit applications within two business days.

Vincent Maposa (CEO of Wetility) noted that since they are not licensed financial service providers, they do not have to adhere to the credit assessment approach stipulated by the NCR. Despite this, they have probably remained too conservative in terms of their credit assessment criteria, as the default rate on their current lending book is very

[53] Clive Spitz and Tony Anderson (Standard Bank), interview by authors, on 20 August 2024.
[54] BusinessTech, "The R70 000 cost of high interest rates in South Africa," news release, 2024, https://businesstech.co.za/news/finance/783005/the-r70000-cost-of-high-interest-rates-in-south-africa/.

low (less than 0.25%). He noted there was pressure from shareholders to increase their risk appetite and to be more lenient in extending credit for solar finance.[55] Ross Mains-Sheard, who co-founded Versofy in 2021 reported they had also been quite conservative in extending credit, at least initially, because to attract lower-cost senior debt they needed a healthy book, and to get a healthy book they had to start by lending to the "top of the pyramid", i.e., less risky customers who are not necessarily the ones who most need the money but can afford to pay it back. This had limited the extent to which they were able to lend to lower-middle-income households, at least at first.[56]

2.5.2 The mismatch between loan terms and the life of underlying assets, the high cost of finance

The structure and cost of finance (loan or lease agreements) available means that households and small businesses who invest in distributed energy resources (DERs) will, in many cases, be able to realise energy cost savings over the long term. However, in the short term, their monthly spending on electricity is likely to increase. This is because of a mismatch between the terms of the finance agreements offered by banks and ESCos and the useful life of the underlying asset.

While the typical useful life of Solar PV systems is 20 to 30 years, and 10 to 15 years for the battery storage assets (cycled daily), the loan tenures offered by financial institutions are typically much shorter, ranging from 5 to 10 years. The net result is that while middle-income households and small businesses that obtain finance to install Solar PV systems on their premises can currently realise significant energy cost savings over the life of the assets, in the short to medium term (0 to 5 years), they can expect their total monthly expenditure on electricity (including lease/loan payments for the solar system) to increase by more than 50% (see Box 1 for an illustrative example).

Cameron Gough, Head of Structuring of FirstRand Group Treasury, noted that, unfortunately, consumers struggle with present value calculations in general. The difficulty households experience in estimating how much future energy cost savings are worth today, given the "time value of money" and the upfront costs of the solar installation, is no exception. He remarked that if a bank can only offer consumers a three-year loan to finance a Solar PV system, the monthly loan instalment on the energy system will naturally feel very high relative to what they were previously paying the City of Joburg for electricity. But what consumers won't take into account is that after three years, their consumption of grid-supplied power will have halved.[57]

Offering residential customers loans with longer tenures helps them better understand and manage energy savings from installing Solar PV systems by spreading out the upfront costs over a more extended period. This reduces the immediate financial burden, aligning loan repayments with the expected energy savings generated by the system. As a result, customers can better compare their reduced energy bills with their loan payments, making it easier to grasp the financial benefits of the investment.

FirstRand has been trying to extend the tenure of the loans for solar systems to more accurately match the useful life of the assets and their decay period. He estimated that increasing the available loan tenor from 5 years to 10 years could make the systems up to 40% more affordable from the day the loan is originated. This, however, was not possible under the Energy Bounce-Back Scheme.[58]

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[55] Vincent Maposa (Wetility), Interview by authors, 15 July 2024.

[56] Ross Main-Sheard (Versofy), interview by authors, 16 July 2024.

[57] Cameron Gough (FirstRand), interview by authors, 22 July 2024

[58] Cameron Gough (FirstRand), interview by authors, 22 July 2024

2.5.3 The tariffs currently offered by electricity distributors to owners of distributed generation do not provide sufficient incentive to export surplus or stored power to the grid

The current tariff structures offered by municipal distributors to residential customers who install distributed generation and storage do not provide them with an incentive to:

i. Reduce consumption of grid-supplied power in peak periods

ii. Export surplus power generated to the grid.

While 71 of the 165 municipal electricity distributors in South Africa allow customers connected to their distribution networks to install distributed generation (with or without a formal application process), only 41 have developed embedded generation tariffs to enable them to credit customers for excess electricity exported onto their distribution networks.[59] Notably, only ~8 of municipal distributors have started implementing these esxport tariffs.[60]

Furthermore, nearly all 41 municipal distributors that offer residential embedded generation tariffs offer export credits at a flat rate of between 32 c/kWh and 130 c/kWh (average of 86.9 c/kWh). Offering households who own distributed generation (DG), such as Solar PV systems, a Time of Use (ToU) tariff might be preferable because it incentivises the owners of DG to align their use of energy with their generation or to store it or use it when overall grid demand is high thereby improving grid stability and reducing system costs.

Patrick Narbel, the co-founder of GoSolr, noted that the introduction of standardised time-of-use-based tariffs across all municipal distributors (for consumption and export) and financing of the replacement of utility-side meters with smart meters (see section below) would significantly strengthen the financial incentive for households and small businesses to invest in embedded generation. "*We don't need to have like feed-in premium or a feed-in tariff or anything like this just to get in there. The economics and the business case are there. … [Y]ou can be a net generator and not just a net consumer, which would change fundamentally the way we build our installation… I believe [this] allows us to start tackling lower SLSM without any type of support for first loss or anything like that. That revenue [from exports] would give us the insurance we need to go there.*"[61]

ToU-based tariffs encourage customers to use electricity when overall system demand and the cost of generation are relatively low. Residential customers with Solar PV tend to generate electricity during the middle of the day but are more likely to consume electricity in the mornings and evenings. This creates a mismatch between demand and supply. A ToU-based tariff structure incentivises households with DG to store the energy they generate in the middle of the day and use it or export it when demand and prices are higher. This not only contributes to grid stability but also reduces the need for costly grid expansions and the use of relatively expensive (and often more carbon-intensive) peaking plants.

Exporting power and/or reducing consumption of grid-supplied power at peak times will also improve the financial return that residential customers receive on their investment in distributed generation.[62]

2.5.4 *Upfront costs of grid connection and installation of a smart meter*

Another factor that discourages DER owners from registering their systems and exporting power to the grid is that all electricity distributors in South Africa expect households/small businesses who install DERs to cover the upfront

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[59] SALGA, *Status of Embedded Generation in South African Municipalities*.

[60] Sustainable Energy Africa (2024), *Embedded Generation and Wheeling Dashboard.*

[61] Patrick Narbel (GoSolr), interview by authors, 19 September 2024.

[62] Ross Main-Sheard (Versofy), interview by authors, 16 July 2024.

costs of grid connection and the replacement of their existing utility-side electricity meters with smart meters. This can cost the customer up to R13 000 incl. VAT (cost varies by municipality), plus installation costs and an additional monthly subscription fee for the management of the meter.[63]

An alternative would be for the distribution network operator to finance all or a portion of the upfront installation and meter replacement costs and recover these costs gradually via the tariff (as it does for all other network infrastructure) In some municipalities, customers who elect to export power to the grid are also required to switch to a tariff category with higher fixed charges, which effectively erodes their energy cost savings (relative to not switching) and acts as a further disincentive to export the surplus power they generate to the grid.

Patrick Narbel from GoSolr noted that Norway had recently replaced all three million of its electricity meters with high-quality smart meters at an average cost of R3 000 and questioned why these devices cost up to R10 000 in South Africa.[64] He maintains that customers should not be expected to finance infrastructure on the utility side of the meter (including the meter). He noted that while GoSolr is willing to extend finance to customers for the replacement of the utility meter, the utility owns the meter and should ideally finance the smart meter and recover the costs via the tariff, as with all utility infrastructure.

2.5.5 Limited government incentives – tax rebates and the Energy Bounce-Back loan guarantee

The government has provided limited incentives for the purchase of Solar PV systems by households and small businesses. The only direct incentive for households was a time-limited tax rebate on the value of solar panels purchased, which was launched in February 2023 and expired in March 2024. The residential tax incentive allowed individuals to receive a tax rebate of 25% of the cost of new solar panels installed between 1 March 2023 and 29 February 2024. The rebate will offset the income tax liability of the individual up to a maximum of R15 000. To qualify for this rebate, the panels needed to have been installed on a private residence, and the customer needs to submit a certificate of compliance to show that the installed system complies with SSEG regulations.[65]

The government has provided more generous direct incentives for the uptake of Solar PV and battery storage by small and medium-sized businesses. Since 2016, registered businesses have had access to a tax incentive for small-scale Solar PV under Section 12B of the Income Tax Act. For systems less than 1 MW, businesses were able to claim 100% of the solar PV system cost as a deduction against their taxable income, and for systems larger than 1 MW, the deduction is spread over three years: 50% of the cost in the first year, 30% in the second, and 20% in the third.

In 2023, the National Treasury provided for a more generous depreciation allowance under Section 12BA of the Income Tax Act. The more generous allowance enables businesses to claim an upfront deduction of 125% of the cost of all renewable energy projects against their taxable income. The more generous allowance, however, is time-limited and is available for two years from 1 March 2023 up to and including 28 February 2025. The objective of the policy is to encourage more generation capacity on the grid. As such, the inclusion of storage in the benefit is only applicable if the asset forms part of a system that generates electricity (e.g., charged via Solar PV).[66]

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[63] Representatives from the City of Cape Town SSEG team, discussion with authors, 6 September 2024.

[64] Patrick Narbel (GoSolr), interview by authors, 19 September 2024.

[65] National Treasury of South Africa, *Frequently Asked Questions: Solar Panel Tax Incentive for Individuals* (2023), https://www.treasury.gov.za/documents/national%20budget/2023/2023%20budget%20faqs%20-%20solar%20panel%20tax%20incentive.pdf.

[66] National Treasury, "Enhanced Renewable Energy Incentive for Businesses," (2023). https://www.treasury.gov.za/comm_media/press/2023/2023112001%20FAQ%20Enhanced%20renewable%20energy%20incentive%20for%20businesses.pdf.

The government is also providing some indirect support for households and businesses that want to raise finance to install Solar PV systems via the Energy Bounce-Back Scheme (EBBS). Under this scheme, the government, through a guarantee administered via the South African Reserve Bank, will assume the first part of any loss (20%) in the event of default, on any loan extended to small and medium enterprises or households for the installation of rooftop Solar PV, batteries, inverters, etc.

As such, the EBBS was designed primarily to improve access to credit to finance Solar PV and storage by enabling participating financial institutions to increase their capacity to extend credit to existing borrowers and/or extend credit to riskier categories of borrowers (than they would have without the risk mitigation mechanism). The EBBS could also have helped to reduce the cost of credit, but only if banks, in response to reduced risk exposure, were prepared to reduce their risk premium and offer the borrower lower interest rates.

The EBBS was set to expire at the end of August 2024, but will be available to customers between February 2025 and May 2025, depending on when the bank first entered the scheme.[67]

[67] Hanno Labuschagne, "Good news for solar loans in South Africa," *MyBroadband* 2024, https://mybroadband.co.za/news/energy/556913-good-news-for-solar-loans-in-south-africa.html.

3. Sizing the potential market for Solar PV systems

3.1 Segmenting and sizing the residential market for rooftop solar PV and storage

3.1.1 Introduction and data sources

In this section, we estimate the potential size of the market for Solar PV systems in the residential sector.

We began by analysing the **residential market**, based on data on the income, expenditure and dwelling types of the ~19 million households in South Africa, obtained primarily from the following sources:

- **The General Household Survey (GHS)** published by Statistics South Africa in 2024 – data on average household expenditure and dwelling types for the survey conducted in 2023.[68]
- **The Household Income and Expenditure Survey** or Living Conditions Survey, published by Statistics South Africa in 2016 (most recent), provides data on average household expenditure.
- Statistics South Africa **database on consumer prices –** Data on total household expenditure by decile and the proportion each decile spends on electricity.

3.1.2 Approach

To estimate the potential size of the market for Solar PV systems in the residential sector, we segmented the ~19 million households in South Africa into six groups based on three factors:

(i) **Access to grid-supplied power and pay for electricity** – we exclude households that do not currently have access to grid-supplied power and those households that do not currently pay for the electricity consumed (presumably because they are recipients of the free basic electricity grant).

(ii) **Ability to pay** – using average monthly household expenditure to assess the ability to pay for or finance the purchase of a Solar PV system

(iii) **Dwelling type** – distinguishing between (i) single or multi-dwelling homes, and (ii) dwelling structures (roof and walls) that are compatible or incompatible with the installation of a Solar PV system.

Step 1: Exclude households that lack grid access or do not pay for the electricity they consume

To estimate the potential size of the market for Solar PV systems in the residential sector, we began by identifying the number of households that do not currently have access to grid-supplied electricity or who do not pay for the electricity they currently consume (Figure 10). Data from the GHS suggests there are ~4.4 million households that lack grid access or are not paying for the electricity they currently consume; these are excluded from the potential market for grid-tied and/or hybrid rooftop Solar PV systems (as they do not have a grid connection or cannot afford to pay for electricity).

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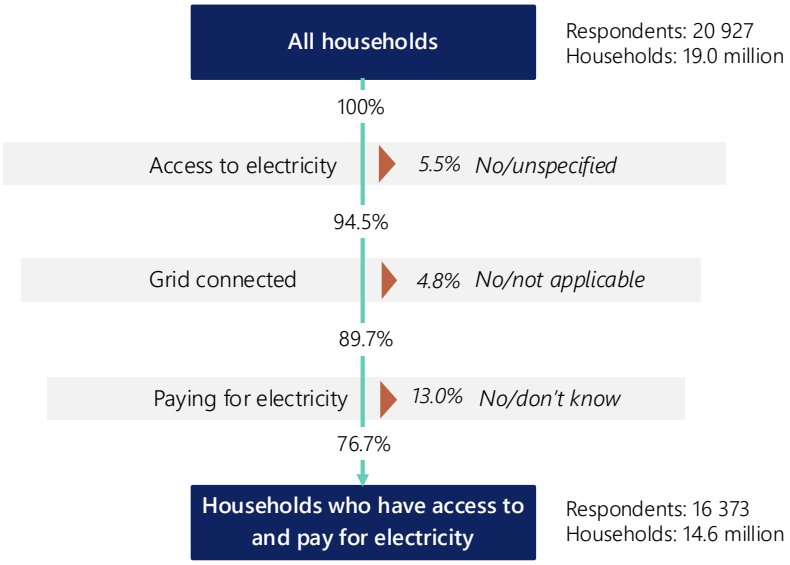
[68] The GHS is an annual household survey which measures the living circumstances of South African households. Data is collected via a household questionnaire. The results from the survey are weighted so that the responses are able to be properly expanded to represent the population of South Africa. The sample weights account for the following: the original selection probabilities (design weights), adjustments for primary sampling units (PSUs) that were sub-sampled or segmented, excluded population from the sampling frame, non-response, weight trimming, and benchmarking to known population estimates from the Demographic Analysis Division within Stats SA.

Figure 10. Exclude households that are not grid-supplied or pay for electricity from the potential market for Solar PV systems



Source: Nova Economics based on Statistics South Africa 2023 General Household Survey.

Step 2: Identify the proportion of these households that can afford to install a standalone Solar PV system

We then used insights from representatives of banks and ESCos serving the current residential market (including Wetility and Versofy) to identify the proportion of households that can afford to purchase or enter into a lease or subscription agreement to install the integrated Solar PV, energy efficient (EE) and storage system they currently offer.

Representatives of banks and ESCos noted that for standalone installations, they currently target households and small businesses who spend a minimum of R1 500 per month on electricity on average, which at a retail tariff of ~R3.50/kWh amounts to ~430 kWh per month. They noted that households that consume less than 430 kWh of power a month are unlikely to be able to afford (or be willing to pay for) even their entry-level leasing and/or subscription financing arrangements, which for the smallest Solar PV+BESS system start at ~R1 399 per month.[69, 70]

Vincent Maposa, the CEO of Wetility, noted that their current product offering targeted two household segments:[71]

i. **"Lower-middle income households",** which they defined as those that earn or spend a monthly average of more than R10 000.

ii. **"Middle-to-high income households",** which they define as earning or spending a monthly average of more than R30 000.

Jochemus Hamman from Capitec bank concurred, noting the total cost of installing a typical standalone Solar PV system for households starts at a minimum of R80 000 and that, as such, very few households with a total budget of less than R10 000 a month would be unable to finance a system like this, let alone purchase it outright. He noted

[69] Ross Main-Sheard (Versofy), interview by authors, 16 July 2024.
[70] Vincent Maposa (Wetility), interview by authors, 15 July 2024.
[71] Vincent Maposa (Wetility), interview by authors, 15 July 2024.

that clients of Capitec bank (the majority of which are generally lower income and spend less than R10 000 per month) are currently spending an average of R10 to R15 when they purchase pre-paid electricity, "*It's literally, … to keep the lights on for the evening. That's it.*"[72]

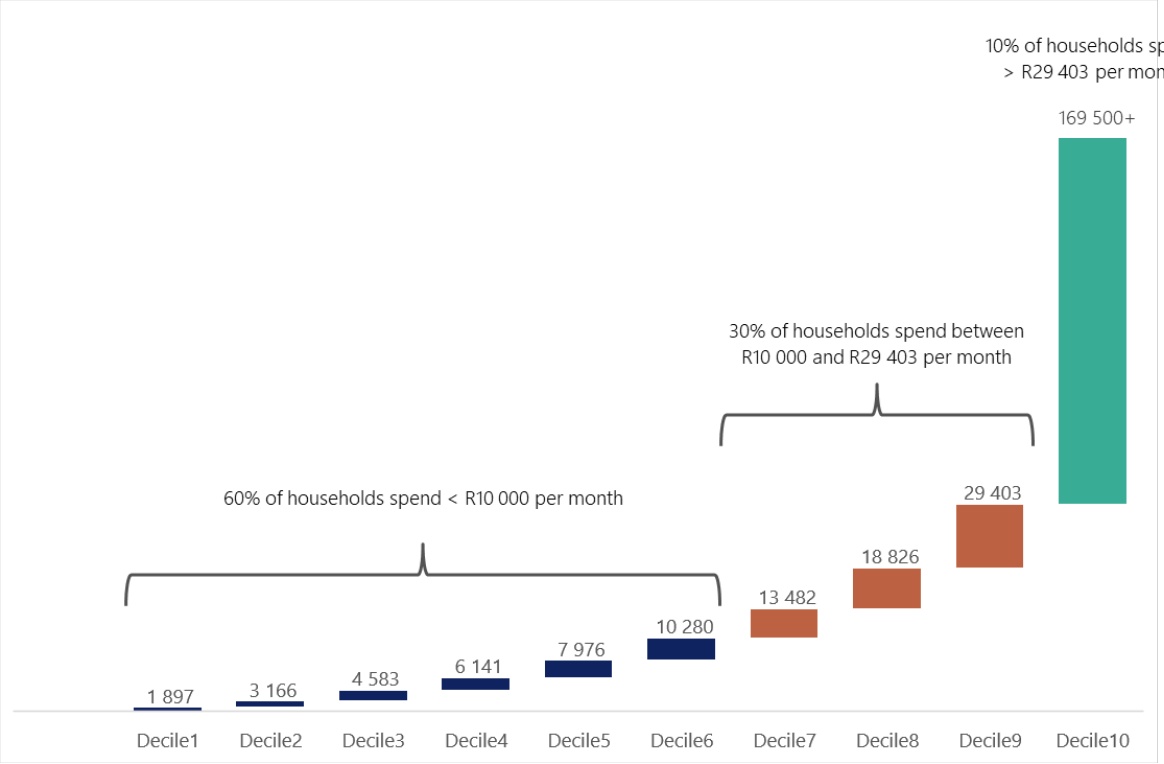
We obtained data on the total average monthly household expenditure by decile from the Household Income and Expenditure Survey (IES) published by Statistics South Africa in 2016 (most recent available) and inflated these to 2023 values (Figure 11). An explanation of how household expenditure deciles align with living standard measures (LSMs), which is another measure used to classify households according to their standard of living and disposable income, is provided in Box 2.

Data on the amount that households in each decile spend on electricity (as a percentage of their total monthly expenditure) are presented in Figure 12. Based on this data, we segmented the ~14 million households that are grid-connected and report they pay for electricity into the following three 'income' groups:

- **Low-income households**: Comprising roughly 60% of South African households, these households spend a total of less than R10 000 a month. As such, they are unlikely to be able to afford to lease or purchase a standalone Solar PV system. These households spent between ~4.4% (decile 6) and ~15% (decile 1) of their total monthly household budget on electricity in 2014/15, which suggests they spend between R10 and R500 a month on electricity.
- **Lower-middle-income households**: About 30% of South African households spend between R10 000 and ~R30 000 a month. These households, which we refer to as "lower-to-middle income", are unlikely to be able to afford to purchase a system outright, but according to ESCos, are often able to obtain credit approval to install a Solar PV system on a lease or subscription basis. These households were spending between ~3.7% (decile 9) and ~4.6% (decile 7) of their total monthly household budget on electricity in 2014/15 – we estimate they currently spend between R650 and R2 100 a month on electricity.
- **Middle-to-high-income households**: The remaining 10% of South African households in the top expenditure decile spend more than R30 000 a month. These households may not be able to afford to purchase a system outright, but would generally be able to raise finance from a bank to purchase a Solar PV system or would be likely to obtain credit approval to enter into a lease or subscription agreement. These households were spending between ~2.5% of their total monthly household budget on electricity in 2014/15 – which means (if they haven't installed a Solar PV system) that they would currently be spending between R800 and R4 500+ a month on electricity.

