GreenCape

Solar PV modules: Shining a light on end-of-life management for large-scale projects

Main insights

- South Africa's landfill ban on electrical and electronic waste (e-waste) necessitates alternative solutions for managing decommissioned end-of-life solar PV modules.
- As an importer or brand owner of solar PV modules, solar PV developers are legally required to take responsibility to ensure that any modules are returned, and repurposed or recycled by an accredited and licenced facility, after being used or damaged.
- Additionally, the influx of solar PV module waste expected from large-scale projects in the medium- to long-term presents a substantial opportunity to scale end-of-life management solutions.

1 Introduction

The market for solar photovoltaic (PV) installations in South Africa has continued to grow over the last decade. Growth has been seen in both the large-scale[1] and embedded generation markets.

The sustainable growth of the solar PV market not only requires a reliable and efficient supply chain, but also the effective and compliant end-of-life management and the development of a more circular solar PV industry[2].

This brief provides an overview of South Africa's growing solar PV market and outlines the obligations of producers[3] of solar PV products under South Africa's extended producer responsibility (EPR) regulations. The brief also highlights the potential for a "circular economy pipeline scenario" when South Africa's large-scale solar PV modules reach their end of life, which would likely require the upscaling of end-of-life solutions, including those for reuse, refurbishment, and material recovery.

This opportunity brief is written for:

- Solar PV producers (i.e. manufacturers, importers, and brand owners) aiming to ensure regulatory compliance.
- Businesses looking to establish or expand solar PV end-of life solutions in South Africa.

1 Large-scale refers to installations of 1 MW and over, excludes rooftop solar PV systems and differs from small-scale embedded generation which refers to installations of less than 1 MW.

2 A circular solar PV industry would keep products, components, and materials at their highest use and / or value for as long as possible. For the solar PV industry this would include solar PV modules and related components and embedded materials.

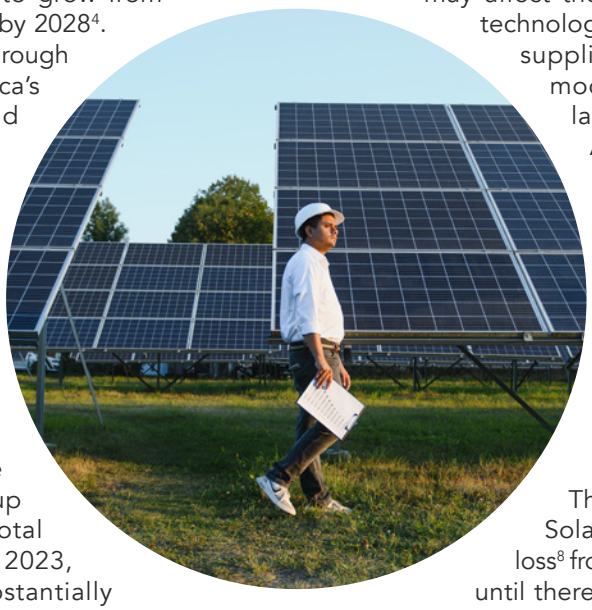
3 For the purposes of EPR, manufacturers, importers, and brand owners are considered to be "PV producers". In some cases, the definition of produces may extend to installers, project developers, and engineering, procurement and construction (EPC) firms.

2 Overview of the South African solar PV landscape

Solar PV systems range from small residential rooftop installations to large-scale infrastructure installations. **This brief focuses on the large-scale market.**

Historically, the growth in large-scale solar PV has been driven primarily by public sector procurement programmes. In the past few years, there has been an uptake of private sector build for own use or sale via long term private offtake agreements.

Whilst South Africa has no solar PV module manufacturing, and limited assembly, the uptake of solar PV is on the rise. **Figure 1** summarises the total capacity of public and private large scale solar PV installations by province. The total large-scale installed capacity for solar PV is forecast to grow from ~2.36 GW in 2023 to ~11.35 GW by 2028[4]. This growth is facilitated largely through the implementation of South Africa's Integrated Resource Plan, and has been driven primarily by the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP).



Due to local content requirements of the REIPPPP and the South African Renewable Energy Masterplan (SAREM), there has been some focus on local assembly and manufacturing capacity of solar PV related components. Private large-scale installations made up ~0.04 GW[5] of the country's total solar PV installed capacity in 2023, and is expected to grow substantially to ~6.22 GW by 2028[4]. This growth is driven largely by changes in the Electricity Regulation Act (Act 4 of 2006). The Act was amended in 2021, increasing the capacity of private sector generators (including solar PV) that may be constructed without the need for a generation licence from 1 MW to 100 MW. A more recent amendment that is awaiting final approval removed the capacity limitation completely, allowing generation projects of any scale without the need for a licence but a remaining requirement to register with the National Energy Regulator of South Africa (NERSA).

The typical crystalline silicon cell solar PV system (illustrated in **Figure 2**) which make up a majority of large-scale installations[6] forms the basis of the estimations displayed in this brief. The lifespan of solar PV modules is typically 25 – 30 years. Several factors including environmental, quality and maintenance may affect the lifespans. Furthermore, solar PV technologies are continually improving, and suppliers seek to upgrade outdated modules. Lastly, publicly procured large-scale installations in South Africa are bound to 20-year power purchase agreements (PPAs). The REIPPPP projects are required to be decommissioned at the end of the PPA period and the land returned to its original state. Whether this will indeed happen or whether there will be a process to allow continued operation (with or without upgrading of modules) remains to be seen.

