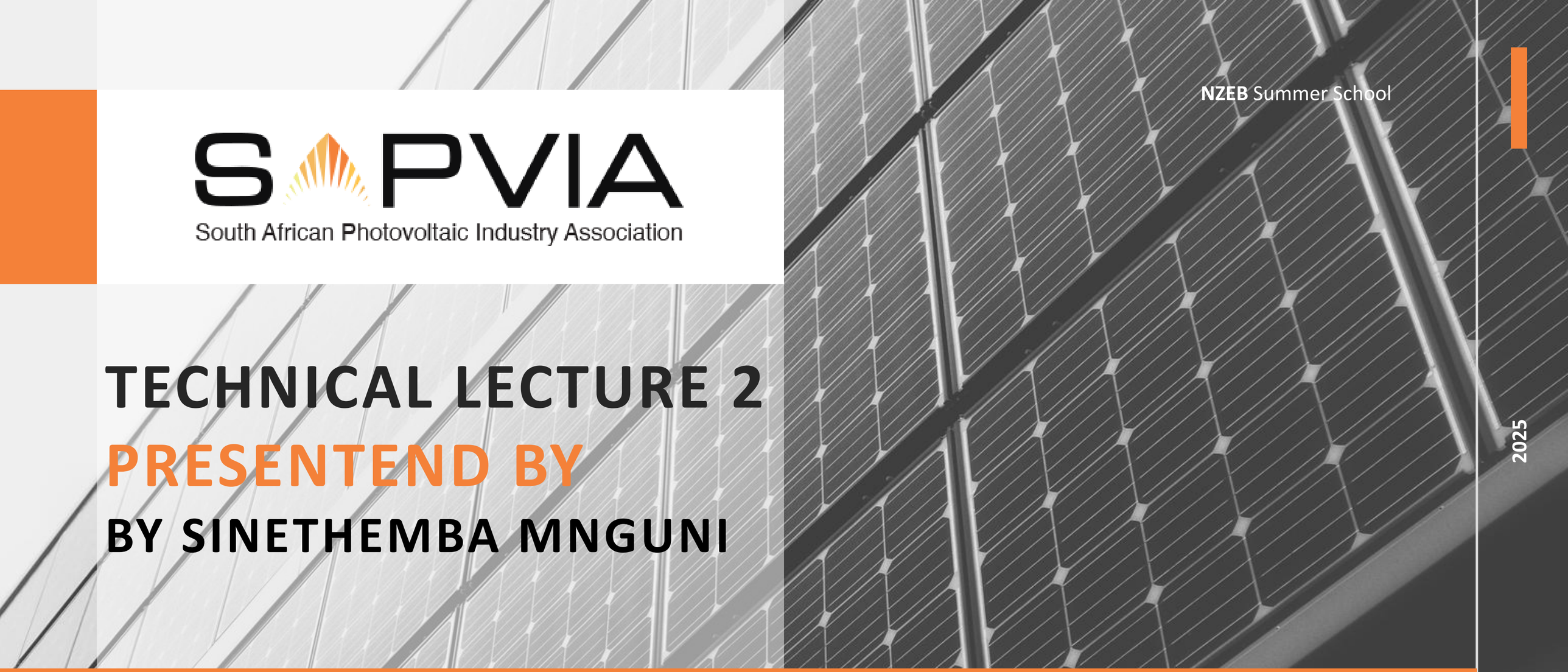

NZEB Summer School

2025

SAPVIA

South African Photovoltaic Industry Association

TECHNICAL LECTURE 2

PRESENTEND BY

BY SINETHEMBA MNGUNI

UNIVEN (NZEB)-Shaping the Future of Solar PV in South Africa: Quality, Safety, and Regulatory Solutions for Retrofitting and Deployment

4 March 2024

South African Photovoltaic Industry Association

Business Overview

THE VOICE OF SOLAR PV IN SOUTH AFRICA

2025

The South African Photovoltaic Industry Association (SAPVIA) is a non-profit industry association established in 2010: To promote, develop and grow the Photovoltaic (“PV”) industry as part of the wider renewable energy sector in South Africa.

WHO WE ARE

SAPVIA provides market and legislative interventions and programs across market segments, i.e., in the utility, industrial, commercial, and domestic markets.

In the domestic market, also known as small scale embedded generation, SAPVIA has identified the need for installations as these systems are designed to reliably operate for 20 years. Whilst the domestic market is at it nascent stages in South Africa, it is growing rapidly and its success and sustainability of this emerging industry depends on reliability of components and the quality of installations.

The South African Photovoltaic Industry Association

OUR VISION

For solar PV to be a significant and reliable contributor to the South African electricity mix; by 2050, there is:

- **Energy Security**, solar PV is used as an infinite daily energy resource
- **Policy and Market Alignment**, where clear laws and policies complement one another, and public-private partnerships enable the growth of the solar market, and
- **Environmental & Market Sustainability** through decarbonized energy and creation of economic development opportunities

ABOUT US

OUR MISSION

As the voice of the solar PV industry in South Africa, our mission is to support and represent our members. We:

- Shape and influence regulations and policy development
- Inform and educate members and other stakeholders
- Facilitate partnerships and collaboration
- Promote higher usage of solar PV in the public & private sector

Through our support, our members:

- Deploy and invest in quality solar PV
- Facilitate greater accessibility and affordability of solar PV
- Create jobs, economic opportunities and develop skills

OUR STRATEGIC FOCUS AREAS

1

SHAPE AND INFLUENCE REGULATIONS AND POLICY DEVELOPMENT

2

INFORM AND EDUCATE MEMBERS AND OTHER STAKEHOLDERS

3

FACILITATE PARTNERSHIPS AND COLLABORATION

4

PROMOTE HIGHER USAGE OF SOLAR PV IN PUBLIC AND PRIVATE SECTOR

THEME FOR THE 2025 SAPVIA STRATEGY

Increase & Amplify Member Value

KEY SUMMARY POINTS

- Put the member at the centre of our going concern
- Clarify the value of our membership fees both in philosophy and practice
- Ensure that the mission is evidenced through members
- Create an enabling environment for our members to compete successfully in the marketplace