[72] Jochemus Hamman (Capitec), interview by authors, 15 July 2024.

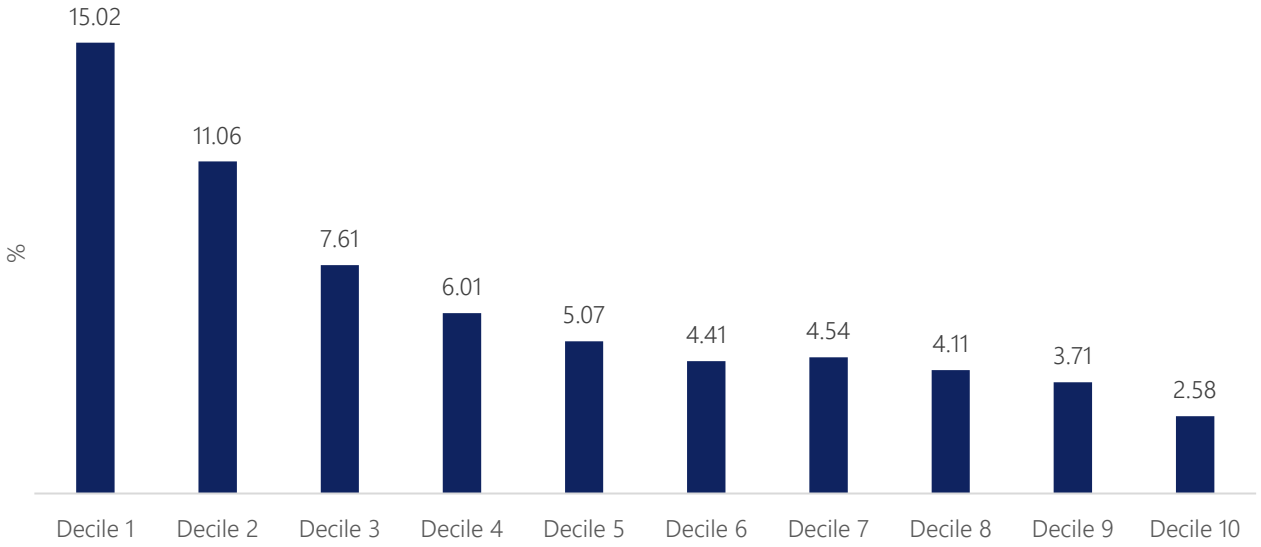
Figure 11. Total monthly household expenditure by decile, Rands, 2023 values



Note: The values provided are the upper limits of the various deciles and the starting value for the subsequent decile.

Source: Nova Economics, based on data from Statistics South Africa

Figure 12. Electricity as a proportion of total household expenditure by decile in 2014/15*



Note: *The values obtained from the Household Income and Expenditure Survey that Statistics South Africa conducted in 2014/15 and published in 2016. Stats SA will conduct another IES in 2022/23, but the results have not yet been released.

Source: Nova Economics, based on data from Statistics South Africa IES 2016.

Box 2. Illustrating how household expenditure deciles align with other Living Standards Measures (LSMs)

As discussed above, we have used household expenditure deciles to segment the potential market for distributed energy resources. Another measure often used by market research and consumer research agencies in South Africa to segment households into ten groups according to their socioeconomic status or disposable income is the Living Standards Measure (or LSMs). In 2018, however, the Living Standards Measure (LSM) survey was replaced with the Socio-Economic Measurement (SEM) survey and segmentation approach.

In Figure 13, we illustrate how the three different measures compare. The ten household expenditure deciles classify South African households into ten equal groups based on their average gross household expenditure, with the first decile representing the 10% of households that spend the least and the top decile representing the 10% that spend the most. The expenditure deciles do not reflect differences in the no. of adults in each household only the total number of households in each decile, so we made the simplifying assumption that there are an average of 2.2 adults in each of the 19 million households in SA so we can compare the distribution with other two measures which reflect of the adult population aged 15 years or older.

Until 2018, a non-profit organisation, the South African Audience Research Foundation (SAARF), conducted a survey to measure household living standards and classify South Africa's adult population into ten groups according to criteria such as urban or rural location and ownership of assets such as cars and major durable appliances. Under the LSM measure, most households were clustered around the mean, falling into LSMs 5, 6 and 7, with very few households falling into the lower LSM groups.

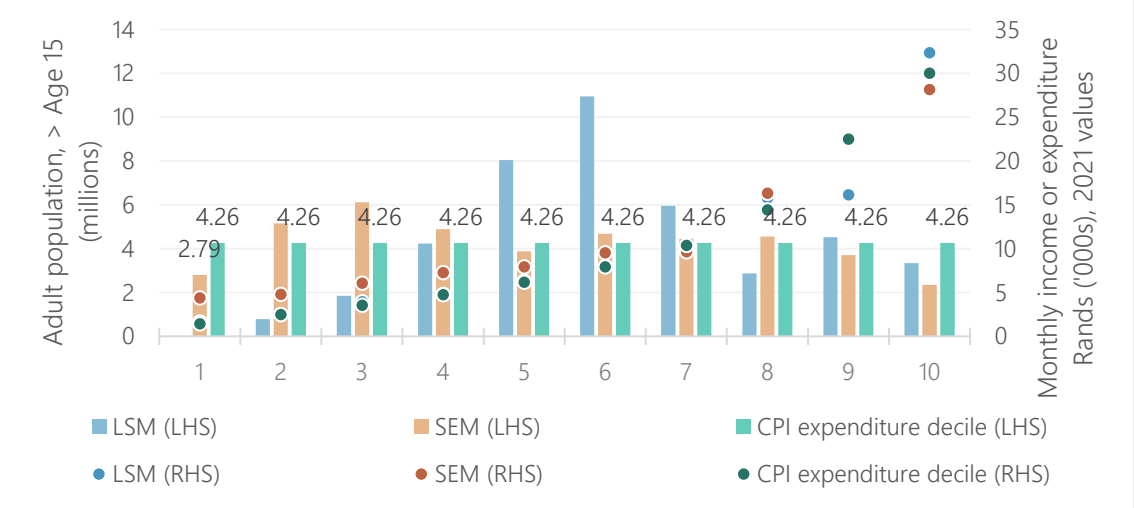
After the closure of the SAARF, a new household segmentation tool and survey known as the Socio-Economic Measure (SEM) was launched under the ambit of Broadcast Research Council of South Africa (BRC), which depicts how South Africans live – based on what goods and services they have access to in their homes (e.g., deep freezer, washing machine, and motor car) and near their homes (e.g., police station and post-office) and the nature of their dwelling (.e.g., no. of rooms and roof material).[73] Like household expenditure deciles, the SEM yields a more even distribution of the South African population across ten groups with SEM 1 representing the 2.8 million adults (6.5% of the total adult population of ~42 million) living in the poorest households and SEM 10 the 2.3 million (or 5.4%) living in the most affluent households.[74]

The SEM and LSM surveys ask participants to report which income category their gross household income falls into, as many people are not comfortable reporting their detailed income. We took the midpoint of the reported income groups to estimate the weighted average of household income for each SEM and LSM Category and then roughly compared gross income with average expenditure in the household expenditure deciles. Note that all values are given in 2021 Rands. The average household income reported per SEM is consistently higher than the average household expenditure, as one would expect.

[73] Kantar TNS, *The Establishment Survey*, The Broadcast Research Council of South Africa (2020), https://brcsa.org.za/es-technical-report-jul-dec-2019/.

[74] "The transition from LSMs to SEMs explained - Adcomm Media," ADcomm, updated 2017-04-12, 2017, accessed 13-08-2024, https://adcomm.co.za/the-transition-from-lsms-to-sems-explained/.

Figure 13. SEM, LSM, and CPI expenditure decile comparison by number of individuals and monthly household income



Notes: The income values for the LSM and SEM were calculated by taking the average income bracket midpoints, weighted to the number of households in each income bracket. The CPI expenditure values represent the upper bound of that decile; however, the tenth decile does not have an upper bound. As such, this value was chosen to match that of the LSM and SEM, purely for illustrative purposes.

Source: Nova Economics, based on LSMs and SEMs extracted from Eighty20 (June 2021), and expenditure deciles published in StatsSA December 2021 Consumer Price Index publication.

Step 3: Segment the residential market based on dwelling type

Finally, we segmented households (the ~14 million that are grid-connected and currently pay for electricity) based on the type of dwelling they currently occupy, distinguishing between:

- **Single dwelling units (SDUs)** include freestanding homes or cluster homes acquired with freehold ownership (where the buyer enjoys outright ownership of the land, buildings, and rooftops).
- **Multi-dwelling units (MDUs)** – flats, apartments and townhouses acquired with sectional title ownership. Under sectional title ownership, **common areas** such as rooftops, gardens, parking lots and other shared amenities are co-owned by all the unit owners and the **body corporate** or **homeowners' association (HOA)** must approve any changes or improvements to or on common property, such as the installation of a Solar PV system.
- **Dwellings that cannot accommodate a standard rooftop Solar PV installation – these include** traditional dwellings, informal dwellings, and other dwellings that are structurally unsuitable and have walls/roof types that would not be able to accommodate a rooftop Solar PV system (e.g., have mud walls or thatched roofs).

3.1.3 Results – the potential size of the market for residential Solar PV systems

The results of the market segmentation show our estimate of the size of the potential market for residential rooftop Solar PV and storage, in terms of the number of households that live in a suitable dwelling and have sufficient income to pay for the installation of a Solar PV system, are presented in Figure 15. Of the total of seven segments, four segments fall within the "addressable market" – these are highlighted in green.

We estimate that **~4.07 million households** are living in compatible single-dwelling units that can also afford to install a standalone Solar PV system on a purchase, lease or subscription basis. We estimate that a further **810 000**

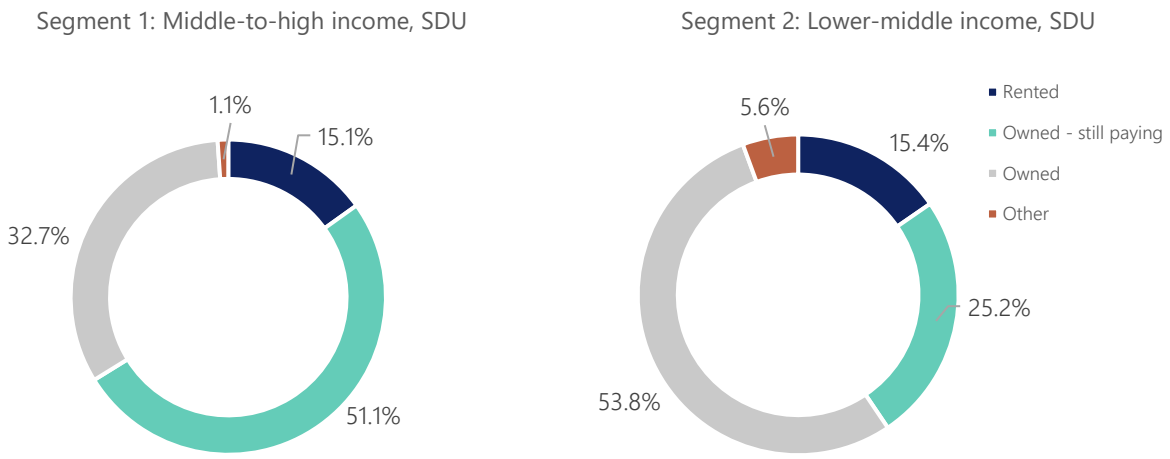
households are living in multi-dwelling units that could afford to contribute to the installation of a jointly owned distributed generation and storage system. The total potential size of the market for standalone residential installations is therefore ~4.07 million individual systems. The potential size of the market in terms of the number of installations on multi-dwelling units is more difficult to estimate, as the average number of apartments in sectional title units in South Africa can range from fewer than 10 to more than 500, so the total number of installations could range from anything between 1 620 and 81 000.

The **total potential market for standalone residential systems,** in turn, comprises:

- **Segment 1:** There are ~1.1 million households in the **"middle-to-high income, SDU"** segment who spend an average of more than R30 000 a month and who live in a single dwelling with free title ownership. Data from the GHS suggests that ~55.0% of these households were spending an average of more than R1 500 on electricity per month in 2023. Most of these households (84%) report that they own their homes, and half (51%) are currently paying off a home loan, while only 15% are renting their homes (Figure 14).

- **Segment 2:** There are ~2.95 million households in the **"Lower-middle income, SDU"** segment who spend an average of between R10 000 and R30 000 a month and who live in a single dwelling with free title ownership. Data from the GHS suggests that ~28.0% of these households were spending more than R1 500 on electricity per month in 2023. Most of these households (79%) report that they own their homes, but only a quarter (25%) are currently paying off a home loan, while only 16% are renting their homes (Figure 14).

Figure 14. Dwelling ownership in the addressable market for standalone residential systems



Source: Nova Economics, based on data from the Statistics South Africa 2023 General Household Survey and 2016 Income and Expenditure survey.

The **total potential market for residential systems on multi-dwelling units,** in turn, comprises:

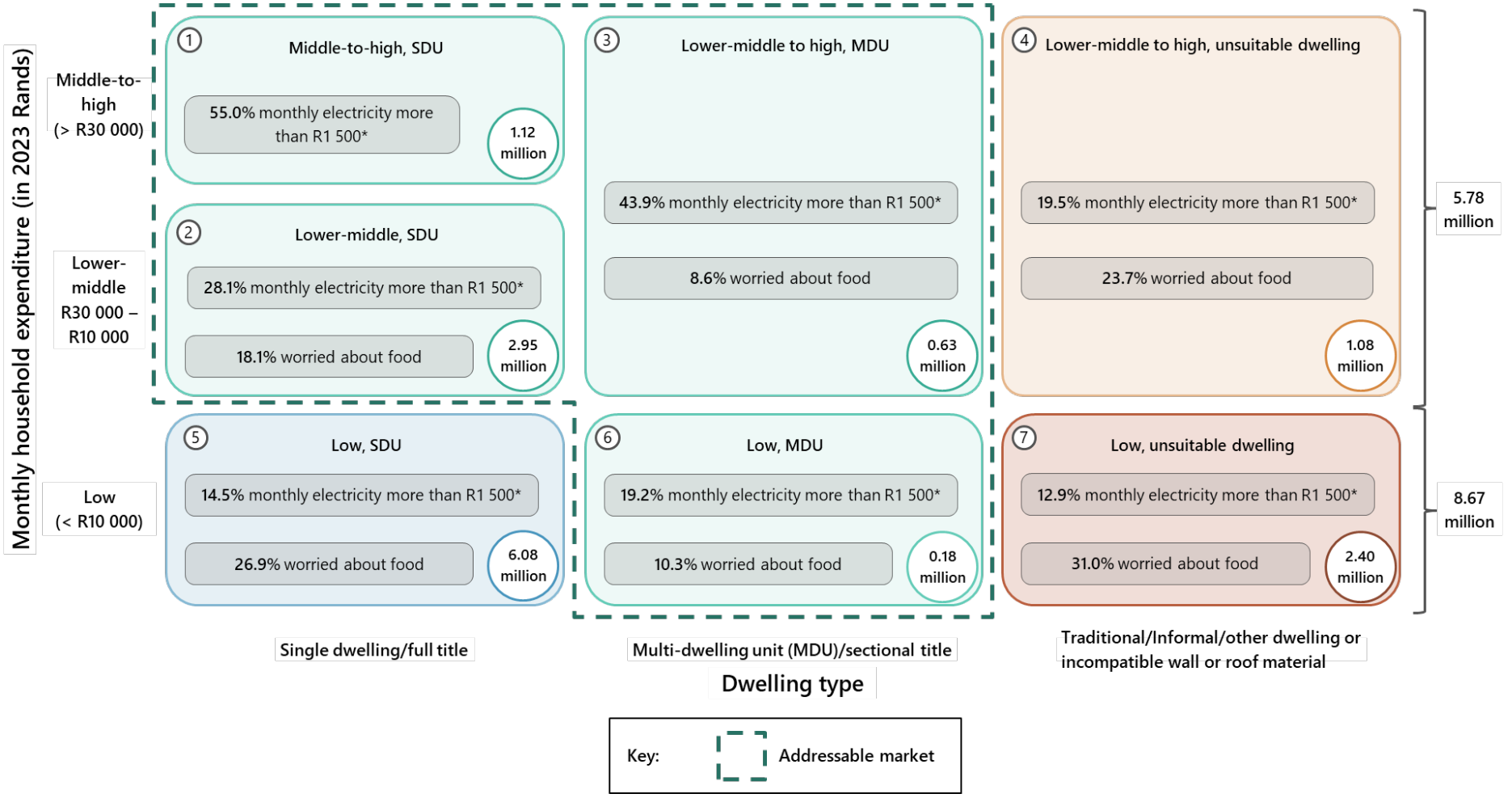
- **Segment 3:** There are **630 000** households in the **"low to high income, MDU"** segment who spend an average of more than R10 000 a month and who live in sectional title properties. Data from the GHS suggests that ~43.9% of these households were spending an average of more than R1 500 on electricity per month in 2023. Sales of distributed generation and storage systems to this segment would likely be facilitated via the body corporates of each sectional title development or for new developments via property developers.

- **Segment 6:** There are **180 000** households in the **"Low-income, MDU"** segment who spend an average of less than R10 000 a month and who live in sectional title properties. Data from the GHS suggests that ~19% of these households were spending more than R1 500 on electricity per month in 2023. Sales of distributed generation and storage systems to this segment would likely be to the landlords/owners of existing affordable or social housing developments or the developers of affordable or social housing properties.

We estimate there are approximately **1.08 million lower-middle-to-high-income households** (represented by Segment 4) who we estimated based on their average expenditure alone could afford to purchase a grid-tied Solar PV system (or contribute towards the purchase of a joint system) but that currently live in dwellings that are not structurally suited to the installation of a rooftop Solar PV system. However, only 19.5% of these households currently spend more than R1 500 a month on electricity, while ~24% reported that there were times in the past 12 months when they were worried about not having enough food to eat because of a lack of money or other resources. This suggests that despite having similar total monthly expenditures to households in segments 1, 2 and 3, they are likely to be much larger households on average and therefore have much lower per capita incomes.

We estimate there are a further **8.5 million low-income households** (segments 5 and 7) who cannot afford to purchase or pay off a grid-tied Solar PV system, even though 72% of these live in a dwelling that is suitable for the installation of a standalone system. Approximately a third (30%) of households in these two segments reported that there were times in the past 12 months when they were worried about not having enough food to eat because of a lack of money or other resources. And only 14% of these households report they spend more than R1 500 a month on electricity.

Figure 15. The size of the addressable market for residential rooftop Solar PV and storage systems



*Note: The percentages in the figure represent the share of households in that expenditure and dwelling group. The number of households is given in the circles, while the blue dashed line represents the segments that are in the target segment. * Based on the electricity share of monthly expenditure from the Income and Expenditure Survey.*

Source: Own creation based on Statistics South Africa 2023 General Household Survey and 2016 Income and Expenditure survey.

3.1.4 Estimating market penetration rates

Data from the 2023 General Household Survey, which was conducted between January 2023 and December 2023, suggests that approximately 10.5% of the 1.12 million middle-to-high income households living in SDUs have already installed a Solar PV system (117 000 households) (Table 3 and Figure 16). While 3.1% of the 2.95 million lower-middle income households living in SDUs (91 000 households) had already installed a system.

According to the results of the GHS, only 2% of the 630 000 lower-middle to high-income households living in MDUs (13 000) have a system installed on their properties (Table 3 and Figure 16).

These market penetration rates are significantly lower than what Wetility, an ESCo that exclusively services the Gauteng market, reported. Vincent Maposa estimated in July 2024 that ~50% of middle to high-income and 20% of lower-middle-income households in Gauteng had already installed Solar PV.[75] His significantly higher estimate of market penetration rates may, however, in part reflect the fact that between 50% and 60% of all residential Solar PV systems installed in South Africa have been installed in Gauteng (Table 4).