The first PPA period ends in 2033[7]. Solar PV modules that undergo early loss[8] from these projects are often stockpiled until there is a viable amount to transport to end-of-life solutions. Early losses and major refurbishment or decommissioning poses a waste management risk for solar PV module owners as e-waste is no longer allowed to be disposed of in landfills. At the same time, this also provides an opportunity for end-of-life solar PV solutions, or new entrants into the e-waste management industry.

4 The estimates for public large-scale solar PV capacity are from IPP Office (2024) www.ipp-renewables.co.za. Private sector estimates and future public estimates are based on GreenCape industry engagements and forecasts (see Large-scale-RE-MIR-2024).

5 Based on GreenCape industry engagements and analysis.

6 Three types of solar PV technologies have been used for large-scale projects in South Africa: monocrystalline silicon cell, polycrystalline silicon cell and PV thin-film.

7 This date is based on the commissioning of the first REIPPPP bid window projects in 2013.

8 Losses due to premature damage during installation or damage before end of the product lifecycle.

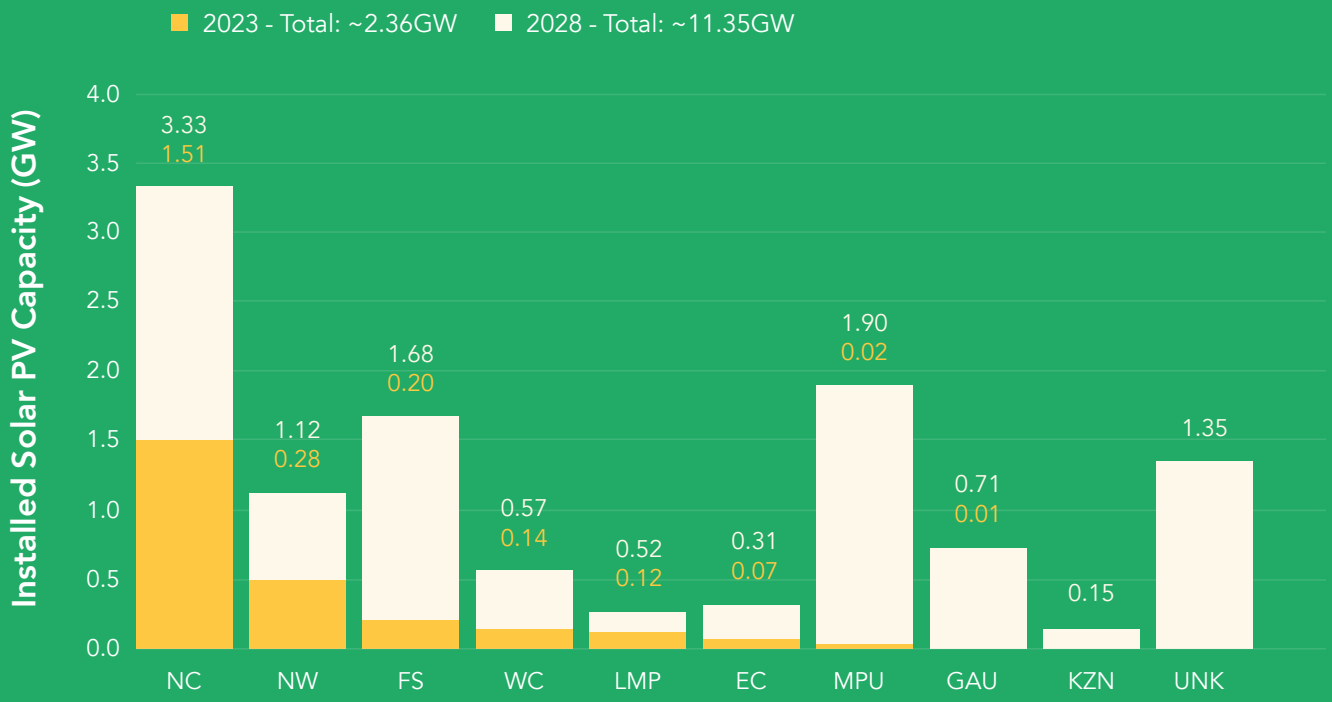


Figure 1: Total large-scale solar PV installed capacity by province[9] up to 2023 and forecasted to 2028
Source: IPP Office (2024) and GreenCape industry engagements[4]

9 NC – Northern Cape; NW – North West; FS - Free State; WC – Western Cape; LMP – Limpopo; EC – Eastern Cape; MP – Mpumalanga; GAU – Gauteng; KZN – Kwa-Zulu Natal; UNK = unknown.