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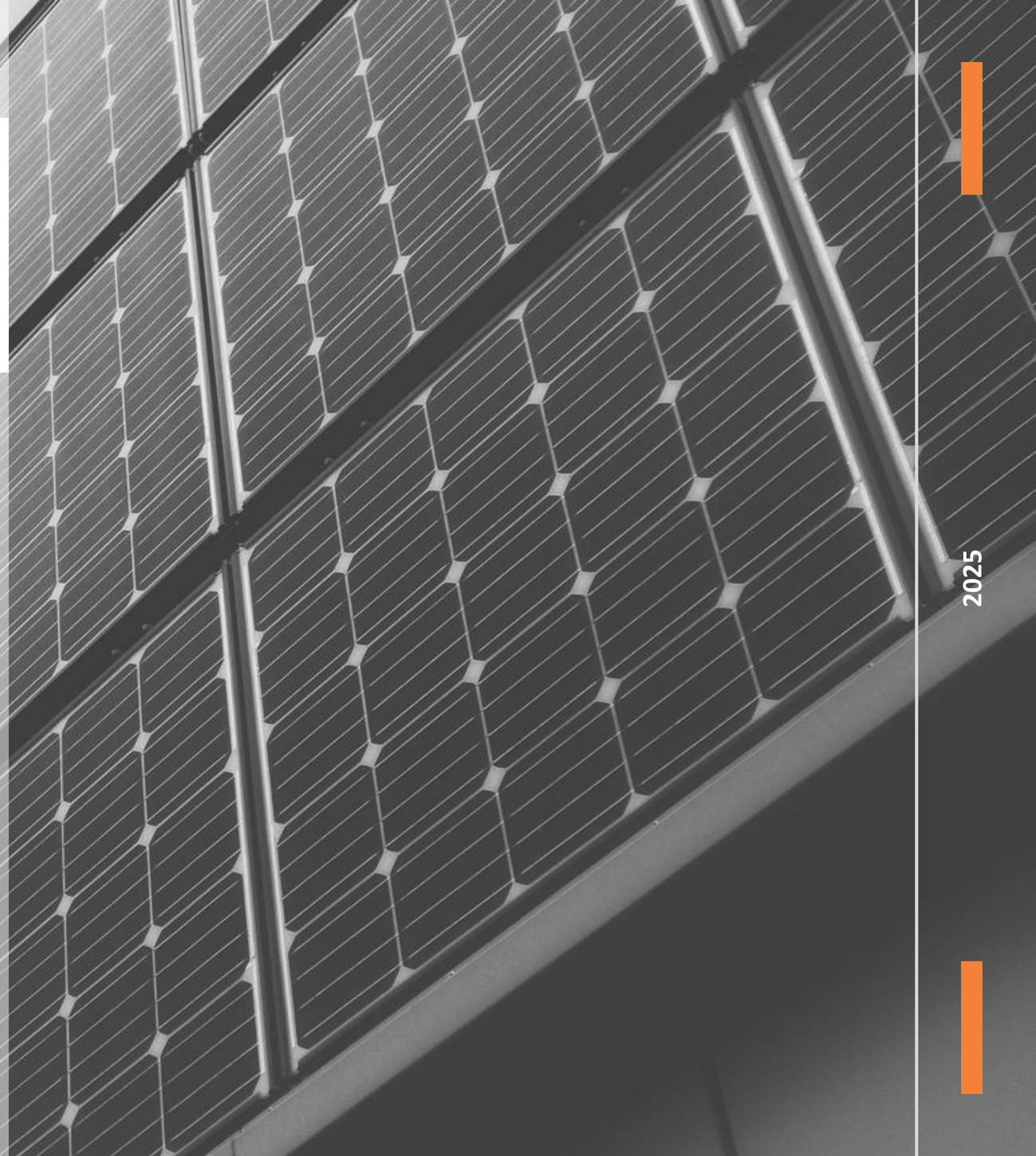
South African Photovoltaic Industry Association

MEMBERSHIP

2025



SPONSOR MEMBERS

We are pleased to have the support of Absa, Daystar Power, African Infrastructure Investment Managers (AIIM), Astronergy, Hohm Energy and voltalia as current sponsor members.

Sponsors support is pivotal in ensuring SAPVIA's ongoing success and our ability to impart meaningful insights and promote the advantages of solar PV throughout South Africa.

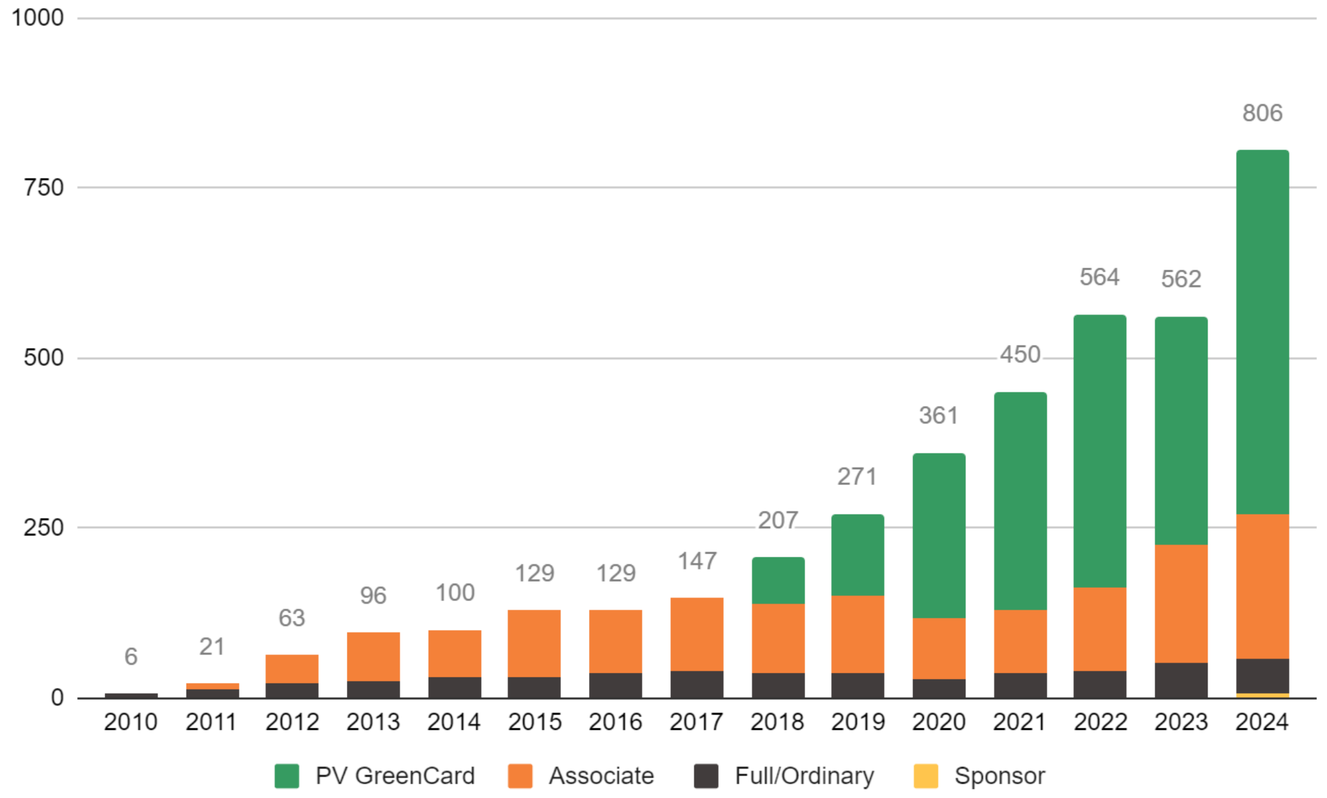
We are deeply grateful for all sponsorship contributions and look forward to securing additional support to further our efforts in serving our members and the broader South African community.

MEMBERSHIP

OUR MEMBERS

In 2024: Over 800 members, comprising

- Project development
- PV project ownership (as independent power producers)
- Engineering-procurement-construction (EPC)
- Operations and maintenance (O&M)
- Manufacturing (OEMs)
- Embedded (roof-top) PV installation
- Training, Consulting and Research
- Finance Institutions
- SMMEs (PVGC)
- PV Professionals (individuals)