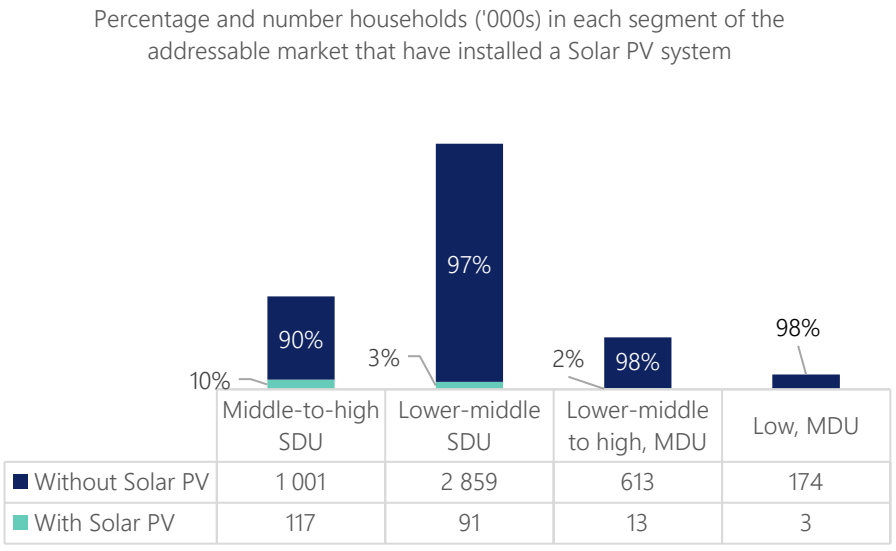
According to the results of the GHS, the average penetration of the low-income market for Solar PV systems is 0.6% while a slightly higher proportion of those living in multi-dwelling units (0.7%) reported they had Solar PV systems on their properties. This is more or less in line with Wetility's estimate of less than 2%.

Table 3. Solar PV penetration in the residential market by monthly expenditure group

Dwelling type	Monthly expenditure group			Total
	Low	Lower-middle	Middle-to-high	
Single dwelling/full title	0.7%	3.1%	10.5%	3.0%
All dwelling types	0.6%	2.4%	9.0%	2.4%

Source: Nova Economics, based on data from Statistics South Africa's 2023 General Household Survey.

Figure 16. Residential Solar PV system market penetration rates, 2023



Source: Nova Economics, based on data from Statistics South Africa 2023 General Household Survey and 2016 Income and Expenditure Survey.

[75] Vincent Maposa (Wetility), interview by authors, 15 July 2024.

While we were not able to estimate market penetration rates by province, estimates of the share of the Solar PV installed by households are provided in Table 4. These estimates suggest that between 50% and 60% of all residential Solar PV systems installed in South Africa are in Gauteng, while between 24% and 31% are installed in the Western Cape. The top ten municipalities account for 76.3% of the 621 MWp installed by residential customers in South Africa, according to estimates published in the SALGA report on the status of embedded generation for the first quarter of 2023.[76]

Table 4. Distribution of residential Solar PV capacity installed by the province

Province	GHS (2023) % of households that reported they installed Solar PV	SALGA (2023Q1) % of total capacity installed across the top ten municipalities
Western Cape (WC)	23.4%	31.1%
Eastern Cape (EC)	3.8%	2.4%
Northern Cape (NC)	3.5%	
Free State (FS)	3.2%	2.8%
KwaZulu-Natal (KZN)	5.2%	3.6%
North West (NW)	5.7%	
Gauteng (GP)	50.5%	58.0%
Mpumalanga (MP)	2.6%	2.0%
Limpopo (LP)	2.1%	

Note: The data published by SALGA is based on estimates by GeoTerra Image. They aggregated installed capacity for the residential sector (system size less than 30 kWp) for the top ten municipalities. We then aggregated this to the provincial level.

Source: Nova Economics, based on Statistics South Africa's 2023 General Household Survey and SALGA Status of Embedded Generation in South African Municipalities report (December 2023).

3.2 Sizing the potential market for Solar PV systems among small businesses

3.2.1 Estimating the number of small businesses in South Africa

In terms of the National Small Business Amendment Act 26 of 2003, small, medium and micro enterprises (SMMEs) can be defined either in terms of the value of their annual turnover, the number of full-time employees or the gross value of their assets excluding fixed property. However, the classification in terms of these criteria differs by industry since agricultural businesses (which of all industries had the lowest turnover limits) typically have much lower turnover relative to profit than enterprises in the wholesale retail trade (which had the highest turnover limits).

For example, in 2003, an agricultural business with a turnover of between R0.5 and R3m was classified as a small business. A small business in the wholesale/retail trade, by contrast, would have had a turnover of between R6m and R32m.

Inflated to 2023 values, a small agricultural business would be defined as an enterprise with an annual turnover of between R1.4m and R8.4m, while a small wholesale/retail trade business would be defined as having an annual turnover of between R16.9m and R89.9m.

[76] SALGA, *Status of Embedded Generation in South African Municipalities*.

Therefore, in terms of the National Small Business (NSB) Amendment Act of 2003:

- **A small business** would be defined as an enterprise with an annual turnover of less than **R8.4m on the lower end of the spectrum or R89.9m o**n the upper end (both expressed in 2023 values), depending on which sector the business operates in.

- **A very small business** would be defined as an enterprise with an annual turnover of less than **R1.4m on the lower end of the spectrum or R16.9m** on the upper end (both expressed in 2023 values), depending on which sector the business operates in.

Table 5. The classification of businesses by size in terms of annual turnover limits, 2003 vs 2023 values

	As defined in the National Small Business Amendment Act 26 of 2003			
Enterprise size	Annual turnover must be less than the given value…			
	Rm, 2003 values		Rm, 2023 values	
	Agriculture	Wholesale and retail trade	Agriculture	Wholesale and retail trade
Medium	5	64	14.1	179.8
Small	3	32	8.4	89.9
Very small	0.5	6	1.4	16.9
Micro		0.2		0.6

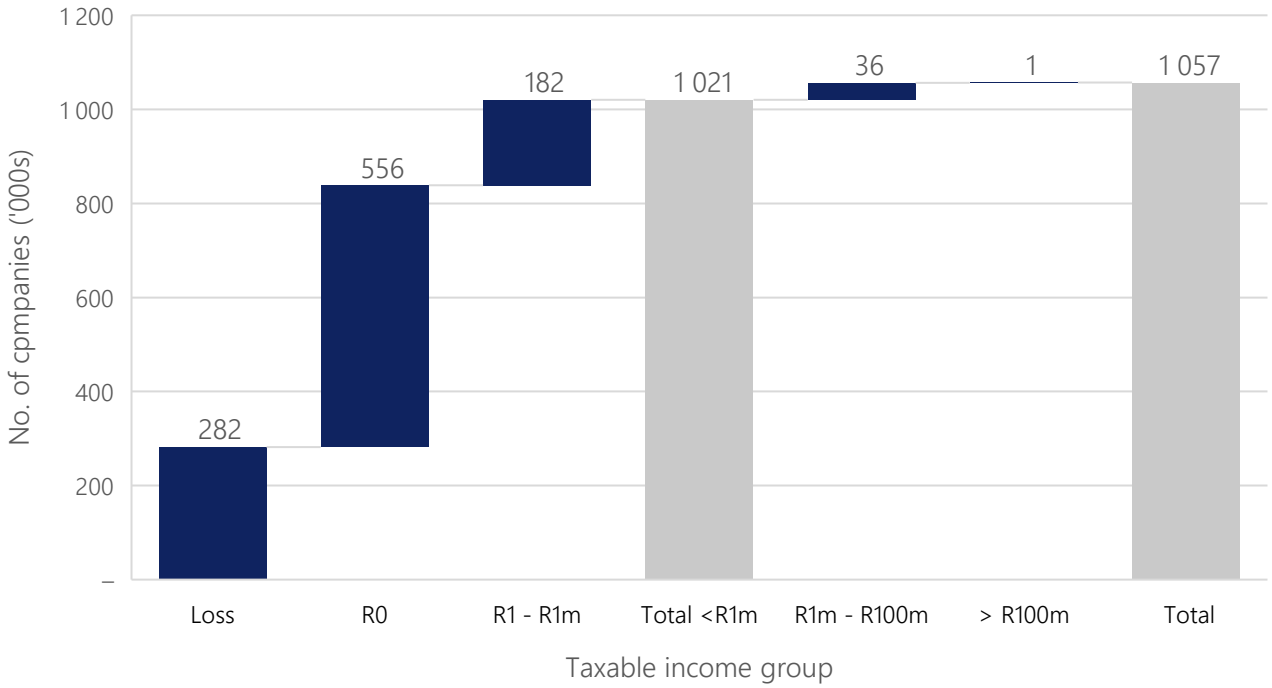
However, while these classifications were stipulated in the NSB Amendment Act, they have not been consistently applied by either the public or private sector.

According to data published by the South African Revenue Service, there were **3.93 million companies registered** with the Companies and Intellectual Property Commission (CIPC) in South Africa in the year ending March 2023. However, not all of the 3.9 million registered companies are actively trading. Many of these companies are registered but are not currently conducting business activities. While CIPC collects on registered companies in South Africa, including their trading status, the data is not publicly available.[77]

The South African Revenue Service (SARS) reports that of the ~3.9 million registered companies, **1.057 million submitted tax returns** (i.e., were registered taxpayers) in the 2020/21 tax year. Of those, the vast majority (97% or 1.02 million) generated taxable income (gross profit) of less than R1 million in the 2020/21 fiscal year.

[77] National Treasury of South Africa and South African Revenue Service, *Tax Statistics 2023* (2023), https://www.sars.gov.za/wp-content/uploads/2023-Tax-Statistics-Main-Publication-compressed.pdf.

Figure 17. Companies that submitted tax returns in the 2020/21 fiscal year, grouped by gross profit



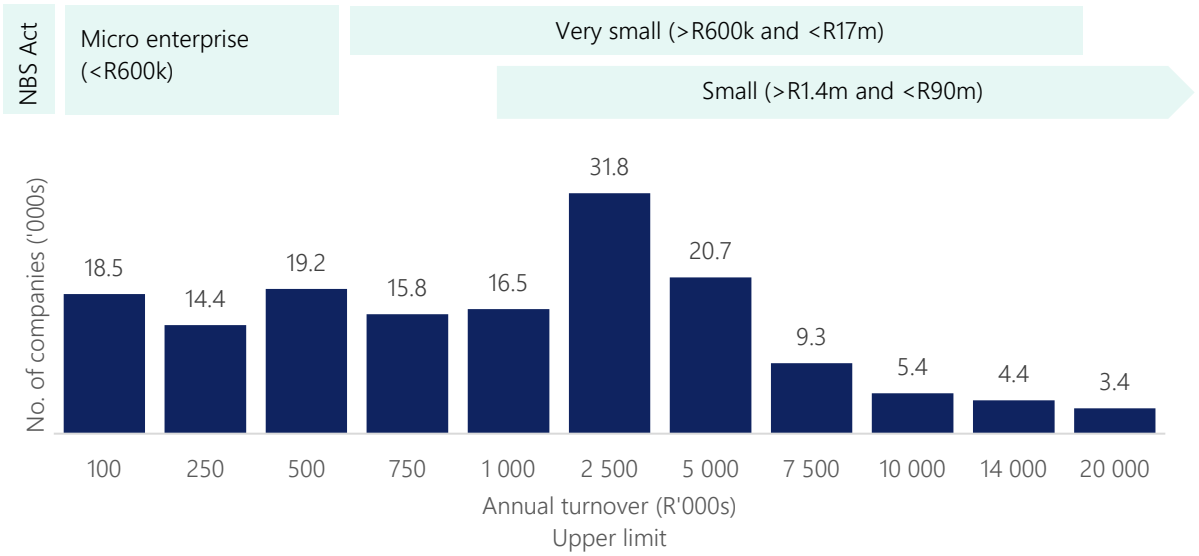
Source: Author's own creation based on National Treasury of South Africa and South African Revenue Service, Tax Statistics 2023.

It is not possible to determine exactly what proportion of the 1.02 million companies that recorded less than R1m in gross profit qualify as small businesses in terms of the NBS Act thresholds, as SARS does not report their annual turnover.

However, SARS notes that **159 307 (~16% of the 1 million)** were assessed as Small Business Corporations (SBCs) in the 2020/21 tax year. Companies registered as SBCs have **an annual turnover of less than R20 million per year** *and* are registered as either a private company, closed corporation or co-operative (excludes those small businesses registered as sole proprietorships or partnerships).

More disaggregated data provided by SARS on SBCs shows that ~107 000 SBCs (67% of the total) had annual turnover over R500 000, which would mean they are classified as "small" or "very small" in terms of the NBS Act turnover thresholds (Figure 18). In addition, data from SARS reveals that just over half 87 000 (56%) of SBCs made a gross profit (profit before tax) in the 2020/21 year, while the other ~44% made a net loss (1 300 reported zero gross profit). Only 3 392 (2%) of SBCs generated gross profits in excess of R1 million in the 2020/21 fiscal year.

Figure 18. Number of companies assessed as SBCs, grouped by annual turnover 2020/21



Note: The values provided are the upper limits of the particular group and the starting value for the subsequent group. The definitions of micro, very small are in terms of annual turnover thresholds defined in the NBS Act and inflated to 2023 values.

Source: SARS 2023 Tax Statistics for the 2021 tax year.

3.2.2 Sizing the potential market for standalone Solar PV systems for small businesses

In summary, it is difficult to ascertain how many of the 3.9 million companies registered in South Africa are actively trading and how many of the 1.06 million businesses that submitted tax returns in the 2020/21 tax year would qualify as small businesses in terms of the criteria defined in the NBS Act. We do, however, know that there were at least 107 000 registered small businesses in South Africa that would be classified as "small" or "very small" in terms of their annual turnover in 2020/21 and that 98% of these generated gross profit (taxable income) of less than R1 million in that year.

There were, however, another 865 000 businesses that are not registered as SBCs and that generated gross profit of less than R1 million in 2020/21.

As such, we estimate there are between 107 000 and 972 000 registered companies in South Africa that are actively trading and could be defined as "small" or "very small" in terms of the criteria defined NBS Act.

To more accurately estimate the potential size of the market for standalone Solar PV systems on small business premises, we would also need to be able to ascertain what proportion of the 107 000 to 972 000 businesses:

i. Operate out of a free-standing premises suitable for the installation of a standalone Solar PV system and

ii. Can afford to purchase or lease a standalone PV System

In the absence of this information, we estimate the total potential size of the market for standalone Solar PV systems is between 107 000 and 972 000 individual installations.

4. The supply of Solar PV and energy storage systems

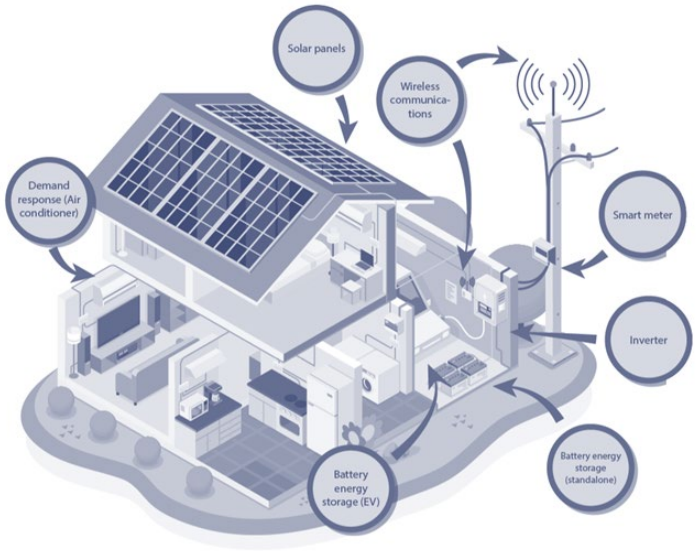
4.1 Overview of the supply side of the market for distributed energy resources

4.1.1 What are distributed energy resources?

Distributed energy resources (DERs) are small-scale energy resources, such as rooftop solar PV and battery storage, that are typically located on the electricity user's premises (e.g. household or business).[78] They are also referred to as "behind-the-meter" energy resources because they are located on the electricity customer's side of the utility meter. The major categories of DERS include:

- Distributed generation – such as rooftop Solar PV, small wind turbines, and combined heat and power (CHP) systems.
- Energy storage systems: such as batteries, thermal energy storage, and flywheels.
- Demand response: such as smart geyser (water heater) switches, smart thermostats, and automated load control systems
- Energy efficiency technologies – such as heating, ventilation and air conditioning (HVAC) systems (e.g., a heat pump), energy-efficient lighting, and appliances
- Electric vehicles and vehicle-to-grid technologies.

Figure 19. Illustration of the integration of DERs in a home



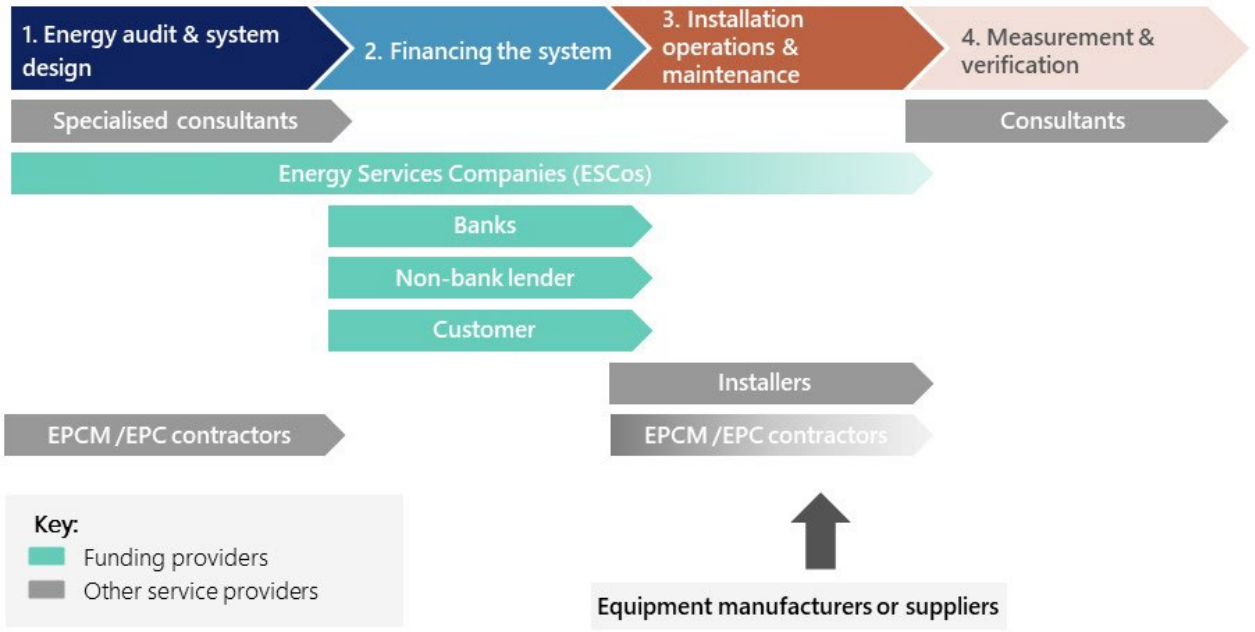
Source: Cummins

[78] "Unlocking the Potential of Distributed Energy Resources – Analysis - IEA," IEA, 2024, https://www.iea.org/reports/unlocking-the-potential-of-distributed-energy-resources.

4.1.2 Value-chain for the financing deployment of distributed energy resources

An overview of the value chain for the supply and installation of distributed energy resources, including but not limited to rooftop Solar PV systems, is provided in Figure 20. A brief description of the steps in the value chain and the involvement of the key role players follows thereafter. [79]

Figure 20.Value chain for the financing and deployment of distributed energy resources



Source: Nova Economics, adapted from GreenCape 2021 Energy Services Market Intelligence Report

1. Energy audit and system design

For larger power users (e.g., medium or large businesses or residential estates/apartment blocks), the process of procuring a rooftop Solar PV system will typically begin with an energy audit. The purpose of the energy audit, typically carried out by an ESCo or specialist energy-efficiency and engineering consultants, is to assess the business's current energy usage and needs, and to identify opportunities to optimise energy consumption and realise cost savings. The energy audit will inform the system design – what energy-efficiency measures, distributed generation, and/or storage systems are required to optimise the customer's energy consumption and bill. System design is also typically carried out by ESCos and specialist consultants serving this market segment. For larger systems, design may be carried out by engineering procurement and construction (EPC) contractors or Engineering, Procurement, and Construction Management (EPCM) contractors.

Energy audits are seldom conducted for households and small businesses since their energy systems are much simpler than those used by large commercial and industrial firms, and their energy consumption (along with the potential cost savings) is too low to warrant the costs of conducting an audit. ESCos and system installers serving these households and small businesses will typically recommend a range of standard distributed energy system designs or packages (e.g., Solar PV + EE or Solar PV + BESS) which vary based on average monthly electricity consumption and customer needs. An overview of standard systems offered by ESCos operating in South Africa is provided in Section 4.2.1.2.