Utility scale crystalline silicon module
400W (20-24kg) / 500W (25-30kg)

1MW =

2 000 (500W) Modules
2 500 (400W) Modules

10-25% Weight — **Aluminium Frame**

MATERIALS

- Aluminium/Iron extrusions
- Surface coating

Used to mount the solar panels during installation with ease

6-8% Weight — **Encapsulate (EVA)**

MATERIALS

- Synthetic polymers

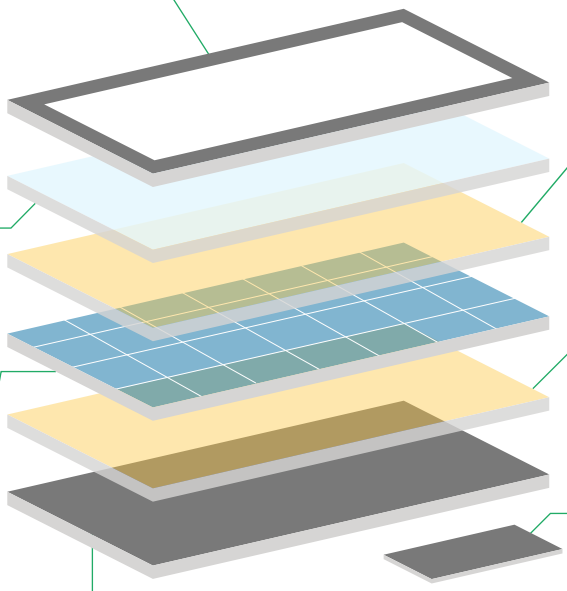
A transparent layer used to hold the cells in position. Prevents moisture and dirt ingress, improving long-term performance

60-70% Weight — **Tempered Glass**

MATERIALS

- Tempered glass
- Anti-reflective coating

Protects solar cells from chipping and damage from elements



1-2.5% Weight — **Junction Box**

MATERIALS

- Synthetic polymers
- Copper/ aluminium conductive terminals
- Diodes

The central point where all of the cells interconnect to the cables

3-5% Weight — **Crystalline Silicon Cells**

MATERIALS

- Silicon wafer
- Metal conductors

Photoelectric effect creates the current needed to produce electricity

0.1-2% Weight — **Backing Sheeting**

MATERIALS

- Synthetic polymers
- Adhesive layer UV stabilisers

Acts as a moisture barrier and final external skin for the panel

* The percentages may vary depending on the make/brand of the module.

Figure 2: Composition by percentage weight of a typical 400W and 500W crystalline silicon solar PV module.
Source: Adapted from RedSun (HK) Group (2023)[10] and Chen et al. (2024)[11]

10 Adapted from RedSun (HK) Group Limited (2023) – (https://www.linkedin.com/pulse/polycrystalline-silicon-solar-panel-components-redsun-newenergy)

11 Chen, P.-H.; Chen,W.-S.;Lee, C.-H.; Wu, J.-Y. Comprehensive Review of Crystalline Silicon Solar Panel Recycling: From Historical Context to Advanced Techniques. Sustainability 2024, 16, 60. https://doi.org/10.3390/su16010060

3 Legislative requirements for solar PV producers and end-of-life solution providers

This section provides an overview of the relevant legislation and legal requirements for solar PV producers and those involved in the management of end of life solar PV modules.

The Waste Act: In South Africa, the management of waste is regulated by the National Environmental Management Waste Act (Act 59 of 2008) (NEMWA).

Classification of waste: In South Africa, solar PV panels and some of the associated equipment (e.g. inverters, cables) are classified as e-waste under the country's EPR regulations (GN1184 of 2020), which came into effect in 2021.

E-waste landfill ban: The National Norms and Standards for Disposal of Waste to Landfill (GNR636 of 2013) prohibit the disposal of certain waste streams to landfill. This includes electrical and electronic waste (e-waste) equipment and consequently solar PV related streams. This means that solar PV waste must be managed by a landfill alternative solution. This should drive the demand for landfill alternative disposal measures.

Waste management licence: The Act provides a list (GN921 of 2013) of waste management activities that require a waste management licence (WML). This includes activities that seek to manage an average of 500kg or more of hazardous waste per day. To obtain a WML, an environmental impact assessment (EIA) must be conducted. Thus, facilities aiming to process 500kg or more of e-waste, such as solar PV modules, need to undertake an EIA as part of the licensing process. This ensures that the environmental impacts of such activities are assessed and managed appropriately.

Norms and Standards (Draft): Norms and standards for the "Management of Waste Electrical and Electronic Equipment for South Africa" are being drafted for consideration by the Department of Forestry, Fisheries and the Environment (DFFE). These standards aim to set minimum requirements for various stages of waste management of e-waste, including collection, storage, classification, sorting, transportation, preparation for reuse and recycling, dismantling, depollution, processing, and preparation for final treatment. Traditionally, norms and standards allow for waste management activities up to a certain threshold without a licence.

Extended Producer Responsibility (EPR): The EPR regulations (GN1184 of 2020) is an environmental policy approach in which a class of producers (as defined) of certain products are responsible for the products at their end-of-life. Producers are required to ensure that EPR measures are in place to keep their products out of landfill. These include: design for recyclability; collection of products in the post-consumer stage; and recovery, reuse, refurbishment, and recycling. Producers are required to pay fees to PROs who in turn use the EPR levies to invest in, amongst others, collection, aggregation and end-of-life management solutions.

EPR impact on solar PV: As of 2021, producers of electrical and electronic equipment (GN 1185 of 2020 as amended by GN400 of 2021), including solar PV related equipment, are required to implement measures ensuring safe handling and disposal of their products at the end of their life cycle. To enable compliance by solar PV producers, more information on how to register as a producer and join a respective producer responsibility organisation (PRO) can be found on the national Department of Forestry, Fisheries and the Environment (DFFE) EPR portal. PROs are expected to maintain a list of contractors who provide legally compliant end-of-life solutions to the sector to enable solar PV related waste to be kept out of landfill and appropriately managed.