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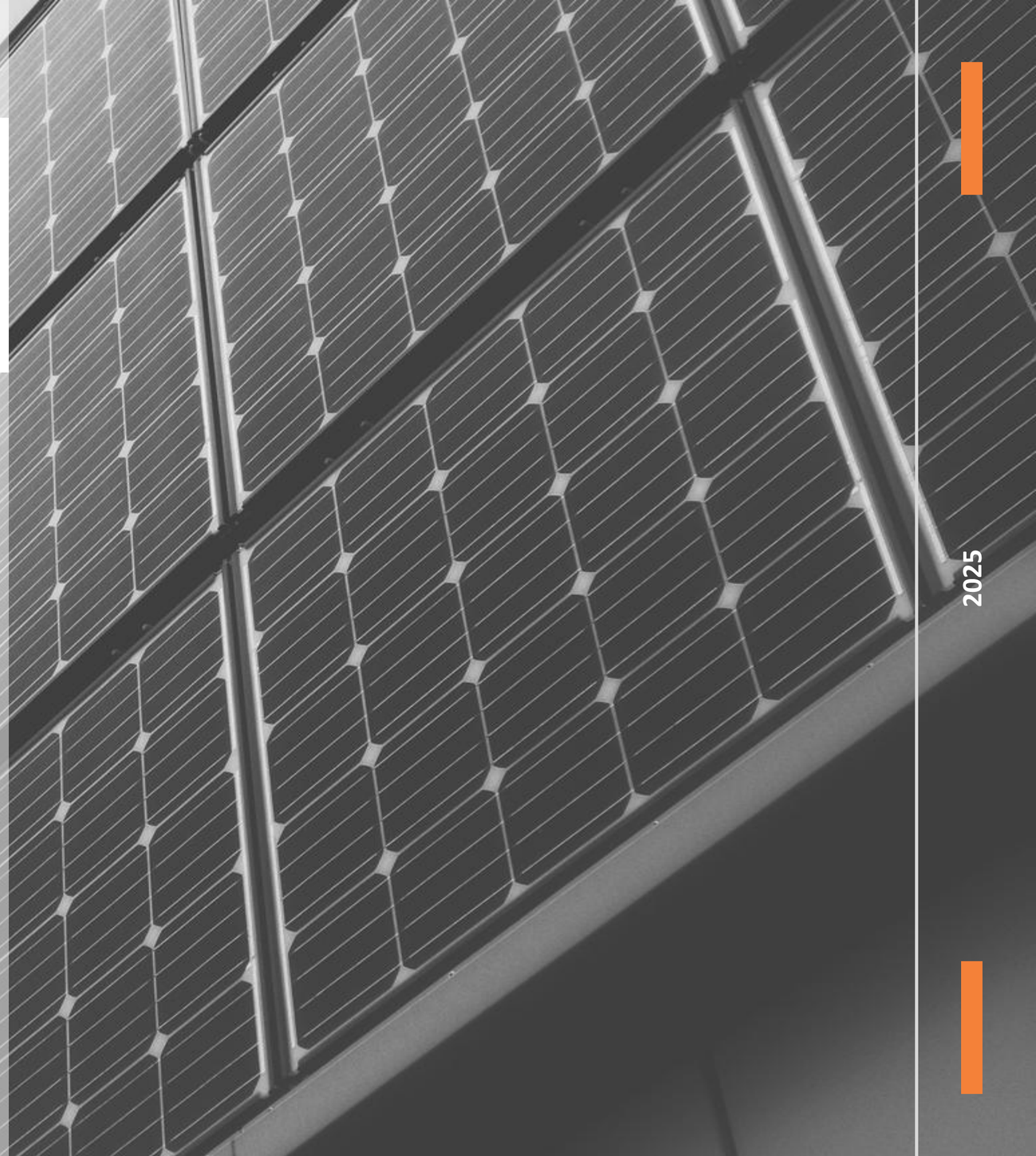
SHAPE AND INFLUENCE REGULATIONS AND POLICY DEVELOPMENT



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Shape And Influence Regulations And Policy Development

Public and Private Sector interaction: DMRE, DFFE, DTI, NERSA, NECOM, ESKOM, BUSA, NBI,

Policy:

- Integrated Resource Plan **IRP**
- SA Renewable Energy Masterplan **SAREM**

Legislation:

- Electricity Regulation Act **ERA** Amendment bill
- ERA Schedule 2 amendment

Regulations:

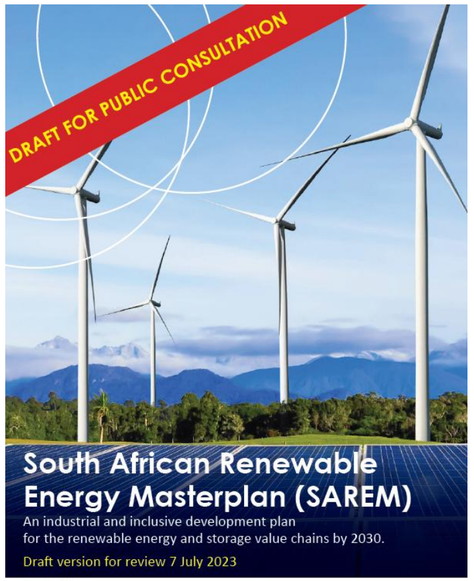
- Municipal Pr Eng sign off
- Municipal By-laws and regulations
- NERSA Net billing

Standards and Specifications:

- SANS 10142-1/2 – Low voltage wiring guide
- NRS 097-2-1 SSEG Utility Interface

Eskom Policies and Plans:

- Transmission Development Plan **TDP**
- Generation Connection Capacity Assessment **GCCA**
- Interim Grid Capacity Allocation Rules **IGCAR**
- Gated connection process



Mineral Resources & Energy
Science and Innovation
Trade, Industry and Competition

2030 NDP

STAATSKOERANT, 4 JANUARIE 2024 No. 49974 3

GOVERNMENT NOTICES • GOEWERMENTSKENNISGEWINGS

DEPARTMENT OF MINERAL RESOURCES AND ENERGY

NO. 4238 4 January 2024

PUBLICATION FOR COMMENTS: INTEGRATED RESOURCE PLAN, 2023

I, Samson Gwede Mantashe, Minister of Mineral Resources & Energy, under Section 4(1) of the Electricity Regulations on New Generation Capacity, hereby publish the Integrated Resource Plan, 2023 for public comments.

Interested and affected persons and organisations are invited to submit written comments on or before 23 February 2024. Comments on the Integrated Resource Plan, 2023 must be submitted to the Director-General of the Department of Mineral Resources & Energy.

By Post:

Mr Jacob Mbele

Private Bag X59
ARCADIA
0007

By Hand

Mr Jacob Mbele

Building 2C
Cnr Meintjes & Francis Baard Street
Pretoria

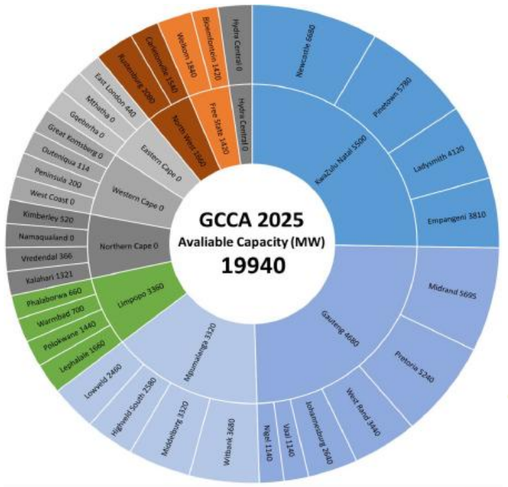
Or by email:
IRP Queries@dmre.gov.za

Or electrotonically:

https://forms.office.com/Pages/ResponsePage.aspx?id=bDWXlV5Askqncn7nJnEGjdSCoIqfOsIGi6IlYefKLn5UMlq2TjQ1WEITVURZTDhCN0szU0lUSlq2Wi4u

Kindly provide the name, address, telephone number, and e-mail address of the person and/or organisation submitting the comments.

SAMSON GWEDE MANTASHE, MP
Minister of Mineral Resources & Energy
Date: 04/01/2024



Eskom

Transmission Development Plan 2022-2031

2025

Shape And Influence Regulations And Policy Development

SAPVIA Member and Industry Feedback: Industry Working Groups

Distributed Generation:

- Commercial and Industrial Sector Focus
- SSEG policy and compliance, Net-Billing, Wheeling, PPA's, CAA compliance

Grid Access:

- Utility scale and Project Development focus
- Grid Access, Project development information, Grid Code compliance

Skills for PV:

- Skills development and Employment pathway focus
- PV GreenCard and Private sector training
- Accredited PV training SETA's, QCTO, SAQA, TVET's

Environmental:

- Utility scale and Project Development focus
- EIA, DFFE interface, Environmental compliance regulations

Manufacturing:

- Local Manufacturing and OEM Focus
- Localisation support, Equipment Standards, Market Data