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[79] Argon Poorun and Jack Radmore, *Energy Services Market Intelligence Report*, GreenCape (Cape Town, 2021), Energy Services Market Intelligence Report 2021.pdf (westerncape.gov.za).

2. **Financing the system**

As illustrated in Figure 20, the main providers of finance for Solar PV systems for households and small businesses are commercial banks and ESCos; however, non-bank lenders or micro-finance institutions also offer financial products.

Households and small businesses wishing to obtain a Solar PV system can either (i) **self-fund** the purchase upfront, (ii) **obtain a loan** from a bank, non-bank lender or microlender, (iii) enter into a **lease agreement** with a bank or an ESCo, or (iv) enter into a **subscription service** with an ESCo. Further details on how these financing arrangements operate, along with their implications for ownership, insurance, maintenance responsibilities, and eligibility for government incentives and carbon credits, are provided in Section 4.1.3.

3. **Installation operations and maintenance**

ESCos serving the household and small business segment will typically subcontract the installation work, operations, and system maintenance to pre-approved local or regional installers. Under this model, the ESCo manages the overall project, including energy audits, design, financing, and post-installation monitoring, but the physical installation and maintenance are carried out by third-party installation professionals. ESCos often work in partnership with specific installers. Some ESCos, especially larger ones, may have teams of in-house installers who handle the installation and maintenance of distributed energy resources (like solar panels, HVAC systems, or insulation) for residential projects. Banks will usually leave the choice and hiring of installers up to the customer, but may provide recommendations on pre-vetted installers and equipment.

ESCos serving larger commercial and industrial customers will typically subcontract the installation work and maintenance to EPCs or specialised system installers.

4. **Measurement and verification services**

Measurement and Verification (M&V) services refer to the processes and methods used to accurately quantify the energy savings or performance improvements generated by energy efficiency projects, renewable energy installations, or DER systems. These services are typically procured by ESCos and are provided by independent M&V specialists or consultancies and often follow particular standards such as those provided by the South African National Standards (SANS) and International Performance Measurement and Verification Protocol (IPMVP).

For residential projects, M&V is often simplified compared to larger commercial or industrial projects. Instead of extensive metering and analysis, the ESCo may use a combination of utility bill analysis, engineering estimates, or smart meters to verify that they have delivered the agreed energy service or energy savings.

4.1.3 Overview of financing arrangements offered to households and small businesses

The four main ways in which households and small businesses in South Africa currently finance the purchase of Rooftop Solar PV systems, as summarised in Table 6, include:

i. Cash

ii. Loan agreement

iii. A lease agreement and

iv. Energy-as-a-service (subscriptions or PPA-based).

Table 6. Financing arrangements for the purchase of Solar PV systems by households and small businesses

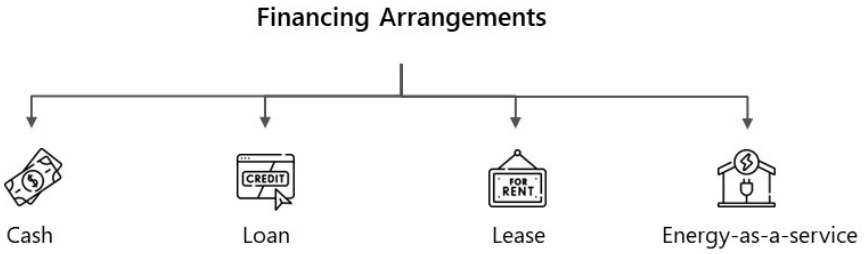
	Financing tool	Description	Finance provider
1	**Cash**	The customer pays for the system upfront and takes ownership on the date of purchase.	Customer
2	**Loan agreement (secured or unsecured)**	The customer takes out a loan from a bank or credit provider and procures the system from an installer. The customer owns the system upon purchase, but the bank generally holds a security interest (lien) until the loan is repaid.	Commercial bank or other registered credit provider
3	**Lease agreement (rent-to-own)**	The customer enters into a lease agreement with a bank or ESCo, and the system is installed. Ownership of the system resides with the lender until the end of the lease term, when ownership transfers to the customer (this may vary depending on the terms of the lease agreement).	Vehicle/asset-backed finance division of a commercial bank or ESCo
4	**Energy-as-a-service (subscription)**	The customer enters into a power purchase agreement with an ESCo, which installs a solar PV system on the customer's premises. The customer procures energy services from the ESCo and potentially benefits from increased energy security and or reduced energy costs.	Energy Service Company (ESCo)

4.1.4 Implications of different financing arrangements

Summarised in Figure 21, each of these financing arrangements has different implications for the:

- Ownership of the system
- Responsibility for insurance and maintenance of the system
- Eligibility for available government incentives and tax rebates (which typically go to the system's owner)
- Potential to generate revenue from carbon offsets (also referred to as carbon tax credits) or renewable energy certificates, which are based on the system's energy generation, and/or reduced energy consumption and resulting displacement of greenhouse gas emissions.

Figure 21. Implications of typical financing arrangements for Solar PV systems for households and small businesses



	Cash	Loan	Lease	Energy-as-a-service
Ownership	Customer owns system from outset. In case of secured loan, bank may reserve right to repossess system on default.		Ownership transfers from ESCo\lender to customer at end of the lease period.	ESCo owns the system.
Responsibility for insurance and maintenance	Customer	Customer	Depends on terms of the agreement. Typically, the ESCo or lender is responsible for maintenance and insurance. Customer assumes full responsibility at end of lease period.	ESCo
Eligibility for tax rebates (e.g. Section 12 A or 12 B)	Customer	Customer	Depends on specific terms of lease.	ESCo
Eligibility for revenue from carbon credits and RECs	Customer possesses rights to RECs and/or carbon credits, but systems are usually too small to warrant registration – cost of registration outweighs the benefits.	Depends on terms of agreement. Customer can cede rights to the associated renewable energy certificates (RECs) and carbon credits to the lender.	Usually, ESCo retains rights to carbon credits and RECs unless otherwise negotiated in specific terms of lease.	ESCO is generally eligible for carbon credits and RECs if it owns the system.

Source: Nova Economics, based on information from a variety of sources.

4.1.4.1 Cash or loan

If a business or residential customer pays for the system upfront or finances it through a bank or credit provider, they will own the system from the start and be fully responsible for its insurance and maintenance. In the case of a secured loan, the bank may have a claim on the underlying asset (can repossess the system) in case of default. The individual must make regular payments to the bank until the loan is fully repaid, at which point the bank releases its lien on the system or other collateral.

Under the cash or loan financing arrangements, a business customer will also be eligible to claim tax rebates that the South African Government has made available to businesses. These include the depreciation allowance to encourage businesses to invest in renewable energy technologies under Section 12B of the Income Tax Act and the energy efficiency allowance under Section 12L of the Income Tax Act. The Government has also provided businesses with a more generous but time-limited depreciation allowance under Section 12BA. This will be available until 28 February 2025.

Residential customers who financed Solar PV panels through loans or cash payments were previously eligible for a tax rebate under section 6C of the Income Tax Act 58 of 1962. This rebate covered 25% of the cost of new, unused solar photovoltaic (PV) panels, up to a maximum of R15 000 per individual taxpayer. However, the rebate was only valid for one year and expired on 1 March 2024.

Given that residential and small business customers who purchase systems with cash or loans own the systems from the outset, they hold the rights to any future revenue from carbon offsets related to the reduction of greenhouse gas emissions. In practice, however, these systems are usually too small to justify being registered for carbon offsets, as the costs of registration would significantly outweigh the benefits.

Customers who finance Solar PV systems with loans may cede the rights to the associated renewable energy certificates (RECs) and carbon offsets to the lender, depending on the terms of the loan agreement. This transfer allows the lender to claim the emissions reductions and potential revenue.

4.1.4.2 Lease

Under a lease arrangement, the household or business customer enters a 'rent-to-own' agreement with a commercial bank (typically a vehicle or asset-backed finance division) or an ESCo, which arranges to have the system installed. Ownership of the system remains with the lessor (bank or ESCo) until the end of the lease term, at which point ownership transfers to the customer – though this may vary depending on the lease terms. During the lease period, the lessor is typically responsible for insuring the system (e.g., against damage and theft) and for its maintenance. These responsibilities transfer to the customer at the end of the lease term.

As is the case with loans, the eligibility for revenue from carbon offsets and RECs depends on the specific terms of the agreement. However, the ESCo or bank typically retains the rights. If not, the customer is once again able to cede the rights to the lessor, which can claim the associated emissions reductions and/or revenue.

4.1.4.3 Energy-as-a-service

Households and businesses can also enter into a power purchase agreement (PPA) or subscription agreement with an Energy Service Company (ESCo) to procure energy services from a Solar PV system installed on their premises. Under this arrangement, the customer benefits from increased energy security and/or reduced energy costs but does not own the system or bear responsibility for its maintenance. Since the ESCo owns the system, they are fully responsible for its insurance, maintenance, and any necessary upgrades to ensure it continues to provide the agreed-upon energy services.

Typically, under this model, the ESCo will enter into an evergreen contract with the customer and will own the system assets in perpetuity. However, many ESCos offer the customer the option to purchase the system at a depreciated value indicated in the contract after a defined minimum period (e.g., 3 years) or on cancellation. Customers can typically cancel the subscription at any time, but the ESCo will charge "de-installation" fees to remove the assets from the property. [80]

As the system owner, the ESCo retains the rights to the renewable energy certificates (RECs) and carbon tax credits associated with the energy generated and the greenhouse gas emissions reduced. If the customer opts to purchase the system, they will assume ownership of these rights unless they agree to cede them to the ESCo.

4.2 Overview of firms supplying Solar PV and energy storage systems to households and small businesses

4.2.1 Overview of ESCos serving the residential and small business segment in South Africa

As discussed in Section 4.1.2, ESCos offer a broad range of energy packages and services to residential and commercial customers. These typically include the design, implementation, and management of a range of distributed energy resources (DERs). When ESCos first emerged in the 1970s, they were focused primarily on improving the energy efficiency of buildings or industrial processes, to reduce consumption and deliver energy cost

[80] In the case of GoSolr, the one-off de-installation fee ranges from R22 770 to R35 400. "GoSolr - Subscribe to a home solar system from R1399 PM," 2024, https://www.gosolr.co.za/.

savings for clients. But more recently (particularly since 2010), they began to expand their services to include the deployment of a range of distributed generation and storage technologies.

By facilitating the deployment of distributed generation and storage in combination with energy efficiency technologies, ESCos can assist their customers to:

i) Improve their resilience to power outages.

ii) Reduce their reliance on fossil fuels and reach sustainability goals

iii) Realise energy cost savings – not only by reducing consumption but also by shifting usage to times when energy prices are lower.

iv) Generate revenue - by exporting surplus power generated to the grid, particularly at peak times when energy prices are higher.

Industry representatives identified Alumo Energy, GoSolr, Versofy, and Wetility as the largest Energy Service Companies (ESCos) serving households and small businesses.

GoSolr is the largest of the four entities in terms of total capacity installed. Patrick Narbel, the co-founder and CTO of GoSolr, noted that they had installed a total of ~75 MW of Solar PV capacity and that the average system size was 4.7 MW, which equates to roughly 16 000 individual installations (Table 7).[81] Versofy is the second largest of the ESCos serving the residential market with 30 MW and ~4 000 installations, followed by Alumo and Wetility.

We estimate that GoSolr has ~R1.5bn of Solar PV and storage assets under management, while Versofy has ~R600m and Wetility and Alumo have ~R400m and R240m, respectively.

Table 7. The four largest ESCos by installed capacity and assets under management

ESCo	Total Solar PV capacity installed (MW)	~no. of installations	Average system size	Value of assets under management (AUM) (in millions)
GoSolr	75	15 957*	4.7	1 500**
Versofy	30	4 000	7.5***	600**
Wetility	12	1 600*	7.5*	240**
Alumo	20#	4 041	4.8	400**

Note: * Calculated by dividing the installed capacity (in kW) by the average system size. ** Calculated assuming R20m per MW installed. *** Calculated by dividing installed capacity (in kW) by the number of installations. # Calculated assuming all 19 000 panels were 470W.

Two other ESCos that were mentioned by interviewees during the study were ReCharge Rental, which is financed and supported by Investec Bank, and Hohm Energy, which filed voluntary liquidation and ceased operations in August 2024. Hohm Energy was not a fully-fledged ESCo, it was described as a 'Digital Solar Marketplace' that enabled customers to determine their rooftop Solar PV requirements through a digitally-enabled assessment, to access loans/lease agreements via third-party providers (including Nedbank's Motor Finance Corporation [MFC] division, FNB's Wesbank, etc.) and designs and enabled a network of vetted Solar PV installers to design and manage projects. Franc Gray, CEO of Hohm's parent company Spark Energy, noted that Hohm had expanded its

[81] Patrick Narbel (GoSolr), interview by authors, 19 September 2024.

cost base too quickly and did not respond quickly enough to a slowdown in residential demand after load shedding ceased in March 2024.[82]

An overview of these six firms, the customer segments they serve, and installation arrangements is provided in Table 8. All six of these firms finance and install Solar PV on free-standing homes and small business premises. However, only two of the six – Versofy and GoSolr offer solutions for multi-dwelling units (MDUs). While most focus exclusively on the small business and residential market, Versofy and Recharge also offer solutions for larger commercial and industrial customers.

Table 8. Overview of ESCos serving residential and small business customers

	Customer segments served				Installation arrangements		
	Free-standing/full title			Multi-dwelling units (MDUs)	ESCo in-house installer	Network of pre-approved third parties	Customer-selected installer
	Residential	Small business	C&I				
Alumo Energy	✓	✓			✓		
GoSolr	✓	✓		✓	✓		
Versofy	✓	✓	✓		✓	✓	
Wetility	✓	✓		✓	✓		
Hohm Energy	✓	✓				✓	✓
ReCharge Rental	✓	✓	✓			✓	

Source: Company websites and stakeholder interviews.

All four of the largest ESCos have some in-house installation capability, but Versofy also uses a network of vetted third-party installers. ReCharge and Hohm Energy facilitated installation via a network of pre-approved third parties. Hohm Energy was not an ESCo in the sense that it did not directly finance the installation of rooftop Solar PV systems by enabling customers to access finance from commercial banks.

4.2.1.1 Capital structure of selected ESCos serving the residential market and future funding requirements

A high-level overview of the capital structure of the three ESCos that were interviewed as part of this study is provided in Table 9.

The equity investors in GoSolr include African Rainbow Capital and Standard Bank, who have contributed at least R200 million in equity funding. It is unclear how much commercial debt GoSolr has raised to date, but we estimate it is at least R1.5bn based on 75 MW of PV capacity installed to date. CEO Andrew Middleton noted in May 2024

[82] William Brederode, "Distressed solar company stung after sharp cooldown in a sizzling SA market," *News24* 2024, https://www.news24.com/fin24/companies/distressed-solar-company-stung-after-sharp-cooldown-in-a-sizzling-sa-market-20240814.

that the company planned to install 500 MW of solar-generation capacity within four years and that future funding for the planned R10bn expansion likely would come from existing shareholders ARC and Standard Bank in the form of both debt and equity.[83]

Table 9. Funding sources for ESCos interviewed

ESCo	Funding type	Amount (millions)	Source of capital
Wetility	Debt	600+	Sanlam, MultiChoice, IDC, commercial bank
	Convertible debt	180	Metier, Others?
	Equity	123	Metier, Others?
GoSolr	Debt	1500+	Standard Bank, Others?
	Equity	200+	African Rainbow Capital, Standard Bank
Versofy	Debt	Unknown	Unknown
	Financial guarantee	15	Sabvest
	Equity	49+	Sabvest Capital Limited via an unnamed consortium with a 30% equity stake

Source: Nova Economics, based on information gathered from interviews and various news articles

Wetility reported in September has raised more than R930 million in funding through a combination of debt and equity.[84] Equity investors in Wetility include private equity firm Metier, while insurance firm Sanlam has provided them with a R600 million commercial debt facility. Christo Fourie from the Industrial Development Corporation noted they had also granted Wetility a debt facility, but that the firm had not yet made use of the funding [85] Wetility reported they had also raised R180 million in convertible debt.

Sabvest Capital Limited noted it had acquired an indirect 12.5% equity stake in a consortium that had a 30% equity stake (effective 3.75% equity share). Sabvest reported that it had provided an initial financial guarantee of R15 million and funding of R16.5 million in funding to support Versofy's operations.[86] Ross Mains-Sheard of Versofy noted that, in terms of their capital structure, the equity investment acted as a first loss layer and enabled them to raise senior debt. The financial guarantee is a credit enhancement mechanism which effectively acts as a mezzanine layer between debt and equity and helps to reduce their overall cost of funding.[87]

4.2.1.2 Products and financing arrangements offered by ESCos for customers in single-dwelling units

ESCos serving the residential market typically focus on installing a range of standardised Solar PV and battery energy storage systems on the rooftops of single-dwelling homes and business premises. Ross Mains-Sheard of Versofy noted that batteries are inevitably part of the grid-tied Solar PV systems ESCos deploy at households

[83] Antony Sguazzin, "GoSolr plans R10-billion South Africa expansion," *Tech Central*, 2024-05-02 2024, https://techcentral.co.za/gosolr-r10-billion-south-africa-expansion/243944/.

[84] Ephraim Modise, "MultiChoice-backed Wetility raises $48 million to offer alternative to Eskom," *TechCabal*, 2023-09-08 2023, https://techcabal.com/2023/09/08/wetility-fundraising/.

[85] Christo Fourie (IDC), interview by authors, 7 August 2024.

[86] Sabvest Capital Limited, *Voluntary announcement investment update* (18/12/2023 2023), http://www.sharenet.co.za/v3/sens_display.php?tdate=20231218070500&seq=3&scode=SBP.

[87] Ross Mains-Sheard (Versofy), interview by authors, 16 July 2024.

because of the mismatch between Solar PV generation (in the middle of the day) and household consumption, which peaks in the morning and evenings.

He noted that, unlike in developed markets, households in South Africa are installing systems primarily for self-consumption since current tariff structures provide very little incentive for households to export power to the grid. Most electricity distributors require that consumers remain net consumers and, as such, place strict limits on the amount of exported energy they can be credited for. In addition, most electricity distributors expect customers to finance the replacement of meters with smart meters, and the cost of these meters seems unreasonably high. As such, there is currently little incentive for households to install Solar PV panels without battery storage.

Vincent Maposa from Wetility noted that they install "bundled products" that integrate **energy efficiency technologies** with Solar PV panels and battery storage. He noted that they bundle their Solar PV and energy storage systems with a smart geyser (water heater) control and encourage the consumer to cook using an air fryer that they supply free of charge, rather than using an electric stove, as this is key to helping customers who install systems to realise energy cost savings.

An overview of the size and costs of Solar PV systems and financing arrangements offered by ESCos serving households and small businesses is provided in Table 10. Cost of financing for standardised Solar PV and battery energy storage systems offered by ESCos, August 2024. All ESCos offer integrated Solar PV and BESS solutions as well as BESS-only packages.

All ESCos (except for solar marketplace Hohm Energy) enable customers to purchase Solar PV systems on a subscription basis. Most of the subscriptions take the form of initial 36-month or "evergreen" energy-as-a-service contracts that are automatically extended until the subscription is cancelled. Versofy and Alumo also give their customers the option to purchase the systems on a lease-to-own or cash-upfront basis. Ross Mains-Sheard of Versofy noted they could also act as a broker and secure a loan to finance a solar PV from a commercial bank on behalf of their customers.[88]

Table 10. Cost of financing for standardised Solar PV and battery energy storage systems offered by ESCos, August 2024

ESCo	System size		Financing arrangement	System cost (approx.)	
	Component	Quantity/size		Solar PV + BESS	BESS only
Alumo Energy	Solar PV panels BESS	4-12 panels (460-480W) 3.8-8.2 (kWh)	Subscription pm	R1 340 – R6 400	NA
			Lease pm	R1 500 – R9 400	R1 100 – R6 500
			Cash	R66 400 – R340 000	R52 600 – R238 400
GoSolr	Solar PV panels BESS	6-18 panels (450-460W) 5-16.5 (kWh)	Subscription pm	R1 399 – R4 400	NA
Versofy	Solar PV panels BESS	8-12 panels (455W) 1-2 batteries (5kWh)	Subscription pm	R1 999 – R3 399	R999 – R1 199
			Lease pm	R2 999 – R4 999	R1 399 – R1 899
			Cash	R129 000 – R219 000	R59 000 – R79 000
Wetility	Solar PV panels BESS	6-26 panels (430W) 3.5-20 (kWh)	Subscription pm	R1 499 – R4 399	R999
Hohm Energy	Solar PV panels	6 – 12 panels (425-555W)	Lease/loan	R1 350 – R3 750	R1 350 – R1 699

[88] Ross Mains-Sheard (Versofy), interview by authors, 16 July 2024.