WHO IS CONSIDERED A SOLAR PV PRODUCER?

The NEMWA's EPR Scheme regulations for the Electrical and Electronic Equipment Sector (GN 1185 of 2020) provides the following definition:

Producer means "any person or category of persons or a brand owner who is engaged in the commercial manufacture, conversion, refurbishment or import of new and/or used electrical and electronic equipment as identified by the Minister by Notice in the Government Gazette in terms of section 18(1) of the Act."

EPR applies to you if you:

- Import equipment on a commercial basis.
- Manufacture and sell equipment under your own brand.
- Resell equipment produced by suppliers, under your own brand.
- Are based outside South Africa, but sell equipment to a South African business.

Producer obligations include:

- Register with the DFFE[12].
- Establish or join a registered PRO.
- Pay fees to the PRO to implement the EPR scheme[13].
- Implement own EPR scheme if own PRO was established.

4 Opportunities in solar PV module end-of-life management

REUSE

In some cases, modules that have been decommissioned before their functional end of life, have the potential to be recovered and refurbished for resale to the second hand market.

As indicated in section 2, it is uncertain what will happen to functional modules at the end of the 20-year PPA period. If the facilities are decommissioned or upgraded with new modules, then there is a likelihood that these modules would be made available to willing offtakers. These modules may have 5 – 10 years of life at the point of decommissioning, and may be refurbished to increase lifespan.

Figure 3 illustrates an estimated number of modules to be potentially decommissioned at the end of PPA periods. The first decommissioning is only expected in 2033[14], and should result in somewhere between 170 000 - 210 000 modules being made available. For 2034, this number is expected to increase to 1.8 - 2.2 million modules[4]. This substantial increase is because of the number of solar PV farms that were commissioned in 2014 and then to around ~2.7 – 3.4 million modules by 2046. **Figure 3** indicates that for potential reuse and refurbishment solutions, there is a pipeline of end-of-life PV module supply and thus an opportunity to establish new or expand existing infrastructure, and to secure logistics and end markets for second hand modules.

RECYCLING

Ultimately, solar PV modules will reach a point where they are no longer functional, and are not able to meet their purpose and must be managed as waste. This loss in functionality may be due to 1) premature damage during installation; 2) damaged from onsite activities[15]; or 3) they reach the end of their product lifecycle.

Figure 4 provides a range of the number of modules that are likely to reach their end of life and enter waste management at a national level i.e. considering public procurement and private sector installations across the country. **Figure 5** and **Figure 6** provide a low and high range estimate of the tonnage of broad components that make up those modules. The low range represents the minimum amount of module and component waste expected each year, while the high range represents the maximum amount of waste. The estimates consider modules lost prematurely before or during installation (1%), an annual loss rate of 0.057% to 0.147% due to damage, and the future decommissioning of modules at their actual end-of-life (assumed to be 30 years) instead of the end of the PPA period (20 years).

In the short-to medium-term (2024 – 2042), there is a limited opportunity for extensive material recovery and the opportunity would likely be supplementary to general e-waste management activities. However, the long term (2043 - 2060) provides periods that will require large volume material recovery and recycling solutions. The projections in this brief are expected to be underestimates because they only consider a single type of solar PV module with a limited capacity range. In reality, the different large-scale solar PV projects use various types of modules with different capacities, so the amount of modules used for different projects can vary significantly depending on the type of solar PV module used. The brief also excludes potential future installations that may be driven by substantial additional investment in renewable energy production.

This longer term horizon also provides an opportunity for the solar PV sector to investigate the potential for closed loop secondary material integration into the potential production of future local solar PV and related components.

12 Producers must register with the DFFE via the South African Waste Information Centre (SAWIC) EPR portal: https://sawic.dffe.gov.za/SAWIC/EPR