Chairperson – Solaref

Solareff®

Deputy Chairperon – Solink

SOLINK

Link: SAPVIA Working Groups web page

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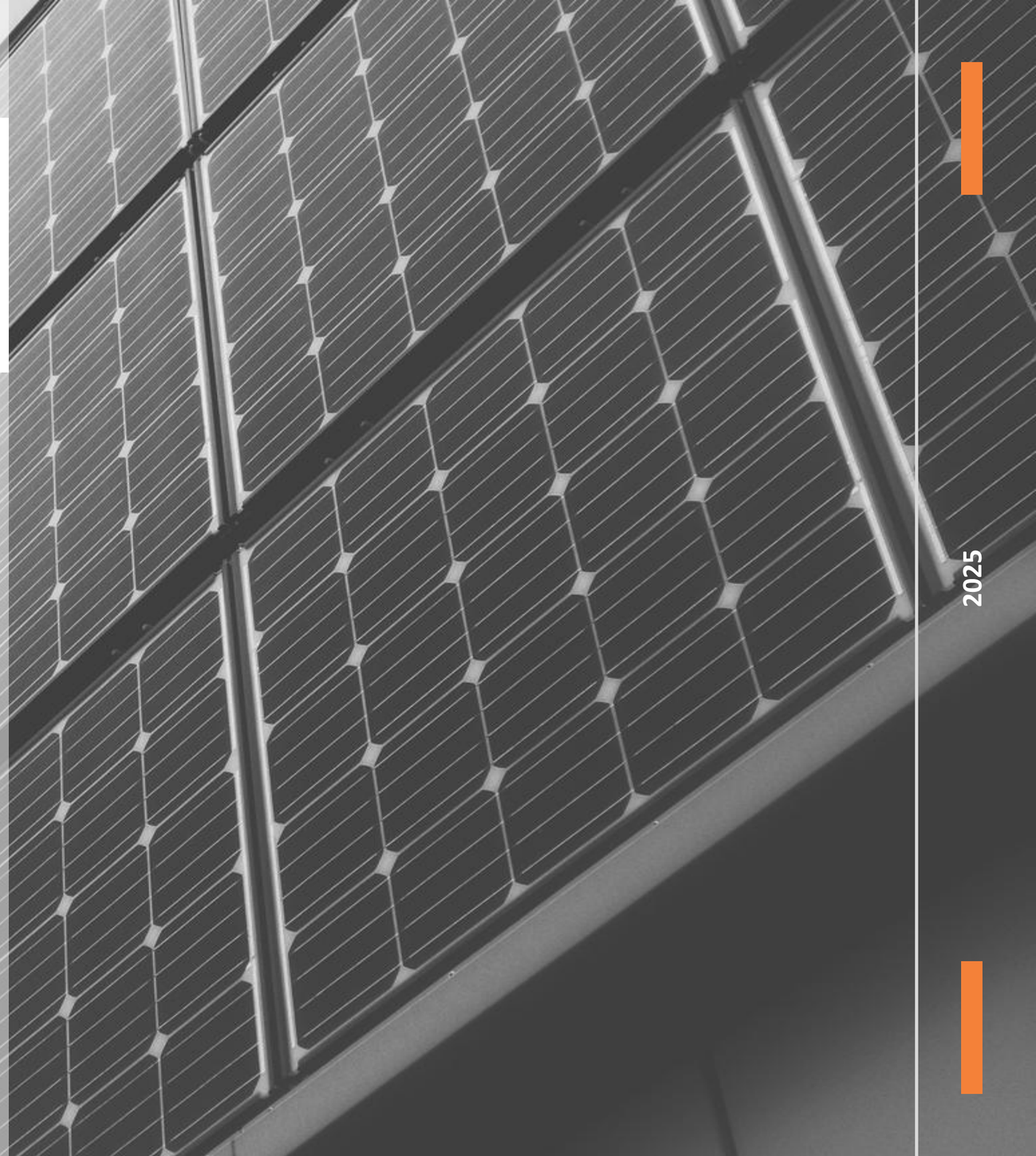
Solar Industry Landscape



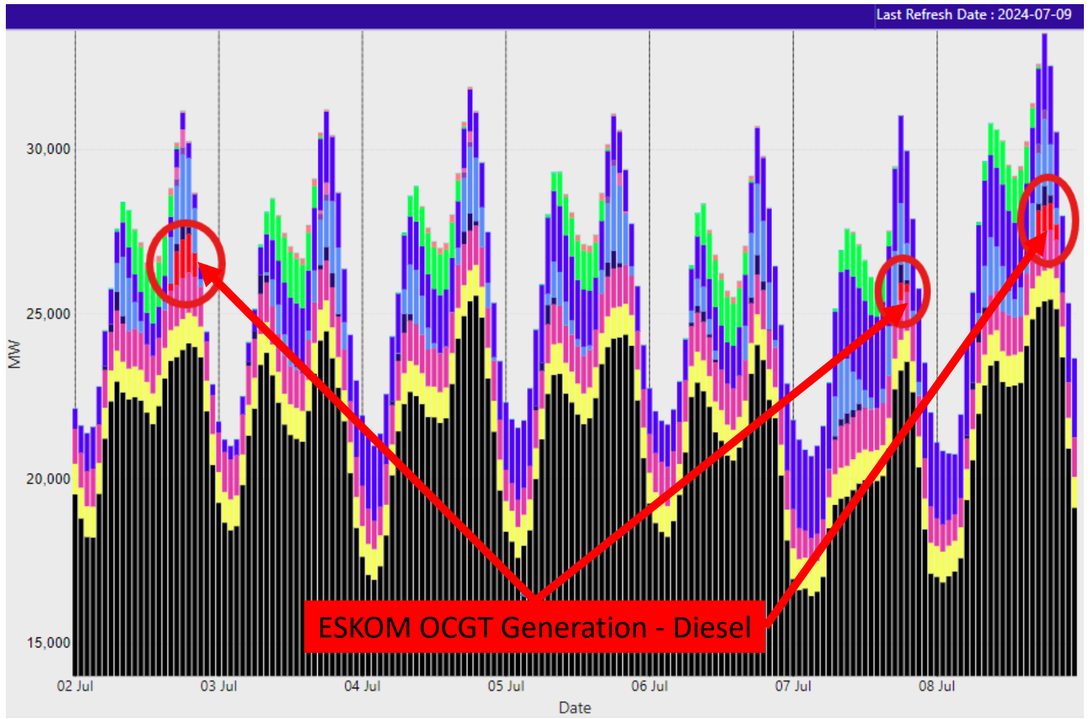
2025

SOUTH AFRICA'S ENERGY LANDSCAPE

LOADSHEDDING AND ESKOM GENERATION EAF

Election result, Diesel burn or the real deal? Trust the data in bad times and good times.

In 2024, improved thermal generation performance due to long term maintenance. Can be seen by decrease in Unplanned Capacity Loss Factor (UCLF)



Source: Eskom station build up

Eskom Weekly system status report 52 Week outlook for system adequacy.

Week Start	Week	MW RSA Contracted Forecast	MW Residual Forecast	MW Available Dispatchable Capacity	MW Available Capacity (Less OR and UA)	MW Planned Maintenance	MW Unplanned Outage Assumption (UA)	MW Planned Risk Level (-16200 MW)	MW Likely Risk Senario (-18200 MW)
08-Jul-24	28	33304	30909	46270	30070	3641	14000		
15-Jul-24	29	33187	30900	46695	30495	3216	14000		
22-Jul-24	30	32099	30544	46923	30723	2988	14000		
29-Jul-24	31	32158	30569	46605	30405	3306	14000		
05-Aug-24	32	31850	30218	46030	29830	3881	14000		
12-Aug-24	33	31107	29474	46030	29830	3881	14000		
19-Aug-24	34	30964	29331	46332	30132	3579	14000		
26-Aug-24	35	30766	29134	45696	29496	4215	14000		
02-Sep-24	36	31128	29240	45311	29111	4600	14000		
09-Sep-24	37	31315	29427	44628	28428	5283	14000		
16-Sep-24	38	31250	29362	44788	28588	5123	14000		
23-Sep-24	39	31005	29117	44440	28240	5471	14000		
30-Sep-24	40	31663	29516	44796	28596	5115	14000		
07-Oct-24	41	31291	29143	44463	28263	5448	14000		
14-Oct-24	42	30935	28796	44463	28263	5448	14000		
21-Oct-24	43	31288	29140	44318	28118	5593	14000		
28-Oct-24	44	31043	28945	43668	27468	6243	14000		
04-Nov-24	45	30877	28868	44318	28118	5593	14000		
11-Nov-24	46	30756	28747	44118	27918	5793	14000		
18-Nov-24	47	30513	28504	43920	27720	5991	14000		
25-Nov-24	48	30369	28360	43920	27720	5991	14000		
02-Dec-24	49	30491	28165	44395	28195	5516	14000		
09-Dec-24	50	30725	28398	43675	27475	6236	14000		
16-Dec-24	51	29472	27145	42018	25818	7893	14000		
23-Dec-24	52	27305	24979	41378	25178	8533	14000		
30-Dec-24	1	27003	24770	41803	25603	8108	14000		