	BESS	1-2 batteries (5.32kWh)	Cash	R100 000 – R222 000	R62 500 – R79 000
ReCharge Rental	Solar PV panels BESS	5 – 14 panels (460W) 3.84-15(kWh)	Subscription pm	R1 499 – R4 599	R999 – R1 499

Source: Stakeholder interviews, company websites

The cost of Solar PV and battery storage systems offered by ESCos on a subscription basis ranges from R1 339 per month to R6 400, depending on the size of the system. All ESCos offering subscription services have in-house capabilities to assess customer credit risk and provide credit approvals.

GoSolr offers an entry-level subscription package, which includes six panels, a 5 kWh lithium battery, and a 3.6 kW hybrid inverter at the cost of R1 399 per month. Their most expensive subscription option, priced at R4 400 per month, includes 18 panels, a 16.5 kWh lithium battery, and a 12kW 3-phase hybrid inverter.[89]

Versofy offers three financing options - subscriptions, rent-to-own leases, and cash purchases. Ross Mains-Sheard (CEO of Versofy) noted that currently, 80% of purchases are through their subscription service, while the remaining 20% is through a rent-to-own model (lease). Cash purchases were negligible.[90] Monthly subscription fees offered by Versofy are ~R1000 lower than monthly instalment payments for the equivalent systems under the rent-to-own financing option.[91]

Wetility offers solar packages ranging from 6 panels with 3.5 kWh of battery storage for a subscription fee of R1 499 per month, to 26 panels with 20 kWh of storage for R4 399 per month.[92]

ReCharge Rental is owned entirely by Investec and offers only solar PV solutions on a subscription basis. Their packages range from 5 to 14 panels of 460 W each and BESS of 3.84 to 15 kWh.[93]

Hohm Energy does not provide any solar packages itself, but offers solar financing solutions for prospective customers, connecting them to solar providers, product suppliers, and financial institutions that offer financing for solar systems. The range of products which they promote on their website as accessible to their clients ranges from 6 to 12 panels of 425 – 555 W each and either one or two 5.32 kWh batteries. The company went into business rescue in July 2024, reporting they were negatively affected by reduced demand due to the cessation of load shedding.[94]

4.2.2 Products offered by ESCos and banks serving the multi-dwelling unit market

ESCos serving the residential market typically focus on installing a range of standardised Solar PV systems at single-dwelling homes (or freehold ownership). However, two of the six we studied, namely GoSolr and Wetility, also offer to design and install custom solutions for multi-dwelling units, which include properties under sectional title ownership, such as apartment blocks or flats. Vincent Maposa of Wetility noted that while the financial incentive to

[89] GoSolr website "GoSolr - Subscribe to a home solar system from R1399 PM."
[90] Ross Mains-Sheard (Versofy), interview by authors, 16 July 2024.
[91] "Versofy Rent-to-own solar | Solar as a service," updated 2024-03-06, 2024, https://versofy.com/.
[92] "Get Solar Now With Wetility | Beast Bundle Solutions," 2024, https://www.wetility.energy/?utm_source=google&utm_medium=cpc&utm_campaign=brand&gad_source=1&gclid=Cj0KCQjwq_G1BhCSARIsACc7Nxrol5pQo4D3VeRJPTcXcyGY26QlBrkGDSV7mZlJVAeab2zj19e399MaAqZ8EALw_wcB.
[93] "ReCharge Solar Rental Solutions," 2024, https://rechargerental.co.za/.
[94] Luke Fraser, "Another major company in South Africa enters business rescue," *Businesstech* 2024, https://businesstech.co.za/news/business/786460/another-major-company-in-south-africa-enters-business-rescue-2/.

invest in Solar PV systems is often stronger for the occupants of multi-dwelling units (who can benefit from shared costs), the process of obtaining approval from residents via the body corporate is much more time-consuming, and this increases the cost of sale.[95]

Major retail and commercial banks in South Africa that serve the residential market are primarily financing the installation of Solar PV systems for single-dwelling homes (i.e., freehold ownership).

However, representatives of Standard Bank and ABSA noted they have also financed the deployment of Solar PV systems on the rooftops of multi-dwelling units (MDUs) via the developers of large-scale, eco-friendly sectional-title estates.[96,97] ABSA introduced South Africa's first "Eco Home Loan" in collaboration with the Balwin Property Development Group in 2020, offering customers who purchase properties in Excellence in Design for Greater Efficiencies (EDGE) certified developments a rate concession of 0.25% on their mortgages.

To achieve an EDGE rating, a property developer must achieve a minimum saving of 20% in energy, water and embodied carbon in materials must be proven through initiatives implemented in the design phase and confirmed during construction.[98] These frequently include measures such as:

- Energy and material-efficient glazing
- Energy-efficient lighting, both internal & external
- Energy-efficient hot water generation system
- Water-wise faucets, showerheads, water closets and irrigation systems.

Balwin Properties noted in March 2023 that it would also include Solar PV generation and battery-backup solutions at all its active developments in South Africa, noting that "*Energy security is an ongoing national crisis, and management is implementing various solutions to address this, ranging from the installation of generators at some of our developments to battery backup solutions (e.g., the Reid at Linbro Park)*".[99]

Portia Letlape from ABSA Bank noted that there is potentially an opportunity for them as a bank to consider financing the installation of Solar PV and energy efficiency systems on "affordable housing developments" via the property developer.[100] The Banking Associate of South Africa defined the "affordable housing market" as households earning a single or gross income of up to R29 600 per month in 2023.[101]

In August 2022, the International Finance Corporation (IFC) partnered with ABSA Bank to support the financing of housing targeted at low-to-middle-income households in South Africa. The three-year initiative takes the form of a rebate to customers and supports prospective homeowners with the purchase of EDGE-certified homes through the UK-IFC Market Accelerator for Green Construction (MAGC) programme. The MAGC programme provides

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[95] Vincent Maposa (Wetility), interview by authors, 15 July 2024.

[96] Rashveer Manilal, Portia Letlape, and Amelia Dieperink (Absa), interview by authors, 7 August 2024.

[97] Clive Spitz and Tony Anderson (Standard Bank), interview by authors, on 20 August 2024.

[98] "Rabie's green journey reaches new heights with EDGE Certification," updated 2024-07-08, 2024, accessed 12-09-2024, https://centurycity.co.za/rabies-green-journey-reaches-new-heights-with-edge-certification/.

[99] "Balwin goes big on solar at all of its development – and is launching its first battery backup in Sandton next month," *BusinessTech* 2023, https://businesstech.co.za/news/business/673535/balwin-goes-big-on-solar-at-all-of-its-development-and-is-launching-its-first-battery-backup-in-sandton-next-month/.

[100] Portia Letlape (Absa), interview by authors, 7 August 2024.

[101] The Banking Associate South Africa, *Financial Sector Code (FSC): Affordable Housing Standards* (2023), https://www.banking.org.za/wp-content/uploads/2024/04/FSC-Affordable-Housing-Standards-2023.pdf.

blended concessional finance and advisory support to catalyse the development of green buildings across emerging markets.

Customers who purchase a home from an ABSA-approved "Eco Home Loan development" are now eligible to receive between 1.5% to 3% of their loan amount back in a rebate. This incentive will be credited directly into the customer's home loan account and capitalised against the outstanding balance, thus reducing their loan amount and saving them further interest over the term of their mortgage.

Portia noted that property developers she had spoken to a few weeks ago noted that they were considering installing embedded power generation systems within their developments because they believe it could be a source of revenue for the body corporate and help to ensure the sectional title developments remain financially sustainable. She noted that the installation of solar panels on freestanding homes in low-income areas has proven problematic because of the high risk of theft.[102]

Amelia Dieperink, the Head of Affordable Housing at ABSA Bank, noted that more affordable multi-family residential properties are poised to become a significant component of South Africa's institutional investment landscape due to their low volatility and healthy returns.[103] She noted that property developers are increasingly motivated by the need to meet sustainability targets (e.g., net-zero targets), which in turn enables them to access green finance and be able to offer the tenant affordable power. She noted that, provided there is sufficient roof space, property developers can afford to install Solar PV, but the storage required to complement the system is often still too expensive to achieve the desired levels of energy efficiency and energy cost savings.

In April 2024, Standard Bank announced that it had secured a $300 million (R5.68 bn) loan from the IFC to fund a portfolio of green and social assets – with a specific focus on renewable energy and affordable housing sub-categories.[104] Clive Spitz, the Executive head of Climate Solutions at Standard Bank, noted that they also offer concessional home loan rates to customers who purchase property in EDGE-certified green developments but do not enjoy (as the bank any funding benefit at this stage).[105] He noted, however that that only applies to customers who purchase a home in a new development – not to the half-a-trillion rand mortgage book that Standard Bank already owns.

Mzansi Clean Energy Capital is a startup energy service company that aims to promote the uptake of 'clean utilities" on existing affordable housing developments (as opposed to new developments) by partnering with the landlords or owners of affordable housing complexes (multi-dwelling units).[106]

They are aiming to target landlords renting to households earning a gross or single income of between R1 500 and R29 500 per month. They are targeting landlords who own large property portfolios and who have existing data on their tenants' energy consumption behaviours. The aim is to introduce clean energy and water projects that will aid property owners in decarbonising their portfolios.

However, Jackline Okeyo (from Mzansi Clean Energy Capital) highlighted that it is difficult to engage with landlords and the need to educate them on the significance of clean energy and its implications for their portfolios. She noted that clean energy is not a concern for the tenants of these housing projects, and they are, in fact, "happy" to sit in

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[102] Portia Letlape (Absa), interview by authors, 7 August 2024.

[103] Amelia Dieperink (Absa), interview by authors, 7 August 2024.

[104] "Standard Bank secures R5.7 billion for renewables and affordable housing in South Africa," *BusinessTech* 2024, https://businesstech.co.za/news/banking/763443/standard-bank-secures-r5-7-billion-for-renewables-and-affordable-housing-in-south-africa/.

[105] Clive Spitz (Standard Bank), interview by authors, on 20 August 2024.

[106] Jackline Okeyo (Mzansi Clean Energy Capital), interview by authors, on 15 July 2024.

darkness for four to six hours of load shedding. Affordability would be the only reason they would consider clean energy if they could get a reduction in their energy bills.[107]

[107] Jackline Okeyo (Mzansi Clean Energy Capital), interview by authors, on 15 July 2024.

Table 11. Overview of commercial banks that finance Solar PV systems for households and small businesses

Commercial bank	Retail banking (direct finance)					Commercial banking (Indirect finance)	
	Secured lending		Unsecured lending				
	Home loan extension	Asset-backed loan or lease	Home Improvement	Personal loan	EBBS-backed Solar loan	Equity investment in ESCos	Debt finance ESCos
absa	✓ And EBBS-backed home solar loan			✓	✓ Bounce-back		✓ Unknown
CAPITEC BANK			✓	✓			
FNB / FirstRand	✓ FNB	✓ Wesbank		✓ FNB	✓ FNB		✓ Unknown
Investec	✓			✓		✓ Recharge	✓ Recharge
NEDBANK	✓	✓ MFC		✓	✓ Nedbank Avo		✓ Unknown
Standard Bank	✓			✓	✓ LookSee	✓ GoSolr	✓ GoSolr
Discovery Bank				✓ Separate credit card facility			

Source: Stakeholder interviews, see Table 13; Laurence (2023), *South African banks' solar financing options explored*.

4.2.3 Overview of banks serving the residential and small business segments in South Africa

Commercial banks in South Africa have also played an important role in financing Solar PV systems installed by households and small businesses. Banks provide finance both directly to households and small businesses via their retail banking divisions and indirectly by funding the ESCos that serve households and small businesses, via their commercial and investment banking divisions (Table 11Table 11).

4.2.3.1 Direct financing solutions offered by the retail divisions of major banks

An overview of the direct Solar PV financing solutions that the seven retail banks offer households and small businesses is provided in Table 11Table 11. The direct solar financing options offered by retail banks include:

- Extension of an existing home loan
- A solar loan from a vehicle or asset-backed finance division
- An unsecured loan, e.g., a personal loan
- A home improvement loan
- An EBBS-backed solar loan
- Extension of existing credit card or single credit facility

Extension of an existing home loan

The most cost-effective way for households that have home loans to finance the purchase of a Solar PV system is to extend their existing home loan facility. Five of the seven banks listed in Table 11, including **ABSA, Standard Bank, FNB, Nedbank and Investec** provide mortgage finance and allow existing home loan customers to (i) access the unutilised portion of their existing home loan facilities to finance Solar PV systems, or (ii) effectively extend it by requesting access to a portion of the capital they have already paid down.

ABSA, however, is the only retail bank that enables its customers to take out an additional loan to finance the installation of a Solar PV system over five years under a separate secondary account under their existing home loan facility.[108] As Portia Letlape explained:

> *"We won't touch that million rand loan that's sitting in your primary bond to finance your home loan. We'll create a secondary account for you, which is the additional loan that you're taking up for solar purposes… we will not reprice the entire loan. We only score you for that additional R100K that you're asking for."*

Portia noted that the interest rates they have been able to offer customers on the secondary five-year solar loan are very competitive – similar to the interest rates they pay on their primary home loan. This is because the first loss on the secondary loan is guaranteed under the energy bounce-back scheme. The tenure of the loan is limited to five years to meet the requirements of the EBBS.

Solar loan from a vehicle or asset-backed finance division

Nedbank and FNB are the only banks that currently offer residential customers solar financing for solutions under their vehicle or asset-backed finance divisions. Nedbank launched its asset-backed solar finance solution, which is

[108] Rashveer Manilal, Portia Letlape, and Amelia Dieperink (Absa), interview by authors, 7 August 2024.

provided through its Motor Financing Corporation (MFC) division in 2022. They noted at the time that it gave clients wanting to install a solar energy solution but who didn't have a home loan facility access to competitively priced asset-backed finance. MFC elected to partner with Hohm Energy, who helped to guide their clients through the process of assessing their energy requirements, finding a solution that fits their needs, overseeing the installation and providing after-installation support.[109] Wesbank, the vehicle finance division of FNB, announced the launch of a similar asset-backed finance solution for residential Solar PV in August 2024. A minimum 10% deposit is required, and the loan term can be structured from 12 months to a maximum of 72 months, and clients are free to choose their own installers and equipment suppliers.[110]

General unsecured personal loan

All seven of the banks listed in Table 11 offer unsecured loans for residential and small businesses that want to install a Solar PV system.

Unsecured home improvement loan

Capitec noted that their whole lending portfolio consists of unsecured loans and that clients who want to finance a Solar PV facility will take out a personal loan and use their existing revolving credit facility or a credit card, which all attract relatively high interest rates.

While Capitec has not launched a Solar-specific loan, they have run some trials to see whether their existing home-improvement loan could be tailored to provide financing for solar PV systems. Under the home improvement solution, the bank's client can apply for a loan of up to a maximum of R500,000, with a repayment period of up to seven years at significantly lower interest rates than they would obtain on an ordinary personal loan (as low as prime) but the loan amount must be used to purchase supplies at selected home improvement partner stores. Capitec then signed up a solar energy installer with a national footprint to provide a turnkey system. He noted, however, that the uptake was very limited.[111]

Specialised Solar loan backed by EBBS

Standard Bank launched a new specialised "Solar Loan" on their "LookSee" home efficiency platform in September 2023, which gave households access to far more competitively priced unsecured loans for the installation of Solar PV and storage.[112] Interest rates on the new loans are far more competitive than those typically offered on unsecured personal loans because first losses on these loans are guaranteed under the government's Energy Bounce Back Loan Guarantee Scheme (EBBS). Interest rates on the LookSee Solar Loan are client-specific but capped at a maximum of Prime plus 2.5% on loans ranging from R3 000 to R300 000. Customers can choose to repay the loan over one to five years.

ABSA, FNB and Nedbank are also offering special interest solar-specific unsecured loans under the EBBS. Nedbank and FNB offer loans fixed at prime and prime plus one per cent, respectively, while ABSA offers a customer-specific rate capped at prime plus 2.5%.

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[109] "Nedbank launches solar financing product," *BusinessTech* 2022, https://businesstech.co.za/news/energy/606066/nedbank-launches-solar-financing-product/.

[110] "Solar Finance," accessed 13-09-2024, https://www.wesbank.co.za/home/solar-finance.

[111] Jochemus Hamman (Capitec), interview by authors, 15 July 2024.

[112] "Standard Bank's LookSee first to launch government backed Solar Loan for Homes," *FA News* 2023, https://www.fanews.co.za/article/banking/35/general/1223/standard-bank-s-looksee-first-to-launch-government-backed-solar-loan-for-homes/38005.

Extension of an existing credit card facility

Discovery Bank offers solar financing solutions through its partnership with the solar system equipment supplier Rubicon. Existing Discovery Bank clients can access funding for the installation of solar systems on their homes; however, the system must be supplied by Rubicon and installed by one of their accredited installers.[113] Discovery offers financing via its 'Unique single credit facility', which we understand is effectively an extension of the client's existing credit card facility. The repayment period is up to 72 months, and the maximum value of the loan offering is R300 000.[114] Discovery Bank can provide loans with interest rates as low as prime minus 2%.

4.2.3.2 Indirect financing solutions offered by the commercial and investment banking divisions of major banks

Banks also support the uptake of Solar PV systems indirectly by funding the ESCos that serve households and small businesses, via their commercial and investment banking divisions (Table 11). Commercial bank support for ESCos is provided through a combination of debt and equity investments.

Travis Clarke noted that **Investec** had established a solar rental subsidiary, ReCharge Rental, which offers solar subscription and rent-to-own services to the residential and commercial sectors.[115] The investment will allow it to reach customers outside of its traditional retail and commercial customer base.[116]

Standard Bank's commercial and investment banking division announced in June 2023 that it had partnered with GoSolr to provide South African households with reliable access to renewable energy. Standard Bank had previously provided GoSolr with 'sustainable green finance' for the rollout of its 'proof of concept'. Following the success of the pilot underwrote a growth capex facility, which we understand consists of a combination of debt and equity investments to support GoSolr's growth ambitions.[117]

Cameron Gough from **FirstRand** noted that while it had also extended finance to ESCos serving the commercial and residential market, it was initially very much via traditional credit channels - working capital facilities, trade finance, asset-backed finance, etc. And there were several counterparties, particularly those serving the residential sector, that the bank had no appetite to lend to because of uncertainty around the value of the solar assets, the future cash flows and market growth.[118]

He noted that now that the market was more established there was deeper interest from a FirstRand perspective in lending to ESCos but there was a need to create innovative solutions - structures on balance sheet, off-balance sheet, and a range of different products - to meet the needs of these clients, which is something they had been engaging with them on.

He noted that while the launch of the energy bounce back scheme had helped to facilitate engagements with ESCOs, it had not utilised the scheme to support lending to ESCos – partly because the scheme was only valid for 12 months, and this was a deterrent to getting too heavily invested.

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[113] "Discovery Bank promises customers 48-hour solar power installations," MyBroadband, 2023, https://mybroadband.co.za/news/energy/505172-discovery-bank-promises-customers-48-hour-solar-power-installations.html.

[114] Labuschagne, "Good news for solar loans in South Africa."

[115] "Sustainable Solutions," accessed 13-09-2024, https://www.investec.com/en_za/individuals/finance/sustainable-solutions.html.

[116] Sguazzin, "GoSolr plans R10-billion South Africa expansion."

[117] "Standard Bank partners with GoSolr to provide South African households with reliable access to renewable energy," 2023, accessed 19-09-2024, https://corporateandinvestment.standardbank.com/cib/global/deals/standard-bank-partners-with-gosolr-to-provide-south-african-households-with-reliable-access-to-renewable-energy.

[118] Cameron Gough (First Rand), interview by authors, 22 July 2024.

5. Feedback and insights from industry stakeholders

5.1 Introduction

In this section, we provide an overview of the insights and feedback we obtained during interviews with firms that supply and finance Solar PV systems to households and small businesses (see Annexure B) on (i) the availability and cost of capital, (ii) the quality of the credit applications they receive and approve, (iii) the ability of ESCos to generate revenue from carbon offsets, (iv) the performance of the Energy Bounce Back Scheme (EBBS) and potential areas for improvement, and (v) Other policy mechanisms or initiatives to promote the uptake of Solar PV systems.

5.2 The availability and cost of capital

5.2.1 Feedback from ESCos on the availability and cost of capital

Feedback from ESCos on the ease of obtaining funding and the cost of the capital they were able to raise was mixed. While some ESCos reported they had experienced significant challenges in accessing commercial bank debt, others reported that getting access to capital had not been an issue.