13 Different PROs have different EPR fee structures. Producers are advised to understand what the EPR fee entails.

14 The first projects from the REIPPPP were commissioned in 2013.

15 Maintenance and cleaning, cutting of grass, harsh weather conditions etc.

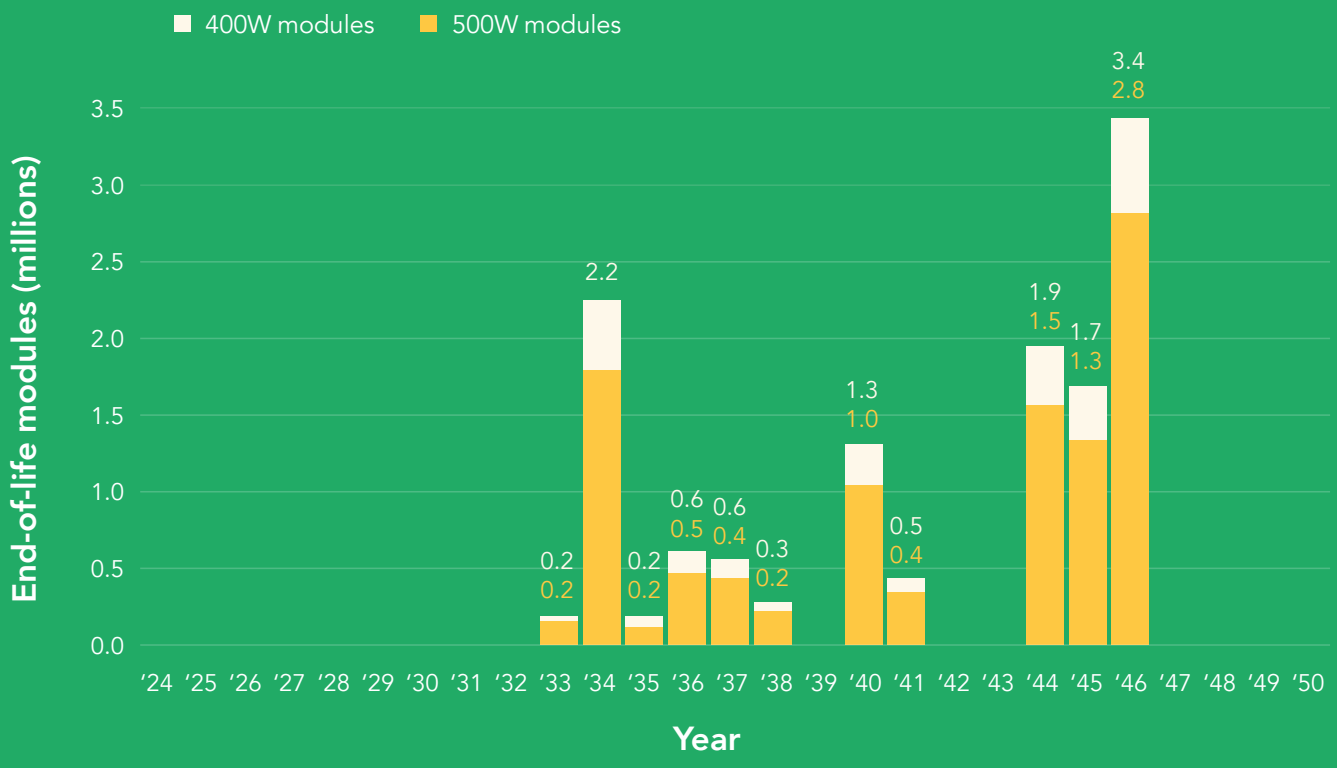


Figure 3: Number of modules and potential decommission dates for modules from post-PPA (20yr) publicly procured utility installations (2024 – 2050).
Source: IPP Office (2024) and GreenCape industry engagements[4]

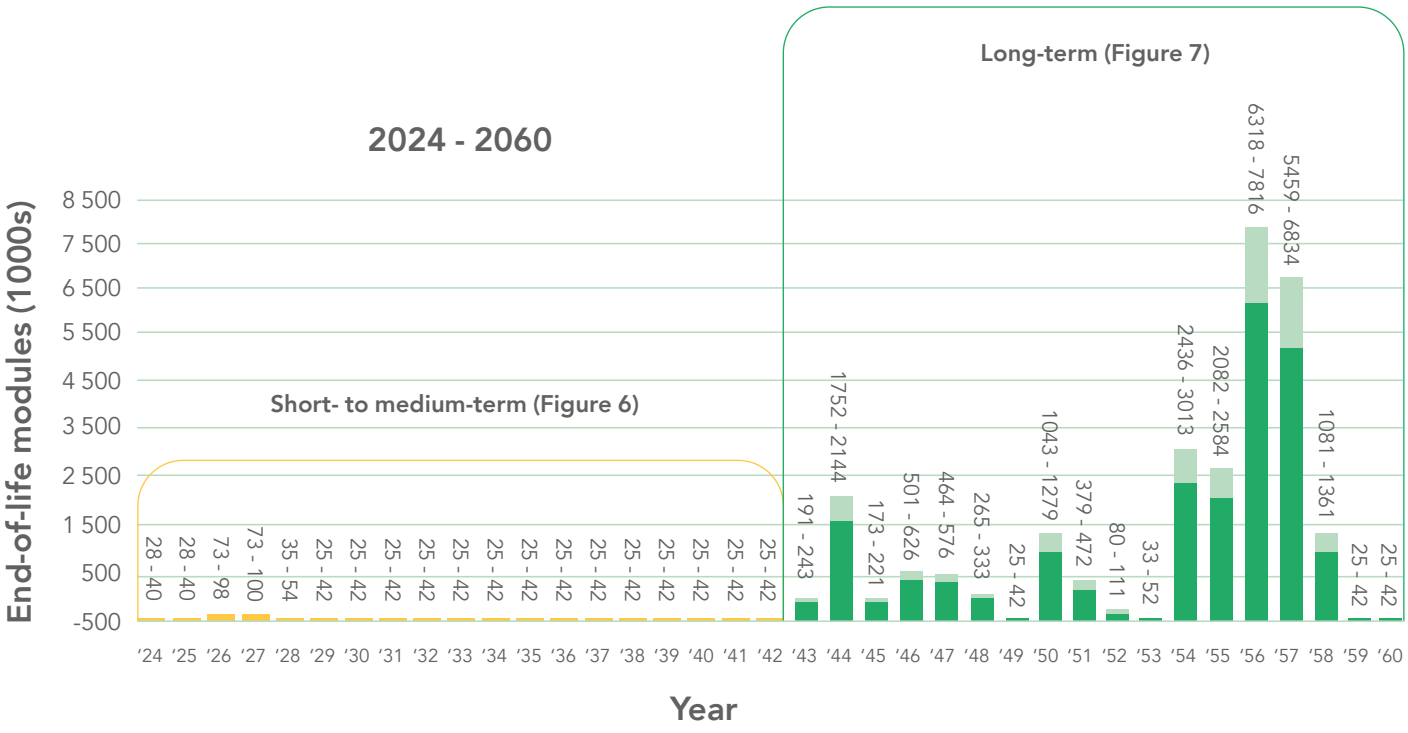
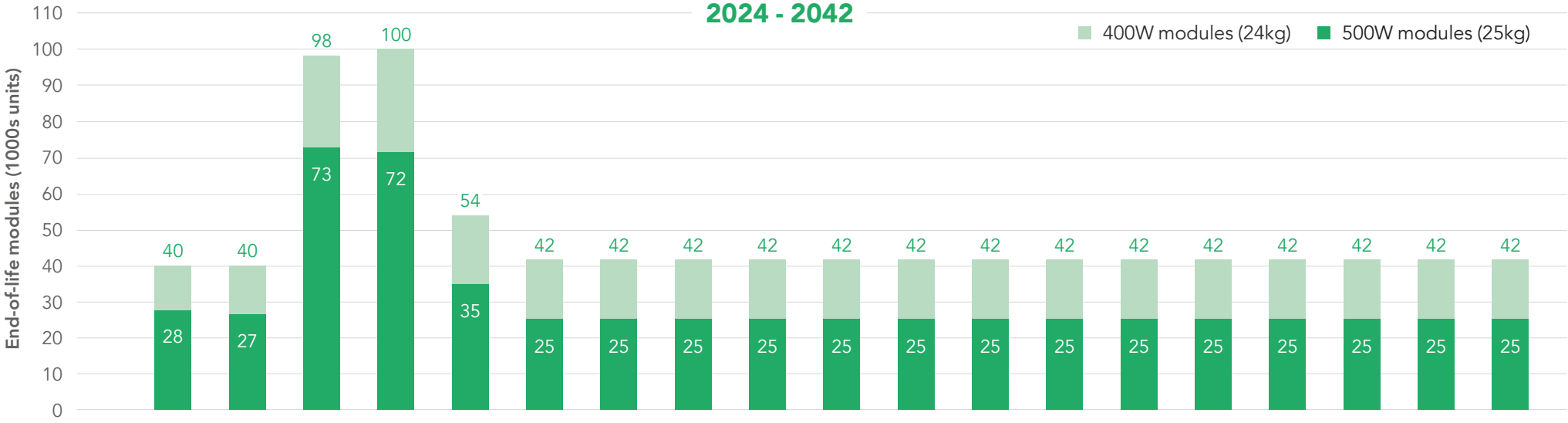