Source: Eskom weekly system status reports

Risk Level	Description
Green	Adequate Generation to meet Demand and Reserves.
Yellow	< 1 000MW Possibly short to meet Reserves
Orange	1 001MW – 2 000MW Definitively short to meet Reserves and possibly Demand
Red	> 2 001MW Short to meet Demand and Reserves

ENERGY PROCUREMENT

To close the generation shortfall

IRP 2019 and Municipal Energy plans govern Public Procurement

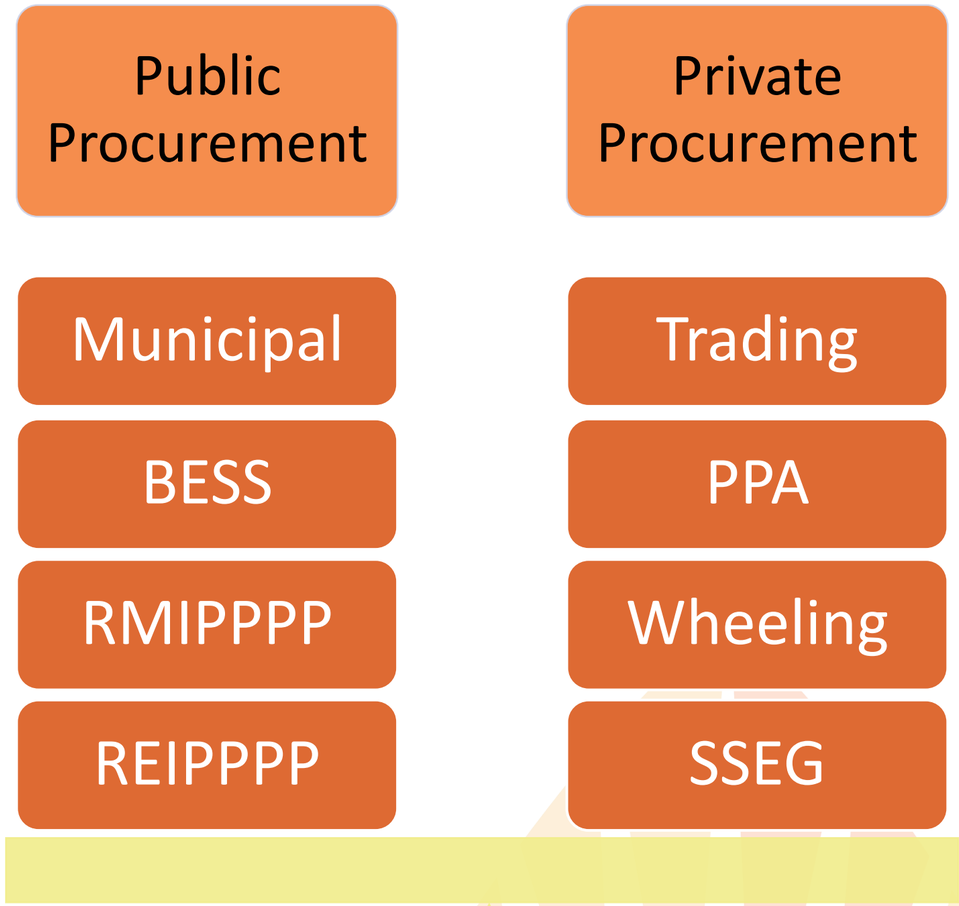
- REIPPPP – 5250MW Connected to the grid
- BW5 – 975MW IA and PPA signed Dec 2022
- BW6 – 860MW Preferred Bidder Dec 2022
- ESSIPPP1 – 360MW Preferred Bidder Dec 2023
- Municipal IPP Procurement – Cape Town 200MW IPP Tender, Ekurhuleni – 30 IPP's 300MW
- Equitable split moving forward
- BW7 – 5000MW. 1800MW Solar PV, 3200MW Wind. RFP released Dec 2023.
- ESSIPPP2 – 615MW RFP released Dec 2023.

Private investment in Generation capacity driven by:

- Security of supply concerns
- Energy cost certainty
- Decarbonisation

Enabling Environment:

- ERA Schedule 2 amendment, December 2022
- Funding readily available. Project financing
- LCOE of RE well below grid parity