Similarly, while two ESCos maintained that having access to lower-cost debt would play a major role in the continued expansion of their operations, another noted that it was measures to de-risk capital would enable them to expand, as it would enable them to provide Solar PV solutions to riskier customer segments (e.g., lower-middle income households and government schools).

GoSolr

Patrick Narbel of GoSolr noted that getting access to capital had not been an issue for them. He noted that initially, they had leveraged the green attributes associated with their business to raise "green finance" on fairly good terms. As their business matured, they were able to secure the backing of large investors, including African Rainbow Capital and Standard Bank. He felt it was unlikely that the availability or cost of capital would be a major impediment to their future growth.

He noted that however that what would be beneficial to GoSolr is to have a facility to de-risk the capital, as this would allow them to provide solutions to segments of the market where credit risk is higher:

> *"What would be beneficial to [us]…to widen the potential customer group, is to have something that de-risks the capital. So, it doesn't need to be cheaper, but if it can be de-risked, then that would be great, especially when you start moving towards offering solutions for townships or government schools or equivalent."*

In summary, while GoSolr is not experiencing challenges concerning the availability and cost of capital, they believe that access to financial guarantees would be advantageous, as it would allow them to extend solar financing to households and in higher-risk segments.

Wetility

Vincent Maposa, CEO of Wetility, highlighted the challenges they faced in securing debt financing from commercial banks, noting that their engagements with these institutions had been difficult due to stringent credit requirements and a lack of understanding of the unique aspects of their business model. He explained that Wetility often walked away from deals with commercial banks that demanded excessive cross-creditor guarantees and collateral, resulting in the company currently having no commercial debt from any major banks. Maposa further pointed out that

negotiations with commercial banks, particularly around legal agreements, were often long and drawn out. Additionally, it had taken them over a year to draw on funding provided by the IDC.

Despite these hurdles, he emphasised that Wetility had successfully raised significant debt and equity funding, totalling over R900 million, by focusing on non-bank financial institutions that were more attuned to its subscription-based model. Notably, major insurance group Sanlam provided a R600 million debt facility in less than six months, while Jaltech, a boutique alternative investment fund manager, was able to secure funding within just 60 days.[119]

Versofy

Ross Mains-Sheard, CEO of Versofy, highlighted that although they have successfully raised funding from commercial banks, they are required to comply with stringent credit criteria, such as interest cover ratios and contract length covenants - fairly standard practices banks use to manage credit risk. He pointed out that banks assign zero residual value to the assets on their books, despite Versofy's ability to redeploy these assets, which raises their cost of funding. Mains-Sheard acknowledged that Versofy cannot compete with the big four banks in terms of average cost of capital, especially since these banks benefit from a 20% first-loss facility under the government-backed EBBS scheme. He explained that Versofy's average cost of funding is at prime plus, whereas the banks' cost is around JIBAR.

However, he emphasised that Versofy can offer a superior service compared to the banks in other aspects, such as providing credit approval within 20 seconds and completing installations within two to three days. Mains-Sheard noted that access to lower-cost funding, whether for working capital or other purposes, would significantly help Versofy achieve grid parity for its deployed solutions.

He also mentioned that Versofy aims to raise debt at a lower rate than what's currently available from commercial banks and other lenders, but accessing concessional finance remains challenging. Their first debt facility was R100 million, a relatively small amount in dollar or euro terms. Mains-Sheard expressed interest in approaching a Development Finance Institution (DFI) for funding, but believes they would need to have at least a billion Rands worth of assets under management before being considered for direct lending.[120]

Versofy is currently exploring an off-balance sheet funding model in partnership with a bank that will provide the capital, backed by the EBBS loan guarantee, to finance the systems they deploy. He noted the advantage would be that they would be able to offer their clients the same system at a much lower cost – "*We would be able to put more panels on roofs but won't have to take on or manage the credit risk*".[121]

5.2.2 Banks' limited understanding of the residual value of Solar PV and battery energy storage assets limits access to credit and contributes to higher financing costs.

As discussed above, banks lack a clear understanding of the residual value of Solar PV and battery energy storage assets and frequently default to the assumption that these assets have no residual value. Several stakeholders noted that the inability of banks to accurately assess the residual value of these assets increases financing costs.

Representatives from FirstRand and Investec interviewed noted that one of the factors that was preventing banks from offering or expanding asset-backed finance solutions for Solar PV and energy storage assets was (i) their

[119] Vincent Maposa (Wetility), interview by authors, 15 July 2024.
[120] Ross Mains-Sheard (Versofy), interview by authors, 16 July 2024.
[121] Ross Mains-Sheard (Versofy), interview by authors, 16 July 2024.

limited understanding of the residual value of these assets and (ii) the uncertainty around the cost and feasibility of repossessing them in the event of default.

Bhulesh Singh, Treasurer of FirstRand, explained that when extending credit, the bank must strike a balance between relying on the borrower's cash flow, the risk associated with the asset, or a combination of both. In secured lending, while the borrower's cash flow remains important, significant emphasis is placed on the asset's value. However, the challenge with solar equipment is that, unlike cars or houses with well-established depreciation patterns, these assets have less predictable decay curves, complicating the underwriting process.

While Wesbank (the division of FirstRand that offers vehicle financing) is well-versed in the second-hand market and the residual value of motor vehicles, this expertise does not currently extend to Solar PV systems. The absence of a developed secondary market for these assets, combined with the uncertainty around the costs and logistical challenges of repossessing solar equipment from a defaulting customer, has further complicated efforts to provide more affordable credit in this sector.[122]

Cameron Gough, Head of Structuring at FirstRand, highlighted the challenges the bank faces in assessing risk for solar equipment. He explained that the bank is grappling with questions about how to calculate risk weights for solar assets, determine appropriate capital reserves for these assets, and estimate the Loss Given Default (LGD) (i.e., the loss the bank would incur if a borrower defaulted on a loan, expressed as a percentage of the total exposure).

Mr Gough noted that several research papers, including some from the prudential authority, estimate that the LGD of solar assets is 100% which makes them difficult to finance. FirstRand has developed its decay models and proxy Loss Given Default (LGD) calculations for Solar PV. However, risk calculations and assessments ultimately need to be approved and validated by regulatory bodies like the Prudential Authority within the South African Reserve Bank (SARB).[123]

FirstRand has been conservative in its lending approach, with the bank lending only to those borrowers who are least likely to default on the loans. As Mr Gough noted, FirstRand's approach has led to "*good borrowers getting double benefit*". This is an area "*where [the] Bounce-Back Scheme can make a difference because the same people, the same vulnerable people who can't afford it get left out over and over again because of the way [lenders] think about risk*".[124]

Jenni Verschoor, part of the Sustainable Solutions team at Investec, noted that Investec was experiencing similar challenges, and although the bank offers quasi-asset-backed finance for Solar PV system assets, they do not currently attach a residual value to the asset. Offering a quasi-asset-backed model is helping Investec to track the products and develop models based on the data collected.[125]

Travis Clarke of Investec noted that the establishment of a liquid market for these assets would assist banks in assessing their residual value and would enable them to offer more affordable asset-backed finance solutions (other than through a home loan facility).[126]

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[122] Bhulesh Singh (First Rand), interview by authors, 22 July 2024.
[123] Cameron Gough (First Rand), interview by authors, 22 July 2024.
[124] Cameron Gough (First Rand), interview by authors, 22 July 2024.
[125] Jenni Verschoor (Investec), interview by authors, 24 July 2024.
[126] Travis Clarke (Investec), interview by authors, 24 July 2024.

5.3 The quality of credit applicants, credit approval, and default rates.

Banks and ESCos involved in the residential Solar PV market consistently reported that the credit applications they receive are generally of high quality and default rates on solar finance are close to zero – this, they believe, is partly attributable to a favourable selection bias in the applicant pool.

Patrick Narbel of GoSolr noted that while they approve ~90% of the credit applications they receive, their default rates remain close to zero. He said this was not surprising given that they had been targeting households in more affluent areas, which are inherently at lower risk of default than the general population.

Representatives from Standard Bank also suggested that favourable selection bias might be at play – with the very low default rates they had experienced probably reflective of the type of customer that chooses to install a Solar PV system on their house.[127]

Vincent Maposa from Wetility reported that their default rates were also close to zero (~0.25%), despite the company having made an effort to reach a wider range of households. He suggested that this could be due to the "stickiness" of their products, or because the cost of the solar systems has largely replaced traditional electricity costs, which customers had already budgeted for and were accustomed to paying.[128]

Bhulesh Singh of FirstRand remarked that while they have had customers default on loans, the losses given default have been absorbed within the excess spread that has been charged for risk. He noted that the bank's view of the credit risk associated with solar finance seems to be much greater than the actual risk, which suggests that banks remain too conservative in their lending approach for solar assets.[129]

Travis Clarke from Investec noted that their default rates were also close to zero but that the bank strives to maintain a 0% default rate across all loan books – this reflects the bank's strategy of focusing on a carefully selected, low-risk clientele.[130]

Jochemus Hamman, Head of Retail Purpose Lending at Capitec, reported that while uptake of their solar finance under the existing home improvement loan solution was very limited, they experience much lower default rates on home improvement loans than they do on their general unsecured lending portfolio.[131]

5.4 The ability of ESCos to generate revenue from carbon offsets

5.4.1.1 The market for and value of carbon credits in South Africa

There are two types of carbon markets: the mandatory (or regulated) carbon market and the voluntary carbon market. The mandatory market is government-implemented, requiring businesses to pay a set amount for each tonne of carbon they emit. In contrast, the voluntary market allows companies and individuals to purchase carbon credits to offset their emissions voluntarily, often driven by sustainability goals rather than regulatory requirements.

The primary demand for carbon credits in South Africa is driven by the mandatory carbon tax regime, where the government requires companies to offset a portion of their emissions. South African companies subject to the carbon tax, like Sasol, can reduce their tax liability by up to 10% by purchasing carbon credits or offsets, which are

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[127] Clive Spitz and Tony Anderson (Standard Bank), interview by authors, on 20 August 2024.

[128] Vincent Maposa (Wetility), interview by authors, 15 July 2024.

[129] Cameron Gough, Bhulesh Singh, and Amit Mohanlal (FirstRand), interview by authors, 22 July 2024.

[130] Travis Clarke and Jenni Vershoor (Investec), interview by authors, 24 July 2024.

[131] Jochemus Hamman (Capitec), interview by authors, 15 July 2024.

terms that can be used interchangeably. Joslin Lydall, the co-founder of Catalyst Solutions and an advisor on sustainability and resource efficiency, notes there is a significant undersupply of carbon credits. She said her firm had been unable to source credits for about 90% of their clients this year, indicating high demand but insufficient availability.[132]

Lydall noted that it is also theoretically possible to sell carbon credits generated in South Africa internationally on the voluntary market, but she isn't aware of any substantial or lucrative deals where South African firms have sold credits on the voluntary carbon market. She noted the effort and costs of compliance were also similar regardless of whether you sell credits on the mandatory or voluntary market, as buyers want a certain minimum level of credibility.[133]

She noted that the carbon tax rate at the time of their last sale was R159 per tonne of CO2 equivalent and that they were able to sell carbon credits at 90% to 95% of the value of the carbon tax rate because there is very little supply. As of September 2024, South Africa's carbon tax rate is set at R190 per tonne of CO_2e, which was an increase from R159 per tonne earlier in the year. The carbon tax is scheduled to continue rising annually, with an expected increase to R236 per tonne in 2025, and further progressive increases to reach R462 per tonne by 2030. Beyond 2030, further increases will be determined by the Minister of Finance and announced in the national annual budget.[134]

Can an ESCo that owns multiple small solar PV installations on customers' homes register these systems as a project under South Africa's carbon offset regulations?

Joslin Lydall confirmed that small-scale solar PV systems, such as those owned by ESCOs and installed on individual homes, are not excluded under the South African carbon offset regulations. But to be eligible, these projects must be developed under recognised standards for Carbon Credit Registration. The most commonly used and operational standard in South Africa is the Verified Carbon Standard (VCS), administered by a body called Verra.

For a "group solar PV project" to qualify for carbon credits under the VCS, it must meet specific criteria:

- **Grid-Connected Definition**: The system is considered "grid-connected" if the owner uses more than 50% of the generated electricity themselves. This is not a problem for most households generating solar power for their use, but it becomes more complex for projects that generate electricity for a third party or engage in wheeling (transmitting power over the grid to a different location).
- **Validation Period:** Projects must complete validation within two years of their start date (when the solar PV system is first turned on). This means that households or companies looking to apply for carbon credits need to act quickly to meet this deadline; they cannot retroactively claim credits for periods beyond two years.
- **Demonstrating Additionality:** The project must demonstrate "additionality," meaning that it wouldn't be financially viable without the revenue from carbon credits. There are two options for proving this: typically, using a financial model that shows the project doesn't meet a specific rate of return without the carbon credit income.

Large-scale renewable energy projects in South Africa cannot be registered for carbon credits, particularly those above 15 GWh, to prevent double-dipping into government benefits.

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[132] Joslin Lydall (Catalyst Solutions), interview by authors, 30 July 2024.

[133] Joslin Lydall (Catalyst Solutions), interview by authors, 30 July 2024.

[134] "Climate Change Regulation 2024," 2024, https://practiceguides.chambers.com/practice-guides/climate-change-regulation-2024/south-africa.

Credits are only issued after a process called verification, where an auditor checks the project's data and confirms that the claimed carbon reductions are accurate. Once verified, the auditor authorises the issuing body (Verra, in this case) to grant the credits to the project developer. Project developers can choose how often they undergo this verification process, with most opting to do it annually.

Joslin Lydall noted that the entire process can be expensive, with initial costs estimated at around R1 million for validation and verification. There are additional ongoing costs, approximately R250 000 annually, which cover auditing, specialist fees, and charges by Verra (the organisation that administers VCS).

- **Project Scale and Grouping**: For solar PV projects to be financially viable, they need to be done on a large scale. Instead of validating each project, it's more efficient to register as a "grouped project," allowing multiple installations (such as thousands of household systems) to be included under one umbrella. This grouping reduces costs since the verification is done once for the entire group, and additional projects can be added later without incurring the same upfront expenses.
- **Data Monitoring:** The verification process is relatively straightforward for solar PV projects, especially if smart meters are installed, as they can easily provide the necessary data on electricity generation for carbon credit calculations.

Overall, the main challenges are achieving sufficient scale and proving "additionality" (demonstrating that the project wouldn't be financially viable without the carbon credit revenue) to make the process worthwhile. However, Joslin suggests that small-scale solar projects owned by ESCOs could qualify under the carbon offset regulations, provided they follow the Verified Carbon Standard.

Have ESCos in South Africa managed to register their Solar PV projects for carbon credits?

GoSolr is currently the only Energy Service Company (ESCo) in South Africa that has successfully generated revenue from carbon credit markets. According to Patrick Narbel, GoSolr achieved this by registering their individual solar PV systems as part of a "group project" under carbon credit schemes. Instead of participating in the local carbon credit market, GoSolr traded its credits in voluntary international markets. However, he noted the mandatory market in South Africa was becoming more attractive, and he was interested in investigating the possibility of participating in the local market as well.

Both Vincent Maposa from Wetility and Ross Mains-Sheard from Versofy noted they would be interested in participating in the mandatory carbon offset market in South Africa, but simply need to invest more time and resources into understanding the potential costs and benefits for their firms.[135]

5.5 The performance of the Energy Bounce Back (EBB) Loan Guarantee Scheme.

5.5.1 Overview of the Energy Bounce Back Scheme

The Energy Bounce Back loan guarantee scheme was introduced by the National Treasury in August 2023 to alleviate the impact of increased load shedding on small and medium-sized businesses and households. The primary objective of the scheme was to facilitate the installation of an additional 1 000 MW of rooftop Solar PV together with complementary battery storage systems.

The government-backed EBBS loan guarantee scheme was designed to encourage banks and other financial institutions to lend to businesses or individuals who might otherwise struggle to access credit due to perceived

[135] Ross Mains-Sheard (Versofy), interview by authors, 16 July 2024.

risks. Under the EBBS, the National Treasury, acting as the guarantor, agreed to cover the first 20% of losses incurred on loans issued by participating banks to finance the purchase of Solar PV and energy storage systems by households and businesses. Under this arrangement, if a borrower defaults, the National Treasury absorbs the initial losses up to 20% of the total loan value before the lender (bank) takes on any losses. This mechanism reduces the loss-given default (LGD) for banks and is designed to encourage them to (i) extend credit to borrowers who might otherwise be deemed too risky and (ii) to enable banks to offer borrowers more favourable loan terms than they might otherwise have obtained.

EBBS loan guarantees can only be accessed via the participating banks. Local DFIs, ESCos, and other non-bank SME finance institutions were also eligible to obtain EBB funding but had to apply via a participating bank.

The funds are disbursed on a first-come-first-served basis or until the scheme expires. The National Treasury provided the South African Reserve Bank (SARB) with a guarantee, which is recorded as a contingent liability on the government's account. The SARB, in turn, lends this money to participating banks at the repo rate with a 0.5% once-off charge of the amount disbursed. Participating banks will structure the loans to consist of 80% of their funding unguaranteed, and 20% from the EBBS at a maximum interest rate of the repo rate plus six percentage points.

National Treasury's official document explaining how the scheme would function reported that the scheme would be available from 30 August 2023 to 30 August 2024. [136]However, it has since been clarified by the National Treasury that the incentive is available to participating banks for 18 months from the date that the particular bank was onboarded. As such, banks onboarded in December 2023 will have until May 2025 to extend loans to customers under this scheme. [137]

The four banks that participated in the EBBS were ABSA, Nedbank, Standard Bank, and FNB. A more detailed overview of the EBBS and an illustration of the three EBBS mechanisms that were approved for the disbursement of funding are provided in Appendix A.

5.5.2 Feedback from participating banks on how successful the scheme has been, what could be improved, and whether there is merit in extending it

5.5.2.1 Overview

Insights on how successful the scheme had been are based on interviews held with representatives of three of the participating banks – namely ABSA, Standard Bank, and The FirstRand Group.

A view shared by three of the participating banks interviewed was that while uptake of EBBS-backed solar finance had been fairly low, it was probably too early to assess the scheme's impact on the adoption of Solar PV, as most of the participating banks only integrated the EBBS in late 2023.

Two of the three participating banks interviewed expressed strong support for the continuation of the scheme and optimism that the scheme would be extended in an improved format that incorporated some of the feedback and learnings from the first twelve months.

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[136] National Treasury and South African Reserve Bank, "Answering the questions about the Energy Bounce-Back loan guarantee scheme," news release, 2023, https://www.treasury.gov.za/comm_media/press/2023/2023080801%20Energy%20Bounce%20Back%20Scheme%20FAQs.pdf.

[137] Labuschagne, "Good news for solar loans in South Africa."

Cameron Gough, Head of structuring at FirstRand, noted that one of the big and positive impacts of the Energy Bounce-Back scheme has been that it compelled them to start thinking about Solar PV finance as a secured lending product, and to put more effort into understanding and estimating the LGD and the residual value of the underlying assets. He emphasised that extending the EBBS would provide them with the necessary time to establish solid entities or financial products that could eventually be offered to Development Finance Institutions (DFIs) and capital markets.

ABSA noted that the EBBS has enabled it to offer clients more competitive interest rates than on their standard solar loans or home loan extensions (it seems a discount of approximately 50 basis points), but noted that affordability and uptake would improve if they were able to extend the tenure of the funding from five to ten years.

Representatives of Standard Bank felt the EBBS needed to be restructured to expand access by lower-middle-income homes to solar finance and that it should aim to deliver Solar Finance at a significantly lower cost to the end-user. Representatives of Standard Bank's retail division noted that the focus of the EBBS would need to shift from providing a credit risk guarantee to delivering blended finance solutions that would significantly reduce the cost of solar finance for the end-user and expand access of lower-middle income households to Solar finance.

A more detailed summary of feedback from participating banks is provided in the subsections that follow.

5.5.2.2 Feedback from ABSA

Support for the continuation of the scheme

Rashveer Manilal, who, in his role as the Head of Renewable Energy at ABSA, oversees the financing of renewable energy solutions for small and medium enterprises (SMEs) and the banks' larger commercial clients, noted he would like to see the scheme continued. He noted that if the scheme were extended, he would like to see the tenure of EBBS-backed loans extended from five years to ten years and the cap on the maximum loan size for commercial clients lifted from R10m to R20m.

Uptake of EBBS-backed solar loans and recommendation to extend loan tenure

Portia Letlape, the Head of Product at ABSA home loans, noted that they had offered their retail customers two backed solar finance products – the first, launched in December 2023 was an unsecured solar loan priced at prime plus two per cent and the second is a Solar finance product linked to existing home loans which had only recently been launched (and would be available until March 2025).