Figure 4: Estimated range numbers of end of life large-scale solar PV modules (2024 – 2060): assuming life of 30 years for public sector installations (i.e. additional 10 years beyond end of the PPAs). GreenCape analysis[16] based on IPP Office (2024) and industry engagments.

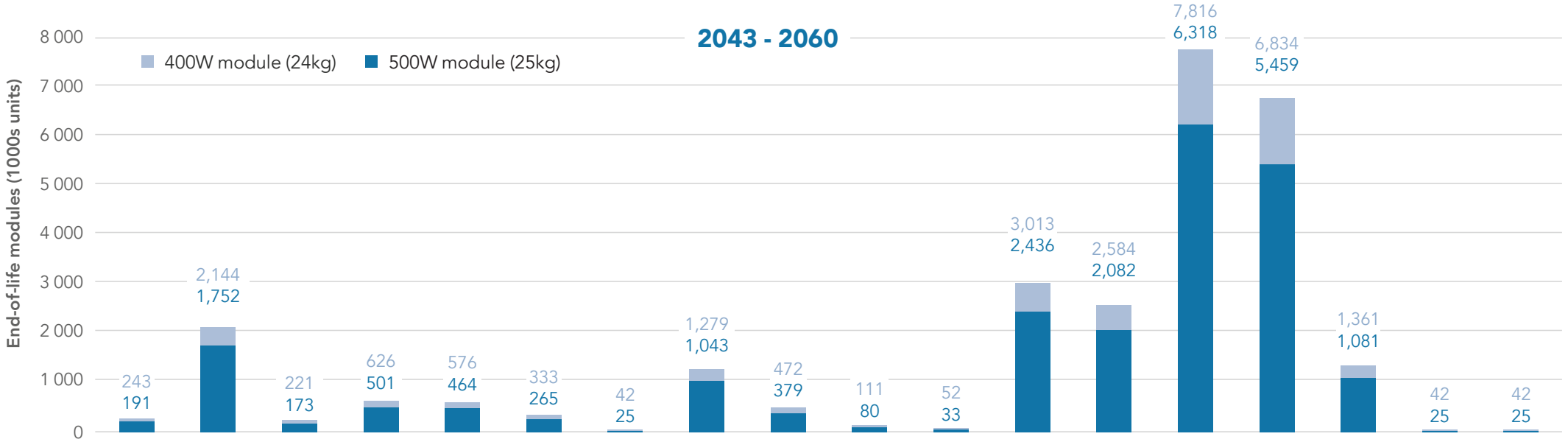
16 Adapted from IPP Office (2024) and GreenCape industry engagements