PRIVATE INVESTMENT IN GENERATION CAPACITY

Private Sector Demand: 2023 South African Renewable Energy Grid Survey

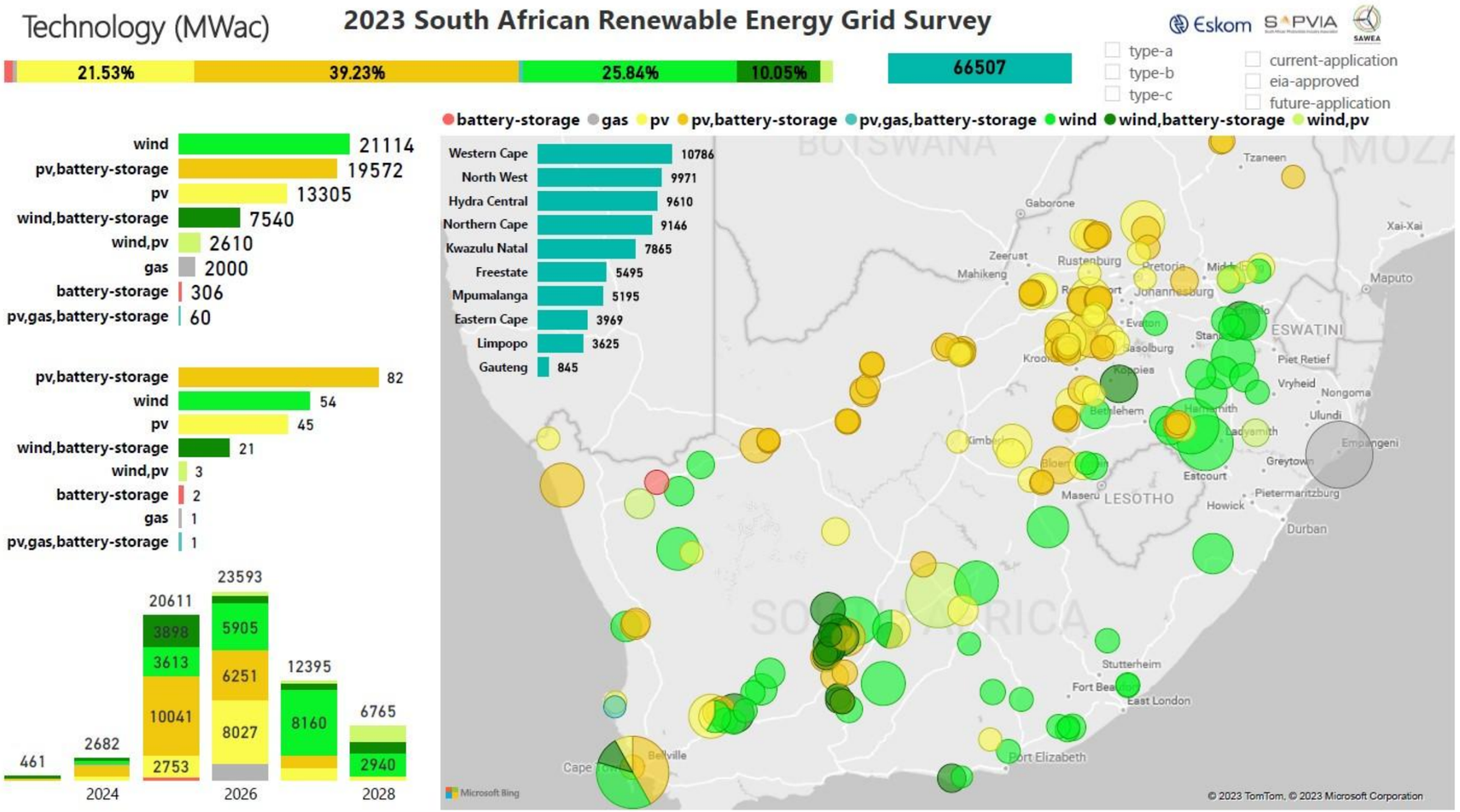
- ESKOM, SAPVIA and SAWEA Joint venture

Highlights:

- 66GW contracted capacity
- 93GW installed capacity
- 39GW installed solar PV + Storage
- 13GW solar PV only

Enabling Environment:

- ERA Schedule 2 amendment, December 2022
- Funding readily available. Project financing
- LCOE of RE well below grid parity



Link: SA Renewable Energy Grid Survey 2023 Dashboard

PRIVATE INVESTMENT IN GENERATION CAPACITY

To close generation shortfall

- Minimum Size of projects registered 100kWp
- Solar PV: 68.2% 7673MW
- Wind: 29.1% 3267MW
- 2024 Registrations: 2744MW

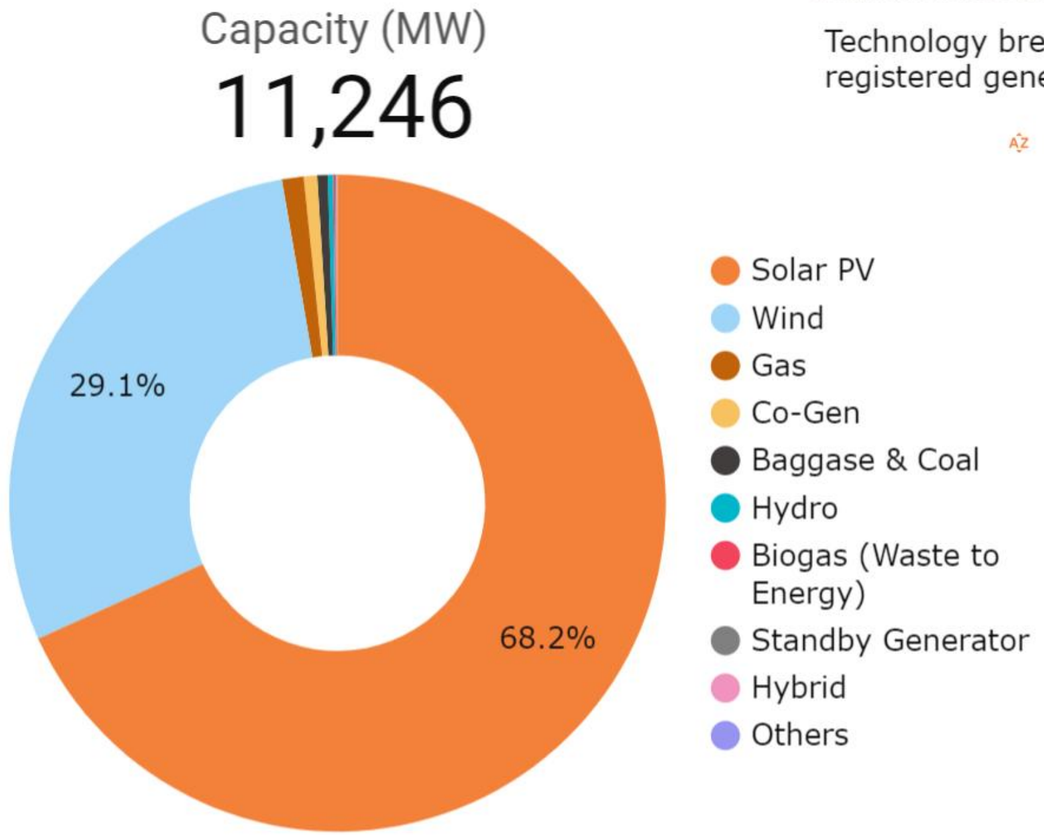
Private investment in Generation capacity driven by:

- Security of supply concerns
- Energy cost certainty
- Supply Chain Decarbonisation
- Wheeling agreements
- Aggregators and traders

Enabling Environment:

- ERA Schedule 2 amendment, December 2022
- LCOE of RE well below grid parity
- Schedule 1,2,3 emissions reduction

NERSA Registered Capacity in South Africa



Source: https://www.nersa.org.za/electricity-overview/electricity-registration/

Link: SAPVIA NERSA Registrations dashboard

2025

PRIVATE INVESTMENT IN GENERATION CAPACITY

To close generation shortfall

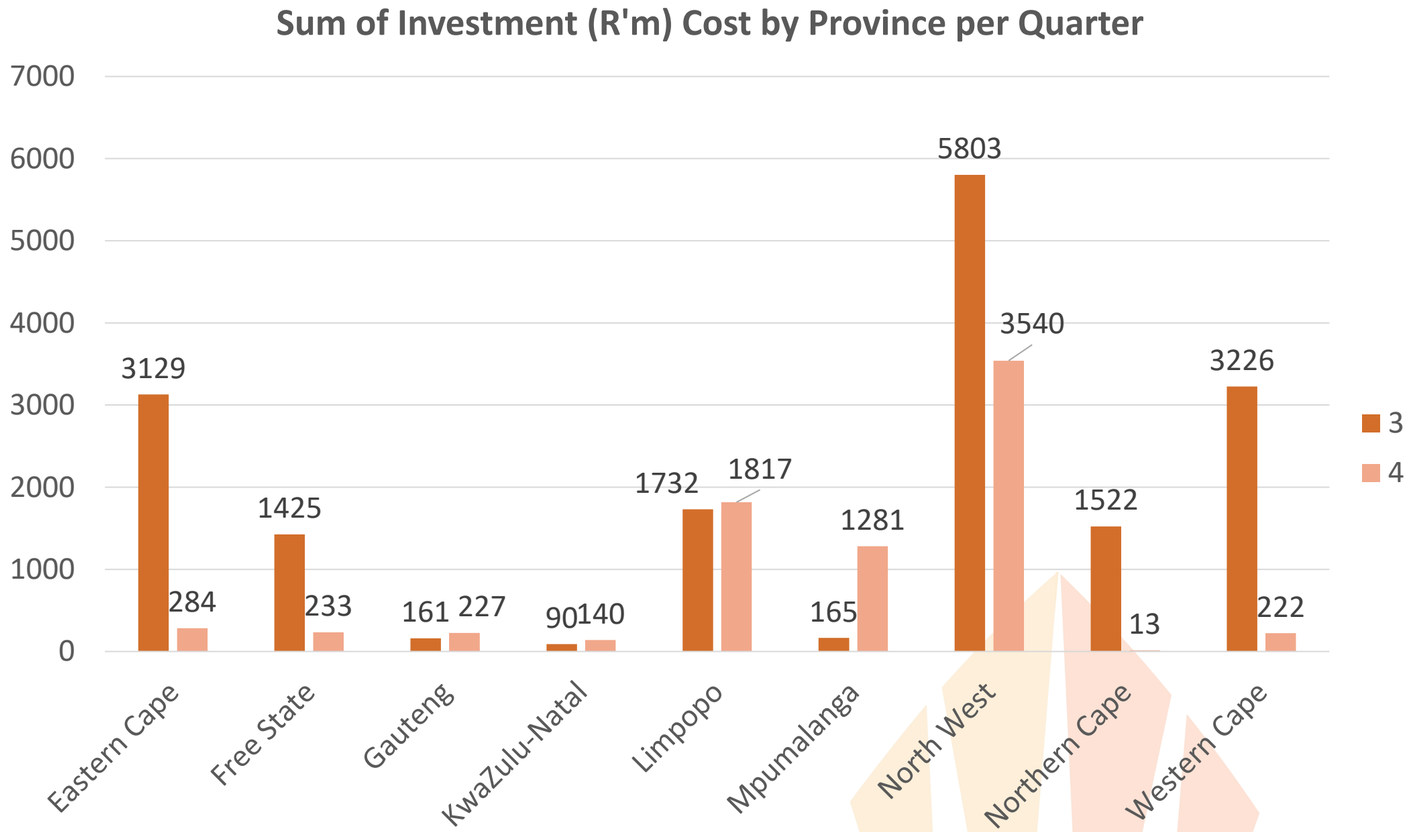
- Minimum Size of projects registered 100kWp
- Solar PV: 66.9% 4301 MW
- Wind: 30.3% 1946 MW
- 2023 Registrations: 4529MW