Letlape noted that while it was too early to assess how successful the bounce-back products were, she agreed with Rashveer that extending the tenure of loans backed by the EBBS from 5 to 10 years would be desirable. Extending the loan tenure will reduce the mismatch between the loan term and the life of the underlying assets, reduce the monthly loan instalments, and enable customers to better gauge whether the installation of the system will reduce their monthly expenditure on electricity.

Lelape noted that before the introduction of the EBBS, the average tenure of solar loans on their books was 7.5 to 8 years, and the cap was around 10 years. While the EBBS enables ABSA to offer clients more competitive interest rates than on their standard solar loans (it seems a discount of approximately 50 basis points), it was difficult to explain to clients that if they accepted the EBBS offer, they would have to pay the loan off within five years.[138]

[138] Rashveer Manilal, Portia Letlape, and Amelia Dieperink (Absa), interview by authors, 7 August 2024.

5.5.2.3 Feedback from the FirstRand Group

Uptake of EBBS-backed solar loans

Amit Mohanlal, Head of Funding and Liquidity at FirstRand noted that the uptake of EBBS-backed loans had been very low (relative to uptake under the previous small business bounce-back scheme) noting that the group had extended a total of 930 loans (with a total value of ~R315 million) between December 2023, when they integrated EBBS into their existing loan structures, and 31 May 2024. Amit noted that demand for Solar PV (particularly among households and SMEs) was closely and positively correlated with how much people were being exposed to load shedding, and one of the reasons for the low uptake of EBBS funding was that there hadn't been any outages for the past 100 days.

Broader impact of the EBBS

Bhulesh Singh, Group Treasurer at FirstRand noted that before the Energy Bounce Back scheme, corporate and commercial clients (large and medium-sized businesses including ESCos) who wanted to apply for credit to finance investment in solar PV systems would generally have applied for credit under normal channels – working capital or a general unsecured loan product, while retail clients would have applied for a personal loan or advance on their home loan. He noted one of the big impacts of the EBBS was that it forced them to start thinking about Solar PV finance as a secured lending product, to start estimating the loss given default and the residual value of the assets.[139]

He said this is a positive development for their commercial and retail clients:

- It means they have access to additional credit capacity – the bank will view credit for Solar finance separately from their existing working capital or personal loan credit capacity.
- Interest rates offered by banks on secured or asset-backed loans are typically much lower than those offered on unsecured loans.

Cameron Gough, Head of Structuring at FirstRand, noted that for the EBBS to be truly impactful, banks would need to make changes to their assumptions regarding the LGD on solar PV and energy storage assets. For example, if the assumed LGD on solar PV assets was 50% before the EBBS, and it could be reduced to 25-30% due to the loss guarantee provided by the EBBS, the bank could almost double its lending capacity with the same amount of nominal capital.

Gough noted that in practice, implementing the risk adjustment is quite complex, it takes time for an increase in the assumed LGD to translate to changes in risk-weighted assets and, consequently, how they affect the returns a bank earns on its assets ("BA returns") This adjustment influences the amount of regulatory capital a bank needs to hold against these assets. He pointed out that if these risk weights are optimised, it can free up capital, which can then be deployed more efficiently or intentionally.[140]

[139] Cameron Gough, Bhulesh Singh, and Amit Mohanlal (FirstRand), interview by authors, 22 July 2024.

[140] Cameron Gough, Bhulesh Singh, and Amit Mohanlal (First Rand), interview by authors, 22 July 2024.

Uptake of EBBS-backed finance by ESCos and other intermediaries

When asked if the EBBS had helped ESCos to access financing from FirstRand (under Mechanism 2 of the EBBS), Gough noted that while the EBBS facilitated much more robust engagement with ESCos operating in the sector, they weren't able to set up a suitable structure within the short twelve-month timeline of the scheme.

He noted that several factors, including the use of tax incentives and carbon credits, needed careful consideration before establishing an EBBS loan facility or structure for ESCos. He felt that setting up the necessary structures and offerings would have required more time than was available under the scheme..

There are several reasons in our view, why a bank like FirstRand may want to lend to multiple Energy Service Companies (ESCos) via an off-balance sheet Special Purpose Vehicle (SPV) instead of lending to each ESCo individually. It may enable the bank to pool risk, increase capital efficiency, bypass lending caps, optimise capital usage, and make it easier to attract first-loss capital from a Development Finance Institution (DFI). An SPV can also potentially package the loans made to multiple ESCos and issue securities backed by these loans to investors. This securitisation process allows banks to access additional funding from the capital markets, further increasing their lending capacity.

When asked if there was perhaps an off-balance sheet structure, a special purpose vehicle could be set up to de-risk lending to intermediaries like the ESCos, Gough noted that it was something they had been working quite extensively on – "*We've got SARB approval actually, for a structure to do exactly that.*"

He believes that lending to multiple providers of energy services via an off-balance sheet structure would drive a lot more investor interest and would increase lending capacity and demand. But the problem with the current EBBS construct is that lending to an SPV is capped at the same amount you can lend to a single ESCo.

He explained that the way the current EBBS product for ESCos or other intermediaries would work is that the bank would have to provide a single line of credit to each entity. Under the current EBBS construct, R500 million is the maximum amount you can lend to a single ESCo, "*But say we want to lend to ten different ESCos, the moment you package the funding you potentially want to extend to multiple ESCos into an off-balance sheet SPV structure, the SPV's legal entity is now your solar provider or your single entity and the same R500 million cap would apply. So, if the EBBS were extended, the cap on lending to ESCos via an SPV would need to be lifted*."

Support for the continuation of the scheme

In conclusion, Cameron Gough, Head of structuring at FirstRand, emphasised that extending the Energy Bounce Back Scheme (EBBS) would provide them with the necessary time to establish solid entities or financial products that could eventually be offered to Development Finance Institutions (DFIs) and capital markets. This extension would allow them to build a few years of operational history, develop robust due diligence processes, and gain a better understanding of the assets and reporting requirements. He felt that at the moment, it would be challenging to attract external investors or third parties due to a lack of a proven track record. However, by using the EBBS as a transitional support, he believes they could prepare for a more substantial, fully developed public market offering in the future.[141]

[141] Cameron Gough, Bhulesh Singh, and Amit Mohanlal (FirstRand), interview by authors, 22 July 2024.

5.5.2.4 Feedback from Standard Bank

Uptake of EBBS-backed solar loans

As discussed in Section 4.2.2, Standard is offering an EBBS-backed solar loan to households and small businesses via its LookSee platform. Clive Spitz, the Head of Climate Solutions for Personal Banking at Standard Bank, noted that the EBBS loan they offer is unsecured and is completely separate from the home loan business.

As one of the largest providers of home loan providers in South Africa, they have focused on extending finance for Solar PV systems to their existing home loan customers. They noted that since home loan customers are also your more affluent retail banking customers, they were also the early adopters of solar PV, but they are starting to see opportunities to extend finance to households in the lower-income segments.

They noted that one of the things that was making it reasonably difficult to establish an appetite for solar finance, not only for the EBBS loan but in general, was the high-interest rate environment that we are currently in, which has eroded household disposable income. They noted they were sure that demand for solar finance would recover as interest rates fall and Eskom tariffs continue to increase, and that the financial lever - the ability to reduce expenditure on electricity - would be a key driver of uptake in future.

Support for the continuation of the scheme

Representatives from Standard Bank's retail division (not including input from their commercial and investment banking side, as they have not been engaged yet) appeared to be somewhat ambivalent about supporting the continuation of the EBBS.

Tony Anderson, the head of the home services division, felt that banks needed to do a lot more work in terms of being able to provide Solar PV financing solutions targeted a lower-to-middle-income households. Clive Spitz noted that a company they had financed in Kenya had done well in terms of facilitating the uptake of Solar PV systems connected to DC appliances among lower-income households. He noted that while the EBBS and DFIs in general were offering credit risk guarantees, in their existing solar finance book, there is almost no risk of default, and so unless banks can start providing solar solutions that appeal to lower-income households, the guarantee doesn't serve much purpose because there's no risk. He noted:

> *"As I say, the DFIs coming in with the guarantees, that's not where the help is needed, it's the pricing [need to deliver a product that will deliver energy cost savings]. Interestingly, and just to highlight this, I think it's an important insight that when talking to international DFIs [about the cost of funding], it may sound cheap initially upfront, but once it converts to rands and goes through the whole process, it's not cheap, and it's just flat at best. And that then doesn't create an [energy cost-saving] incentive, which is really what's needed."*

Spitz noted that it was a blended finance solution that enabled the bank to *"manage the market risk with incentivisation to the end-user customers"*. He noted that the cost and structure of the finance provided by the government and DFIs must ultimately have a significant impact on end-user affordability to gain market traction. Tony Anderson suggested that social lending and green lending would need to be combined to deliver an impactful outcome in less affluent segments of the market.

5.5.3 Feedback from non-participating banks on how successful the scheme has been, what could be improved, and whether there is merit in extending it

Capitec and Investec chose not to participate in the EBBS due to the onerous reporting requirements and the costs that would be incurred to integrate the scheme with their existing loan offerings. They also highlighted that the

short duration of the scheme (which was only valid for 12 months) was a significant deterrent to participation as it gave them limited time to reap the potential benefits of the investment.[142, 143]

Jochemus Hamman, the head of retail purpose lending at Capitec also questioned how effective a loan-guarantee scheme would be in expanding access to solar finance given that the participating banks are regulated in terms of the National Credit Act and must still apply the standard credit approval processes and criteria and as such wouldn't be able to lend to risker customer segments.[144] He noted that while the guarantee scheme is designed to limit losses in the event of default, banks wouldn't be in a position to relax their lending criteria to lend to riskier customer segments.

5.5.4 Feedback from local development finance institutions on how successful the scheme has been, what could be improved, and whether there is merit in extending it

Unsuccessful attempt to access funding from the EBBS

Local DFIs such as the Industrial Development Corporation (IDC) of South Africa, or non-bank lenders, were also able to participate in the EBBS but had to apply for funding via a participating bank. Christo Fourie, Head of the Energy Strategic Business Unit at the IDC, expressed frustration at how they had attempted but had been unable to access EBBS-backed funding, despite several assurances from the National Treasury that approval of their facility via one of the banks was imminent.

The IDC launched a programme in 2023 to provide funding to ESCos that were able to deliver Solar PV and storage systems to small businesses that were being impacted by load shedding, but in the absence of EBBS-backed funding, had to draw on the existing credit facility they have with KfW to provide ESCos serving small businesses and households with funding.[145]

The IDC noted that they have more discretion when it comes to assessing the credit risk of ESCos than the banks – they have a different approach to due diligence and can assess ESCos based on track record, process, and the quality of installations. They maintain they have more flexibility(in terms of the type and tenure of loans they can extend to ESCos) than commercial banks, but are unable to compete with banks on the cost of credit they can provide. The IDC's cost of funding is purely determined by the credit line that we use to fund a specific sector or programme, whereas the banks are deposit-taking and can typically lend at lower rates, even without access to the EBBS loan guarantees. [146]

Fourie noted that uptake of funding under their programme had been slow, with only four or five ESCos having received credit. While the IDC had made debt facilities available, they had not had a single drawdown from any of the loan facilities provided. The IDC representatives interviewed attribute this to a slowdown in the demand for Solar PV from March 2024, after load shedding ceased and the cost of credit they had provided. He noted that the funding they provided under the scheme via the KfW credit line was not initially intended for solar and was not that concessional. He said he suspected the interest rates on the facility they had offered Wetility were a least 1 percentage point higher than the cost of debt finance they had accessed from other non-bank lenders, including Sanlam.

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[142] Jochemus Hamman (Capitec), interview by authors, 15 July 2024.

[143] Travis Clarke (Investec), interview by authors, 24 July 2024.

[144] Jochemus Hamman (Capitec), interview by authors, 15 July 2024.

[145] Christo Fourie (IDC), interview by authors, 7 August 2024.

[146] Stuart Bartlett, Christo Fourie, Nell Grobbelaar, Calvany Roger, and Sonja Loggenberg (IDC), interview by authors, 7 August 2024.

5.5.5 Feedback from ESCos on how successful the scheme has been, what could be improved, and whether there is merit in extending it

ESCos are largely unaware of the funding made available under the EBBS via participating banks.

None of the ESCos interviewed, including GoSolr, Versofy or Wetility, had attempted to access EBBS-backed funding via participating banks. While GoSolr and Versofy both have debt facilities with one or more of the participating banks, the debt finance they have received is not guaranteed under the EBBS.

Vincent Maposa from Wetility noted they don't have a single cent of commercial debt from any of the banks. Instead, they approached alternative lenders like Sanlam and Jaltech, as they could have very straightforward conversations with them about covenants in a manner that is truly reflective of what's actually happening in their market. In contrast, banks were very inflexible. When asked what DFIs can do to improve access to credit under the ESCo model, he noted that what DFIs can do is de-risk their projects by offering to provide first-loss guarantees on local commercial or alternative debt.

Vukile Davidson from the National Treasury confirmed that lending by banks through Mechanism 2 of the EBBS (a loan guarantee for rooftop solar PV for energy service companies (ESCos) providing leasing and/or subscription services to SMEs and households) had been limited.

ESCos were only able to access the EBBS through credit provision by banks, which proved a challenge for many ESCos. Mr Davidson reported that feedback from banks revealed that (i) banks are uncomfortable with the ESCo's ability to assess credit and (ii) lending to ESCos requires banks to change their thinking, as lending to ESCos requires banks to take on equity-like risk, which they are not traditionally comfortable taking on.

He admitted that the National Treasury did not think about the nuances between banks and ESCos in their model and thought that credit provision through the banks would be sufficient. Mr Davidson and his team have been journeying with the banks and believe that the banks are becoming increasingly comfortable with lending to ESCos. However, there remains some *"anxiety around their willingness to take on this equity-like risk"*.

As discussed earlier, when we asked the representatives of the FirstRand group if they had made any attempt to provide funding to ESCos via the EBBS, Cameron Gough noted that while the EBBS facilitated much more robust engagement with ESCos operating in the sector, the bank had felt they would be able to set up a suitable structure within the short twelve-month timeline of the scheme. He also believes that lending to multiple providers of energy services via an off-balance sheet structure (rather than doing each ESCo individually) would drive a lot more investor interest and would increase lending capacity and demand. But the problem with the current EBBs construct is that the lending to an SPV is capped at the same amount you can lend to a single ESCo.

Ross Mains-Sheard of Versofy noted that he is currently exploring an off-balance sheet funding model in partnership with a bank that will provide the capital, backed by the EBBS loan guarantee, to finance the systems they deploy. He noted the advantage would be that they would be able to offer their clients the same system at a much lower cost – "*We would be able to put more panels on roofs but won't have to take on or manage the credit risk"*.[147]

5.5.6 Additional feedback from the National Treasury on the Energy Bounce-Back Scheme

Vukile Davidson of the National Treasury's Financial Centre Policy Unit noted that, from their perspective, and a policy perspective, the principal benefit of incentivising the uptake of Solar PV systems is environmental. However,

[147] Ross Mains-Sheard (Versofy), interview by authors, 16 July 2024.

he credited load shedding for being "the Trojan horse" that stimulated the demand for Solar PV due to its positioning in the South African market as a load shedding resilience technology, which is what has ultimately been driving consumer behaviour.[148] Mr Davidson reported that lending under the EBBS had been moderate with only ~40% of the expected demand being realised. The uptake of loans under the scheme was larger in the commercial segment than in the residential segment.[149]

Based on feedback from banks participating in the scheme, he reported that:

- Uptake by residential customers was slower than anticipated as households are highly sensitive to the current level of load shedding, and "*so for a lot of individual customers, the incentive for the capital outlay part when you're not experiencing load shedding, and you haven't experienced load shedding for about three to eight months, is reduced. That has put downward pressure on the household portion of demand.*" The aggressive upward interest rate cycle has further limited household demand as many customers are constrained in terms of disposable income and are facing increasing financial pressure.

- While demand for Solar PV in the business segment is less sensitive to the current phase of load shedding, the constraint that the banks have faced in extending credits for solar equipment for this cohort has largely been around legacy investments made in generators. Many businesses made the capital outlay for very expensive diesel generators in the early stages of load shedding, which Mr Davidson believes has impacted the demand for Solar PV in this segment. Businesses are reluctant to take on additional debt when they have already made large capital outlays for load shedding mitigation measures.

- There are national constraints around the claiming of carbon offset credits, as the current carbon tax regulation does not allow for carbon credits under the domestic compliance carbon tax in South Africa. This is a result of the requirement for additionality – the tax department within the National Treasury sees recent investment in Solar PV as load shedding reliance, and so does not agree that additionality requirements have been met.

Overall, Mr Davidson acknowledged that the National Treasury was considering the possibility of extending the EBBS, but will only be able to report on the efficacy of the programme once it has ended.[150]

5.5.7 Summary of feedback from stakeholders on how the EBBS could be improved

In summary, the recommendations that participating banks provided on how the Energy Bounce-Back Scheme (EBBS) could be improved include:

- **Extend the Programme time frame:** One of the major limitations of the programme was that it was only valid for 12 months, which gave banks very little time to integrate the specific requirements of the EBBS into their existing loan offerings. A representative of FirstRand noted that while the EBBS facilitated much more robust engagement with ESCos operating in the sector, they weren't able to set up a suitable structure to provide finance for ESCos within the short twelve-month timeline of the scheme.

[148] Vukile Davidson (National Treasury), interview by authors, 8 July 2024.
[149] Vukile Davidson (National Treasury), interview by authors, 8 July 2024.
[150] Vukile Davidson (National Treasury), interview by authors, 8 July 2024.

- **Increase the maximum tenure of the loan from 5 to 10 years:** Representatives from ABSA noted that if the scheme were extended, they would like to see the tenure of EBBS-backed loans for both retail and larger commercial clients extended from five years to ten years. Extending the loan tenure will reduce the mismatch between the loan term and the life of the underlying assets, reduce the monthly loan instalments, and enable customers to better gauge whether the installation of the system will reduce their monthly expenditure on electricity.
- **Lift the cap on loans to a single commercial entity from R10m to R20 m:** A representative of ABSA noted the cap on the maximum loan size for commercial clients should be lifted from R10m to R20m.
- **Lift the lending cap of R500m for a single entity to facilitate the creation of SPVs that will enable banks to lend to multiple ESCos.** Representatives of FirstRand maintain that lending to multiple providers of energy services via an off-balance sheet structure would drive a lot more investor interest and improve lending capacity and demand. But the problem with the current EBBS construct is that lending to an SPV is capped at R500m - the same amount you can lend to a single ESCo. So, if the EBBS were extended, the cap on lending to ESCos via an SPV would need to be lifted.
- **EBBS would need to be restructured to expand access to lower-middle-income homes to solar finance and should aim to deliver Solar Finance at a significantly low cost to the end-user.** Representatives of Standard Bank's retail division noted that the focus of the EBBS would need to shift from providing a credit risk guarantee to delivering blended finance solutions that would significantly reduce the cost of solar finance for the end-user and expand access by lower-middle-income households to Solar finance.

The recommendations that non-participating banks provided on how the Energy Bounce-Back Scheme (EBBS) could be improved include:

- **Reduce reporting requirements:** One of the reasons that Capitec and Investec did not participate in the EBBS was due to the onerous reporting requirements and the costs that would be incurred to integrate the scheme into their existing loan offerings. They also highlighted that the short duration of the scheme (which was only valid for 12 months) was a significant deterrent to participation.[151, 152]
- **Redesign the scheme because the perception is that 'bank-centric' loan-guarantee mechanisms were unlikely to be effective in expanding access to credit for underserved groups:** Jochemus Hamman, the head of retail purpose lending at Capitec, also questioned how effective a loan-guarantee scheme would be in expanding access to solar finance to the underserved customer given that the participating banks are regulated in terms of the National Credit Act and must still apply the standard credit approval processes and criteria. As such, despite the first-loss provision, participating banks wouldn't, in practice, be able to relax their criteria to lend to riskier customer segments.[153]

The recommendations that ESCos provided on how the Energy Bounce-Back Scheme (EBBS) could be improved include:

- **De-risk ESCos' projects by providing a more effective way to provide first-loss guarantees** on debt that is extended by local commercial or alternative debt providers to ESCos.

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[151] Jochemus Hamman (Capitec), interview by authors, 15 July 2024.

[152] Travis Clarke (Investec), interview by authors, 24 July 2024.

[153] Jochemus Hamman (Capitec), interview by authors, 15 July 2024.

5.6 Other policy mechanisms or initiatives to promote the uptake of Solar PV systems

Industry stakeholders interviewed also identified several policy mechanisms or initiatives that they believe the government, potentially with the support of DFIs, could introduce to continue to promote the uptake of Solar PV systems by households and small businesses. These include:

- **Removal of barriers to the export of power** – Patrick Narbel from GoSolr maintains that one of the relatively simple things that would significantly improve the business case for households in South Africa to invest in Solar PV would be to allow customers to become net generators without having to pay R10 000 upfront for the replacement of the utility's meter and go through a six-month process to obtain approval to export power to the grid.