YEAR		'24	'25	'26	'27	'28	'29	'30	'31	'32	'33	'34	'35	'36	'37	'38	'39	'40	'41	'42
POTENTIAL RANGE (400W - 500W modules)	**Total Modules**	27 878 - 39 761	26 837 - 39 843	72 971 - 98 478	71 848 - 100 168	35 056 - 54 179	25 076 - 41 704	25 076 - 41 704	25 076 - 41 704	25 076 - 41 704	25 076 - 41 704	25 076 - 41 704	25 076 - 41 704	25 076 - 41 704	25 076 - 41 704	25 076 - 41 704	25 076 - 41 704	25 076 - 41 704	25 076 - 41 704	25 076 - 41 704
	Total Weight (t)	697 - 954	671 - 956	1 824 - 2 363	1 796 - 2 404	876 - 1 300	627 - 1 001	627 - 1 001	627 - 1 001	627 - 1 001	627 - 1 001	627 - 1 001	627 - 1 001	627 - 1 001	627 - 1 001	627 - 1 001	627 - 1 001	627 - 1 001	627 - 1 001	627 - 1 001
	Glass (t)	418 - 716	403 - 717	1 095 - 1 773	1 078 - 1 803	526 - 975	376 - 751	376 - 751	376 - 751	376 - 751	376 - 751	376 - 751	376 - 751	376 - 751	376 - 751	376 - 751	376 - 751	376 - 751	376 - 751	376 - 751
	Alu-minium Frame (t)	70 - 239	67 - 239	182 - 591	180 - 601	88 - 325	63 - 250	63 - 250	63 - 250	63 - 250	63 - 250	63 - 250	63 - 250	63 - 250	63 - 250	63 - 250	63 - 250	63 - 250	63 - 250	63 - 250
	Solar Cells (t)	21 - 48	20 - 48	55 - 118	54 - 120	26 - 65	19 - 50	19 - 50	19 - 50	19 - 50	19 - 50	19 - 50	19 - 50	19 - 50	19 - 50	19 - 50	19 - 50	19 - 50	19 - 50	19 - 50
	Encapsu-lation (t)	42 - 76	40 - 76	109 - 189	108 - 192	53 - 104	38 - 80	38 - 80	38 - 80	38 - 80	38 - 80	38 - 80	38 - 80	38 - 80	38 - 80	38 - 80	38 - 80	38 - 80	38 - 80	38 - 80
	Back-sheet (t)	1 - 19	1 - 19	2 - 47	2 - 48	1 - 26	1 - 20	1 - 20	1 - 20	1 - 20	1 - 20	1 - 20	1 - 20	1 - 20	1 - 20	1 - 20	1 - 20	1 - 20	1 - 20	1 - 20
	Junc-tions Box (t)	7 - 24	7 - 24	18 - 59	18 - 60	9 - 33	6 - 25	6 - 25	6 - 25	6 - 25	6 - 25	6 - 25	6 - 25	6 - 25	6 - 25	6 - 25	6 - 25	6 - 25	6 - 25	6 - 25
	Other (t)	0 - 10	0 - 10	0 - 24	0 - 24	0 - 13	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10	0 - 10

*Note: Based on the percentages illustrated in **Figure 2**, the table displays a range of the minimum and maximum values of the various components that could potentially be available as waste in the corresponding years, therefore, the total weight of the modules is not equal to the sum of the total weight of the components. These waste arisings are primarily those that may result from damage during installation of public and private sector builds and are indicative i.e. they may be spread slightly differently across the years depending on the scheduling and progress of these builds.

Figure 5: Annual number of end-of-life large-scale modules and tonnages of components for South Africa (2024 – 2042).
Source: GreenCape analysis[16].