Private investment in Generation capacity:

- Q3 and Q4 total: R24.9 billion
- Overnight costs:
- Q3: R19M/MW (Wind And Solar)
- Q4: R12.8M/MW (Solar Only)

Insights:

- Q3: 68 plants connected to Eskom (Tx and Dx), 785MW. 30 plants connected to municipal Dx network, 27MW
- Q4: 86 plants connected to Eskom (Tx and Dx), 568MW. 38 plants connected to municipal Dx network, 37MW



Source: NERSA Quarterly notices

PRIVATE INVESTMENT IN GENERATION CAPACITY

Wheeling projects share

102 Projects registered 10MW and larger

- Total Capacity 10 041MW
- Solar PV: 78 projects 6781MW
- Wind: 24 projects 3260MW

Wheeling specific projects:

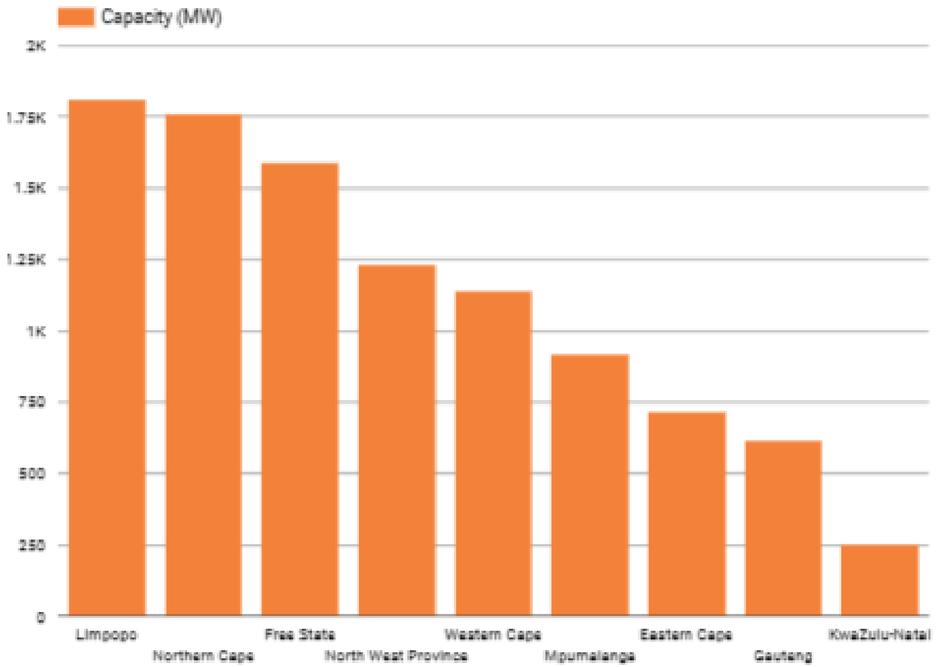
- Total Capacity: 5612MW
- Solar PV: 42 projects 3487MW
- Wind: 17 projects 2125MW

Enabling Environment

- ERA Schedule 2 amendment, 2021. Lifting of licencing requirements from 1MW to 100MW, removal DEC 2022

NERSA Registered Capacity in South Africa

Capacity (MW)	Number of Projects
10,041	102



Source: https://www.nersa.org.za/electricity-overview/electricity-registration/

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Provincial breakdown of registered generation facilities by capacity

Data Filters

Technology: Wind, Solar PV (2)

Province

Capacity (MW)
10 475

Select date range

Link: SAPVIA NERSA Registrations dashboard

2025

PRIVATE INVESTMENT IN GENERATION CAPACITY

SSEG share 1MW and smaller

Registrations in 2024:

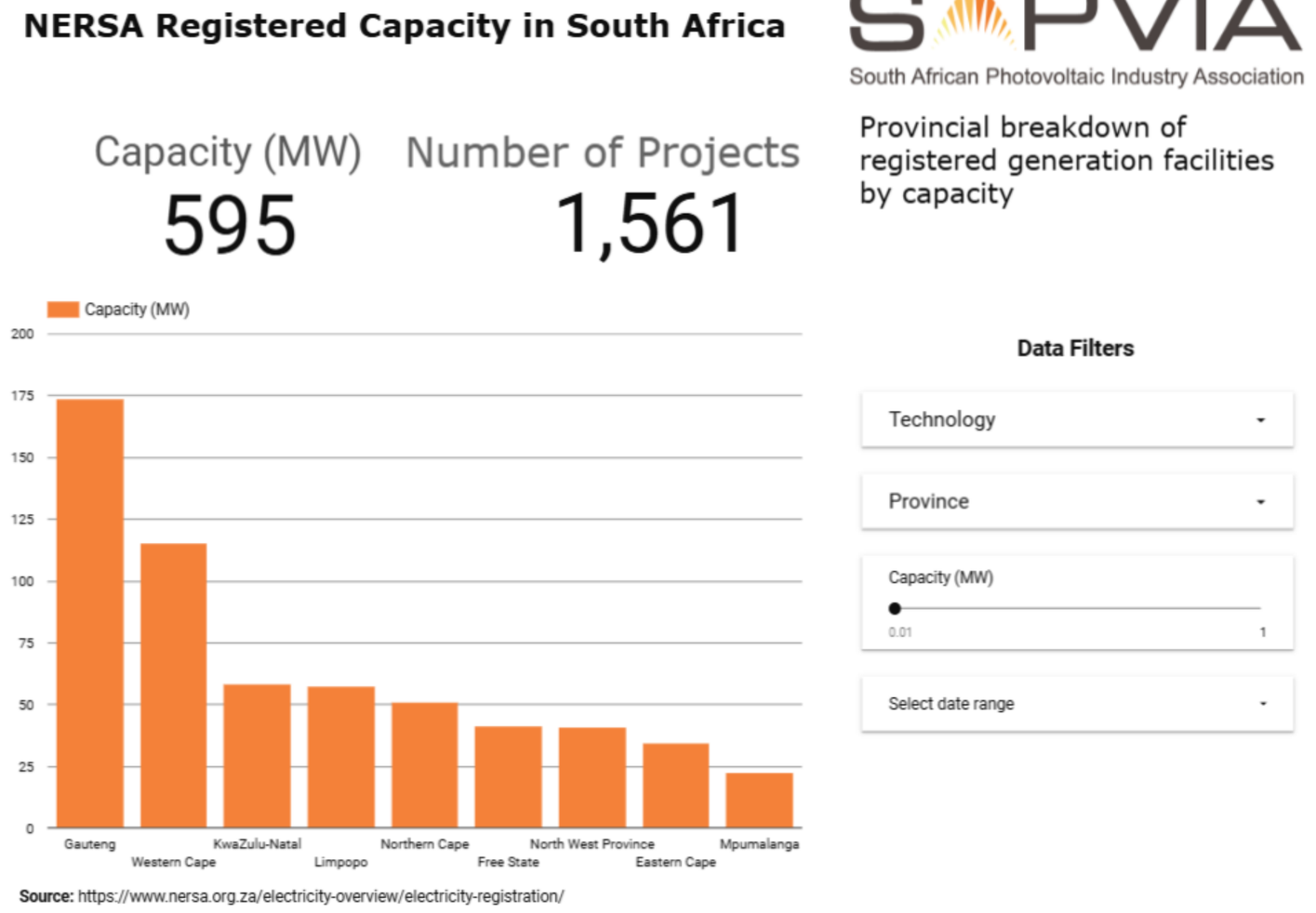
- Q1 2024: 79 Projects/ 31MW
- Total 2024: 392 Projects, 148MW