  In most municipalities in South Africa, electricity consumers who export power to the grid are only credited up to the amount of electricity they consume, meaning any surplus they export beyond that has little or no value. Narbel noted that if consumers were compensated for all the power they export to the grid, it would fundamentally change the way they build their installations and would enable them to start profitably serving the lower-middle-income market without any additional financial support.
- **Support for ESCos that offer Solar PV on a rental or subscription basis –** Jochemus Hamman from Capitec felt that support from DFIs in developing rental and subscription models and other innovative financing structures is crucial. He noted these models make Solar PV more accessible to middle to low-income groups.[154] Representatives of Investec suggested that DFIs could create off-balance sheet structures to lend directly to ESCos like ReCharge Rental - this could help lower the cost of finance and improve cash flow management.[155]
- **De-risk ESCos projects by providing a more effective way to provide first-loss guarantees** on debt that is extended by local commercial or alternative debt providers to ESCos.
- **Support for the development of a liquid market for renewable energy assets** – Travis Clarke from Investec suggested that DFIs could support the development of a liquid market for renewable energy assets that would make it a lot easier for banks to place a residual value on these assets.
- **Provide incentives for the adoption of green building practices -** Travis Clarke from Investec also suggested that DFIs could provide incentives for the installation of energy-efficiency technologies and renewable energy systems on new residential property developments (similar to those provided by the IFC under its MAGC programme).
- **Replacement of existing geysers with Solar geysers** – representatives of ABSA noted they believe that in homes that cannot afford a Solar PV system, there is still an opportunity to finance the replacement of conventional electric geysers (water heaters) with solar water heaters. They noted it costs roughly R20 000 to R25 000 to convert an electric geyser to a solar geyser, and that households are able to save up to R1 000 on monthly electricity costs by doing this. They recommended that DFI's consider supporting the uptake of a range of energy efficiency and renewable energy technologies rather than Solar PV panels and systems exclusively.[156]

[154] Jochemus Hamman (Capitec), interview by authors, 15 July 2024.

[155] Travis Clarke and Jenni Verschoor (Investec), interview by authors, 24 July 2024.

[156] Rashveer Manilal, Portia Letlape, and Amelia Dieperink (ABSA), interview by authors, 7 August 2024.

- **Technical assistance to improve understanding of the residual value of Solar PV system assets** - representatives from FirstRand said they would appreciate technical assistance from DFIs to develop the necessary regulatory frameworks and structures for an improved understanding of the risks and "Loss Given Default" associated with Solar PV system assets to facilitate market development.[157]

[157] Cameron Gough, Bhulesh Singh, and Amit Mohanlal (FirstRand), interview by authors, 22 July 2024

Appendix A

A.1. Overview of the Energy Bounce-Back Scheme

The Energy Bounce-Back Scheme (EBBS) is a revised and repurposed version of the Covid-19 Loan Guarantee Scheme that was launched in 2020 to assist businesses during the Covid-19 pandemic, and the Bounce-Back loan scheme that was launched in 2022 to assist eligible businesses that faced financing constraints as a result of Covid-19, the July 2021 civil unrest, and the flooding in KZN.[158]

The EBBS seeks to reduce the impact of load shedding on businesses (with a turnover of less than R300m per annum) and households by enabling investment in Solar PV systems (including storage assets) by these customer groups, to incentivise an additional 1 000 MW to be installed. The EBBS is complementary to the tax incentives described in Section 2.5.5. Applicants may therefore apply for both tax and EBB measures. The government guarantees solar-related loans for small and medium enterprises (SMEs) on a 20 per cent first-loss basis.[159] This takes place via three mechanisms:

i. **Mechanism 1:** A loan guarantee for rooftop Solar PV and related assets (such as inverters and battery energy storage) for households and Small and Medium Enterprises (SMEs),

ii. **Mechanism 2**: A loan guarantee for rooftop solar PV for energy service companies (ESCos) providing leasing and/or subscription services to SMEs and households, and

iii. **Mechanism 3**: Provision of working capital loans for businesses in the rooftop Solar PV supply chain.

National Treasury's official document explaining how the scheme would function reported that the scheme would be available from 30 August 2023 to 30 August 2024.[160] However, it has since been clarified by the National Treasury that the incentive is available to participating banks for 18 months from the date that the particular bank was onboarded. As such, banks onboarded in December 2023 would have until May 2025 to extend loans to customers under this scheme.[161]

EBB loan guarantees must be accessed via participating banks (Nedbank, ABSA, FNB, and Standard Bank). The EBBS could also be accessed by DFIs and non-bank SME finance providers through participating banks on the same basis as the banks' participation.

The funds are disbursed on a first-come-first-served basis or until the scheme expires, irrespective of the mechanism these funds are borrowed. The National Treasury provided the South African Reserve Bank (SARB) with a guarantee, which is recorded as a contingent liability on the government's account. The SARB will, in turn, lend this money to participating banks at the repo rate with a 0.5% once-off charge of the amount disbursed. Participating banks will structure the loans to consist of 80% of their funding, unguaranteed, and 20% from the EBBS at a maximum interest rate of the repo rate plus six percentage points.

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[158] National Treasury and South African Reserve Bank, "Answering your questions about the Bounce-back scheme," news release, 2022, https://www.treasury.gov.za/comm_media/press/2022/2022042601%20Bounce%20Back%20Scheme%20FAQs.pdf.

[159] National Treasury and South African Reserve Bank, "Answering the questions about the Energy Bounce-Back loan guarantee scheme," news release.

[160] National Treasury and South African Reserve Bank, "Answering the questions about the Energy Bounce-Back loan guarantee scheme," news release.

[161] Labuschagne, "Good news for solar loans in South Africa."

Table 12. Eligibility criteria and maximum loan size for the three mechanisms

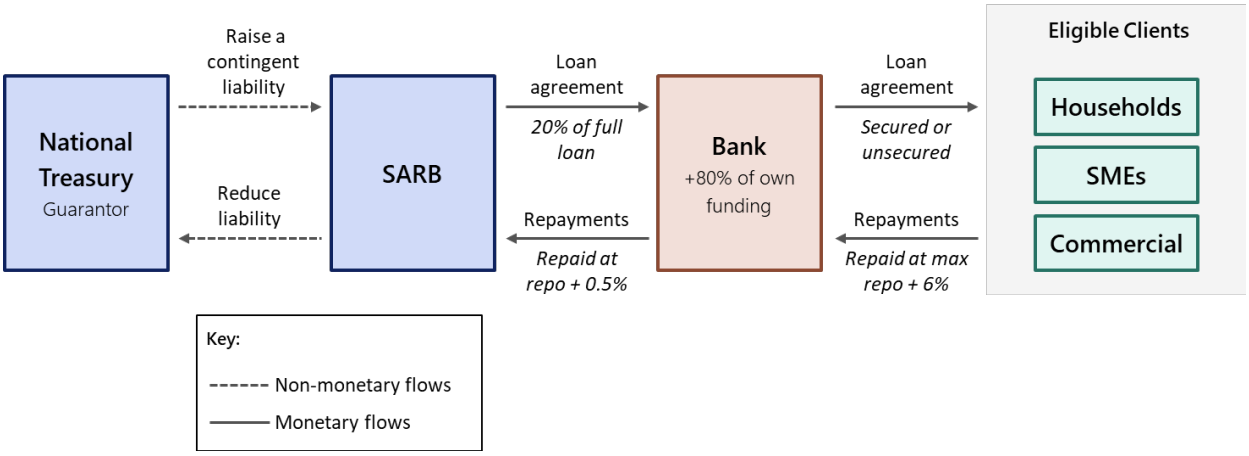
	Mechanism 1		Mechanism 2		Mechanism 3	
	Eligibility criteria	Maximum loan size	Eligibility criteria	Maximum loan size	Eligibility criteria	Maximum loan size
Households	Meet the participating bank's specific credit criteria	R300 000	Meet DFI/Non-bank lender or ESCos' credit requirements	R300 000	N/A	
Small and Medium Business	Registered with CIPC or VAT registered. Meet the participating bank's specific credit criteria. <R300m in turnover per annum	Up to R10m per business Limit of R30 000 for resilience measures	Meet DFI/Non-bank lender or ESCos' credit requirements <R300m in turnover per annum	Up to R10m per business Limit of R30 000 for resilience measures	N/A	
ESCo, DFI, non-bank lender	N/A		Meet the facilitating bank's specific credit approval criteria	Up to R500m per ESCO/DFI/non-bank lender	N/A	
ESCo, installer, distributor, and manufacturer of Solar PV equipment	N/A		N/A		Must be a business in the rooftop solar supply chain Meet the facilitating bank's specific credit approval criteria	Up to R100m

A.1.1. Mechanism 1: Households/SMEs secure a loan directly from a bank with a 20% first-loss guarantee provided by the government

Under the first EBBS mechanism, participating banks can lend directly to households and businesses (SMEs and larger commercial clients with a turnover of <R300m per annum) to finance the purchase of Solar PV systems, and the first 20% of the loan they provide to the end customer will be guaranteed by the South African government (Figure 22). In other words, in the event of default, the government will absorb the initial 20% of the loss. To qualify, households and SMEs must satisfy the basic eligibility criteria outlined in Table 12 and obtain credit approval from one of the participating banks (who must comply with the terms of the National Credit Act 34 of 2005).

Qualifying households and businesses enter into a standard secured/unsecured loan agreement with a participating bank at a maximum interest rate of the repo rate + 6p.p. (prime lending rate + 2.5p.p.) and make regular repayments to the bank over the term of the loan. The SARB (guaranteed lends 20% of the funds required by the household/SME to the participating bank at the repo rate plus a 0.5 per cent once-off charge of the amount disbursed, and the bank will raise the remaining 80% of the funds required. The bank, in turn, repays the SARB, reducing the contingent liability on the balance sheet of the National Treasury.

Figure 22. EBBS Mechanism 1: Loan guarantee for rooftop solar for SMEs and households' investments

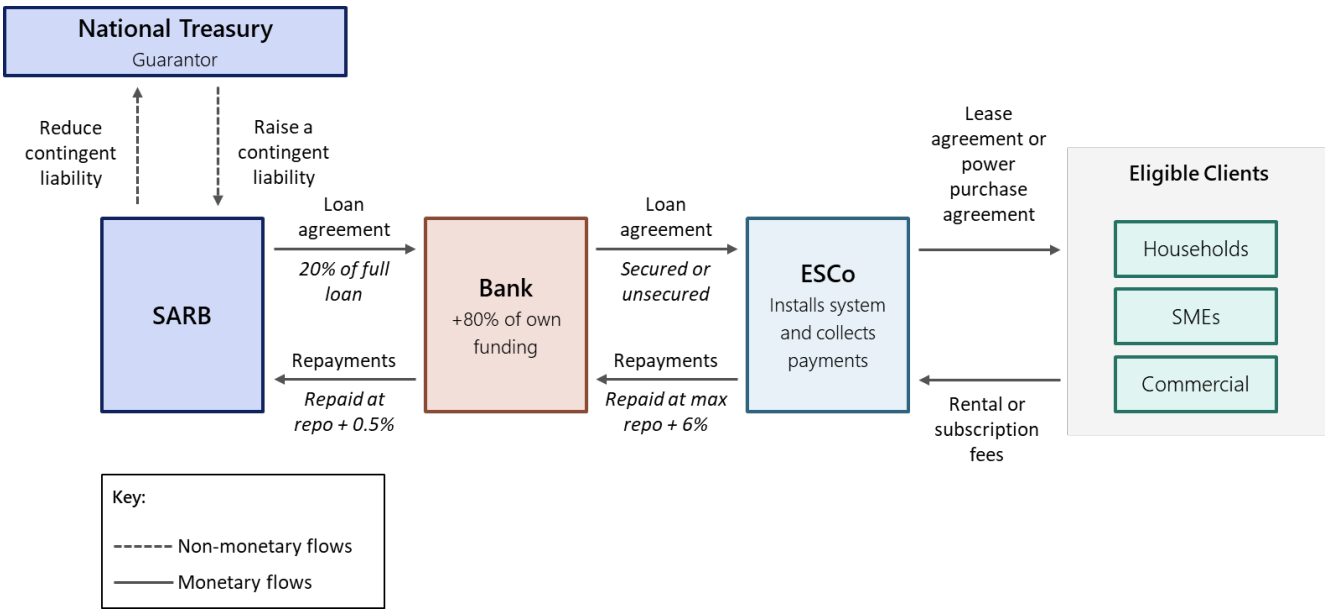


A.1.2. Mechanism 2: Households/SMEs secure finance from ESCos/DFI/Non-bank lenders who, in turn, secure loans from a participating bank with a 20% first-loss guarantee provided by the government

Under the second EBBS mechanism, participating banks provide ESCos with loans to provide the end-customers with, and the first 20% of the loan they provide to ESCo is guaranteed by the South African government (Figure 23). To qualify for a loan, ESCos must obtain credit approval from one of the participating banks.

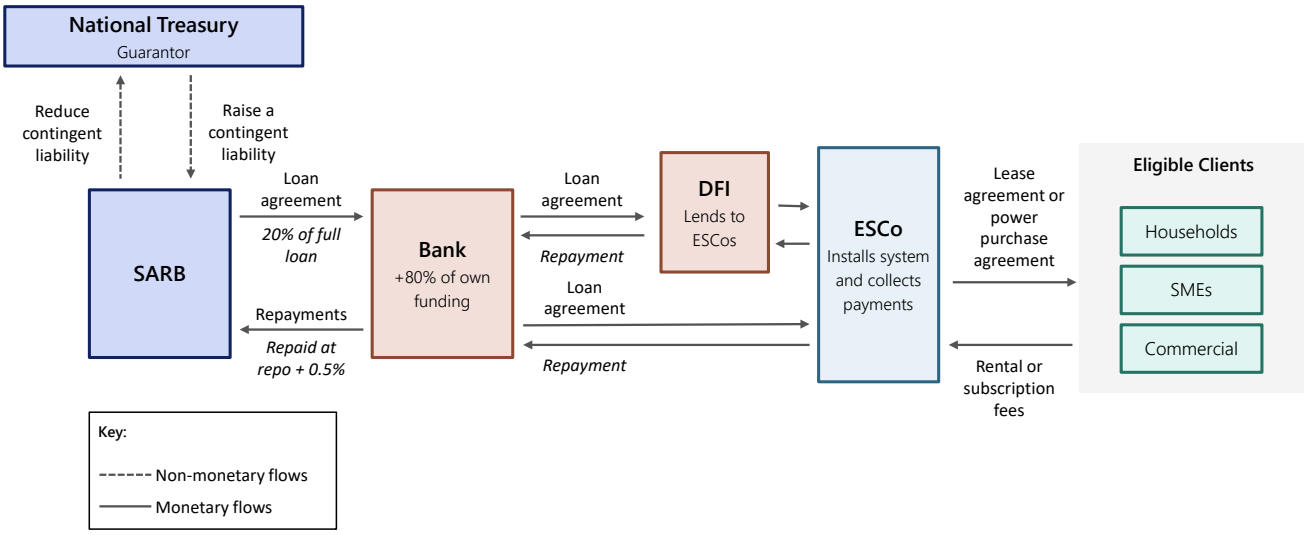
Participating ESCos, in turn, provide households, SMEs and larger businesses (annual turnover <R300m) with finance to purchase a solar system on a lease or energy-as-a-service basis (Figure 23). Participating ESCos have discretion as to whether they extend leasing arrangements to individual SMEs and households, but unlike banks and other registered credit providers, they do not have to comply with the terms of the National Credit Act 34 of 2005 to assess affordability and enter into a lease agreement or subscription (PPA) with an end-customer.

Figure 23. Mechanism 2a: ESCos/DFI secure loans from a participating bank with a 20% first-loss guarantee provided by the government, and in turn, finances household solar PV on a leasing or subscription basis



Local DFI's such as the IDC or non-bank lenders, can also apply for a loan guaranteed by the National Treasury but must apply via a participating bank. DFIs, in turn, may extend credit to ESCos. The IDC noted that they have more discretion when it comes to assessing the credit risk of ESCos than the banks – they have a different approach to due diligence and can assess ESCos based on track record, process, and the quality of installations. They maintain they have more flexibility in the type of loans they can extend to ESCos than commercial banks, but have been unable to compete with banks on the cost of credit they can provide (banks can typically lend at lower rates, especially since they can directly access EBBS loan guarantees). The IDC noted they had been unsuccessful thus far in accessing funding guaranteed under the EBBS despite several assurances that approval was imminent (Figure 24).

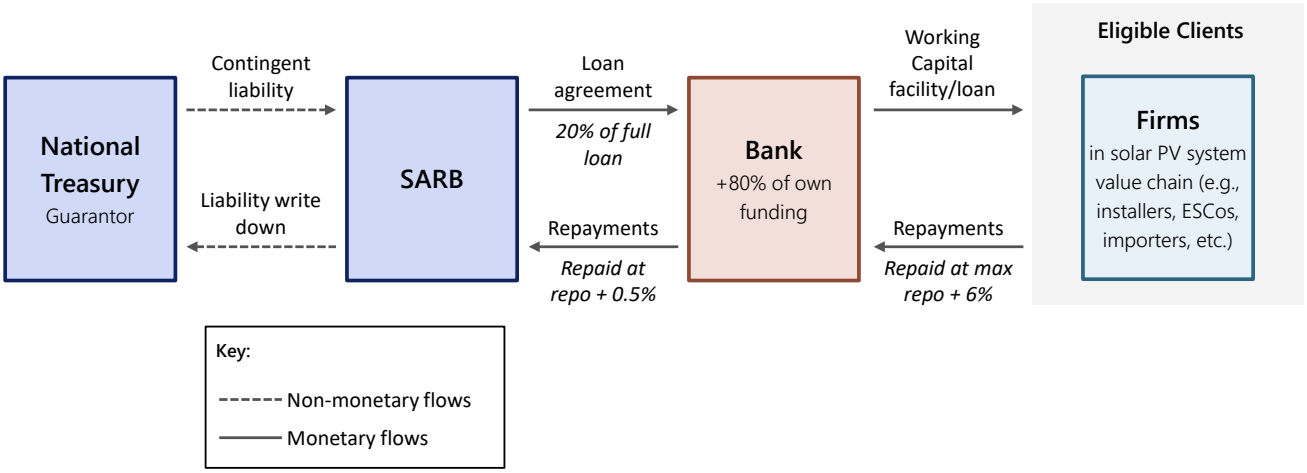
Figure 24. Mechanism 2b: DFI/Non-bank lender secures loans from a participating bank with a 20% first-loss guarantee provided by the government, and provides household/SMEs with loans to purchase solar PV systems



A.1.3. Mechanism 3: Households/SMEs secure finance from ESCos/DFI/Non-bank lenders who, in turn, secure loans from a participating bank with a 20% first-loss guarantee provided by the government

Under the third mechanism, businesses in the rooftop solar supply chain, including ESCos, installers, those importing batteries, investors and panels can borrow up to R100 million from participating for working capital with a 20% first-loss guarantee provided by the government. The purpose of this mechanism was to ensure that equipment distributors and installers can maintain sufficient inventory and that installation times are reduced (Figure 25).

Figure 25. EBBS Mechanism 3: Working capital loan



Appendix B

Table 13. List of stakeholders interviewed

Stakeholder	Representatives	Stakeholder type	Meeting date
SAPVIA	De Wet Taljaard	Industry association/expert	Friday, 28th June
National Treasury	Vukile Davidson	Government institution	Monday, 8th July
Capitec	Jochemus Hamman	Commercial bank	Monday, 15th July
WeTility	Vincent Maposa	Energy services company	Monday, 15th July
Mzansi Clean Energy Capital	Jackline Okeyo	Energy services company	Monday, 15th July
Sasfin/Sunlyn	Michael Moses	Commercial bank	Tuesday, 16th July
VersofySolar	Ross Mains-Sheard	Energy services company	Tuesday, 16th July
FirstRand	Cameron Gaugh, Bhulesh Singh, and Amit Mohanlal	Commercial bank	Monday, 22nd July
Investec	Travis Clarke	Commercial bank	Wednesday 24th July
Catalyst Solutions	Joslin Lydall	Industry association/expert	Tuesday, 30th July
African Development Bank	Anders Pedersen	Development Finance Institution	Wednesday, 7th August
ABSA	Rashveer Manilal, Portia Letlape, and Amelia Dieperink	Commercial bank	Wednesday, 7th August
IDC	Stuart Bartlett, Christo Fourie, Nell Grobbelaar, Calvany Roger, and Sonja Loggenberg	Government institution	Wednesday, 7th August
Standard Bank (Retail)	Clive Spitz and Tony Anderson	Commercial bank	Tuesday, 20th August
GoSolr	Patrick Narbel	Energy services company	Thursday, 19th September

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