YEAR		'43	'44	'45	'46	'47	'48	'49	'50	'51	'52	'53	'54	'55	'56	'57	'58	'59	'60
POTENTIAL RANGE (400W - 500W module)	**Total Modules**	190 582 - 243 232	1 751 766 - 2 144 302	172 511 - 220 935	501 234 - 626 034	464 432 - 575 813	264 850 - 333 253	25 076 - 41 704	1 043 164 - 1 279 355	378 920 - 471 859	80 174 - 110 577	33 125 - 51 765	2 435 609 - 3 013 358	2 082 451 - 2 584 398	6 318 412 - 7 815 561	5 459 177 - 6 834 329	1 080 649 - 1 361 170	25 076 - 41 704	25 076 - 41 704
	Total Weight (t)	4 765 - 5 838	43 794 - 51 463	4 313 - 5 302	12 531 - 15 025	11 611 - 13 820	6 621 - 7 998	627 - 1001	26 079 - 30 705	9 473 - 11 325	2 004 - 2 654	828 - 1 242	60 890 - 72 321	52 061 - 62 026	157 960 - 187 573	136 479 - 164 024	27 016 - 32 668	627 - 1 001	627 - 1 001
	Glass (t)	2 859 - 4 378	26 276 - 38 597	2 588 - 3 977	7 519 - 11 269	6 966 - 10 365	3 973 - 5 999	376 - 751	15 647 - 23 028	5 684 - 8 493	1 203 - 1 990	497 - 932	36 534 - 54 240	31 237 - 46 519	94 776 - 140 680	81 888 - 123 018	16 210 - 24 501	376 - 751	376 - 751
	Aluminium Frame (t)	476 - 1 459	4 379 - 12 866	431 - 1 326	1 253 - 3 756	1 161 - 3 455	662 - 2 000	63 - 250	2 608 - 7 676	947 - 2 831	200 - 663	83 - 311	6 089 - 18 080	5 206 - 15 506	15 796 - 46 893	13 648 - 41 006	2 702 - 8 167	63 - 250	63 - 250
	Solar Cells (t)	143 - 292	1 314 - 2 573	129 - 265	376 - 751	348 - 691	199 - 400	19 - 50	782 - 1 535	284 - 566	60 - 133	25 - 62	1 827 - 3 616	1 562 - 3 101	4 739 - 9 379	4 094 - 8 201	810 - 1 633	19 - 50	19 - 50
	Encapsulation (t)	286 - 467	2 628 - 4 117	259 - 424	752 - 1 202	697 - 1 106	397 - 640	38 - 80	1 565 - 2 456	568 - 906	120 - 212	50 - 99	3 653 - 5 786	3 124 - 4 962	9 478 - 15 006	8 189 - 13 122	1 621 - 2 613	38 - 80	38 - 80
	Backsheet (t)	5 - 117	44 - 1 029	4 - 106	13 - 300	12 - 276	7 - 160	1 - 20	26 - 614	9 - 226	2 - 53	1 - 25	61 - 1 446	52 - 1 241	158 - 3 751	136 - 3 280	27 - 653	1 - 20	1 - 20
	Junctions Box (t)	48 - 146	438 - 1 287	43 - 133	125 - 376	116 - 345	66 - 200	6 - 25	261 - 768	95 - 283	20 - 66	8 - 31	609 - 1 808	521 - 1 551	1 580 - 4 689	1 365 - 4 101	270 - 817	6 - 25	6 - 25
	Other (t)	0 - 58	4 - 515	0 - 53	1 - 150	1 - 138	1 - 80	0 - 10	3 - 307	1 - 113	0 - 27	0 - 12	6 - 723	5 - 620	16 - 1 876	14 - 1 640	3 - 327	0 - 10	0 - 10

*Note: Based on the percentages illustrated in **Figure 2**, the table displays a range of the minimum and maximum values of the various components that could potentially be available as waste in the corresponding years, therefore, the total weight of the modules is not equal to the sum of the total weight of the components.

Figure 6: Annual number of end-of-life large-scale modules and tonnages of components for South Africa (2043 – 2060).
Source: GreenCape analysis[16].

DRIVERS/ENABLERS

Regulatory drivers:

- **Landfill ban:** As indicated in section 3.
- **EPR:** As indicated in section 3.

Solar PV end-of-life analysis: The national Department of Minerals and Energy-led South African Renewable Energy Masterplan (SAREM) outlines actions to unlock the industrialisation opportunities associated with renewable energy. One action includes undertaking a detailed analysis to be implemented by the dtic and DSI on the potential to build an end-of-life industry for renewable energy value chains. This includes product life extension, reuse, remanufacturing, and recycling. This analysis should provide insights into strengthening the business case for reuse and recycling.

Existing industry bodies: South Africa has several industry bodies that support solar PV producers. The South African Photovoltaic Industry Association (SAPVIA) helps the broader industry navigate the regulatory landscape. The PROs for electrical and electronic equipment assist solar PV producers in meeting legal obligations and help solution providers access finance and end-of-life solar PV feedstock.

Existing aggregation: A number of e-waste solution providers already exist in South Africa, such as DESCO, Ewaste Africa, and Reclite. These companies collect broken and decommissioned solar PV modules from across the country, disassemble them, and segregate the components for different recycling solutions.

*Note: dtic and DSI - Department of Trade Industry and Competition and Department of Science & Innovation.

RISKS/BARRIERS

Logistics: Due to many large-scale installations taking place in remote areas, logistics will impact throughput and viability. Between 2024 to 2042, managers are likely to stockpile damaged and decommissioned modules until there is enough to justify logistics costs; this may affect throughput modelling for solution providers. From 2043 to 2060, an expected increase in the scale and rate of decommissioning will require more immediate solutions. There may even be a case for onsite pre-processing to increase logistics efficiency.

Limited closed loop offtake: While South Africa has an active metal recycling industry, it lacks solutions for recycling glass and solar cells into secondary materials, especially through closed-loop recycling back into solar PV modules. Currently, South Africa has no solar PV module manufacturing, so recovered materials are pre-processed and exported for processing instead of being used locally. This limits the potential offtake for recovered materials. However, the SAREM aims to support future local manufacturing of renewable energy technologies, including solar PV modules.

Long term investment horizons: The major opportunities are likely to be realised in the long term, creating horizon risk for short-term investments due to the uncertainty of the next twenty years in the dynamic renewable energy market. However, this also allows companies, especially those handling broader electrical and electronic waste streams, time to scale up infrastructure and secure logistics and feedstock.

In summary, this brief highlights that solutions currently exist for end-of-life management of solar PV modules and have the potential to scale in the long term due to the expected influx of solar PV module waste in the future.

This industry brief was made possible thanks to the support of the City of Cape Town

For more information and support contact:

GreenCape: info@greencape.co.za | (021) 811 0250