SSEG investment driven by:

- Loadshedding protection for residential
- Security of supply concerns (C&I)
- Energy cost certainty
- Decarbonisation of production Scope 1 to 3 emissions

Enabling Environment:

- Feed in tariffs and SSEG processes in Municipalities
- End of 2023 71 Munics allowed SSEG, 67 have an official application process, 43 have a SSEG tariff. Out of **165** municipal distributors.
- NRS 097-2-1 and NRS 097-2-3:2023



Link: SAPVIA NERSA Registrations dashboard

2025

PRIVATE INVESTMENT IN GENERATION CAPACITY

GIS and AI Solution to quantify Known-Unknown

SSEG Installed Capacity Estimations

- 2021: 700MW, 2022: 1.15 – 1.5GW
- SAPOA deployed 640MW in 2022, plan to roll out 500MW/year for the next 10 years

GIS Solutions

- Residential, SSEG, C&I and utility scale
- Accuracy rates: Residential 86% and C&I 95% and improving (AI learning)
- % roof covered by PV for retail, commercial and industrial buildings
- NLI data overlay – Policy Implications
- National, Provincial, municipal, suburb down to stand level

Data Access

- Data portal launched **5 October 2023**
- Public access with National level data
- Data subscription through partners

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South African Photovoltaic Industry Association

PrimeThought
Software Solutions

GEOTERRA IMAGE

2025

SAPVIA INSTALLED CAPACITY DATASET

GIS and AI Solution to quantify Known-Unknown

Q1 2023 Data Highlights:

Capacity Procurement Scheme:

- Public – 2287MW
- Private – 3371MW

No. of systems identified:

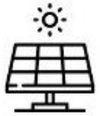
- Gauteng: 138 213
- Western Cape: 96 273
- KwaZulu-Natal: 30 781

Market Segment QoQ Growth:

- Residential <30kWp: 137%
- C&I SSEG 30kWp – 1MWp: 45%
- C&I Large Scale: 46%
- Utility Scale: 0%

INSTALLED SOLAR PV CAPACITY

Total installed capacity of systems identified grouped by market segment. Listed values across market segments include both Public and Private generation capacity procurement.

	Market Segment	System Size	Total Capacity
	Residential	0 - 30 kWp	620.89 MWp
	Commercial and Industrial (C&I) - SSEG	30kWp - 1MWp	1247.63 MWp
	C&I Large Scale and utility scale	1MWP - 50MWp	1925.53 MWp
	Utility Scale	> 50MWp	1865.03 MWp
		TOTAL	5659 MWp

Source: SAPVIA Installed Capacity Data Portal

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GEOTERRA IMAGE

2025

SAPVIA INSTALLED CAPACITY DATASET

GIS and AI Solution to quantify Known-Unknown

Q1 2023 Data Highlights:

No. of systems identified:

- City of Tshwane: 22 956
- City of Cape Town: 21 342
- City of Johannesburg: 15 040

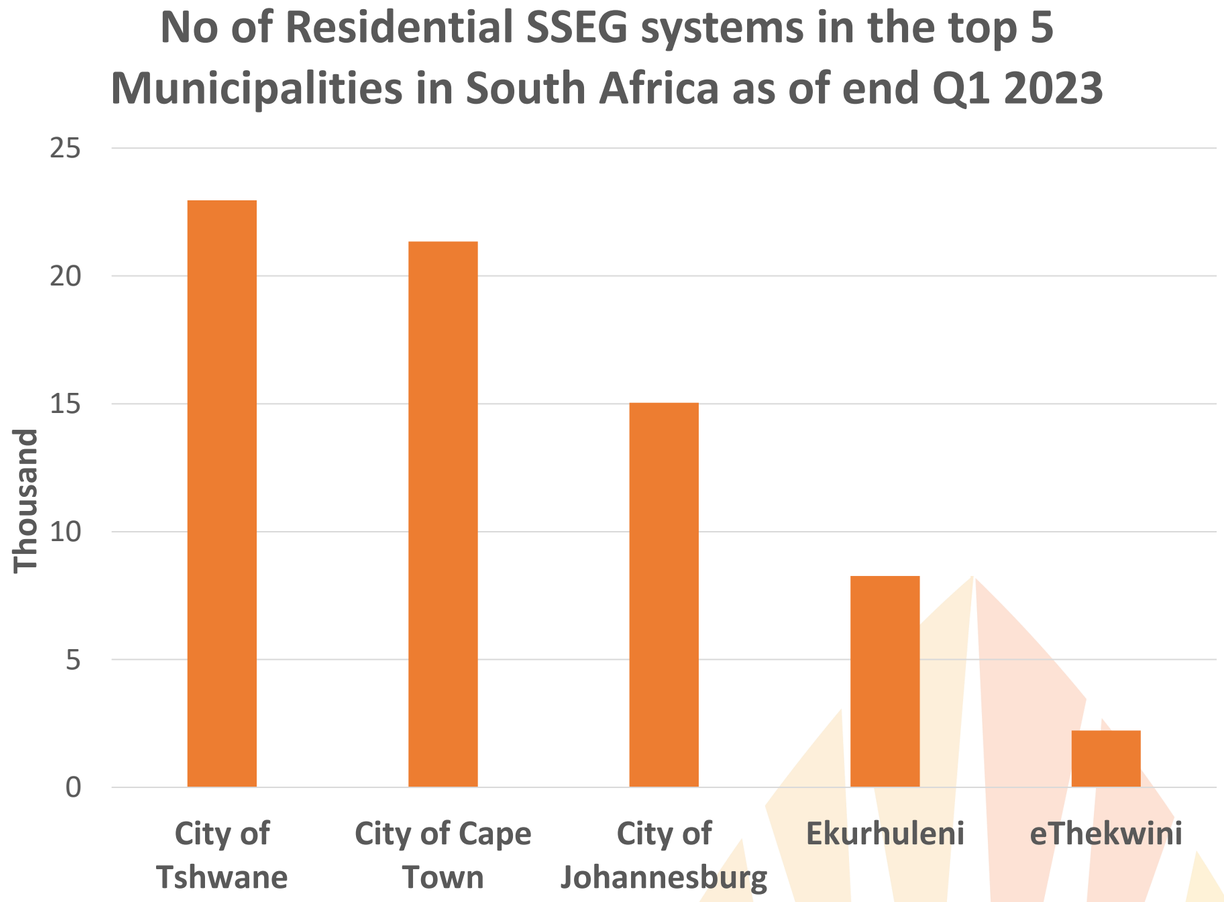
Percentage residential systems:

- City of Tshwane: 94%
- City of Cape Town: 91%
- City of Johannesburg: 87%

Average residential system size:

- eThekwini: 10 kWp
- Western Cape: 7 kWp

- Cape Town average Solar PV growth rate 22/23 across NLI 7-10 **37%**



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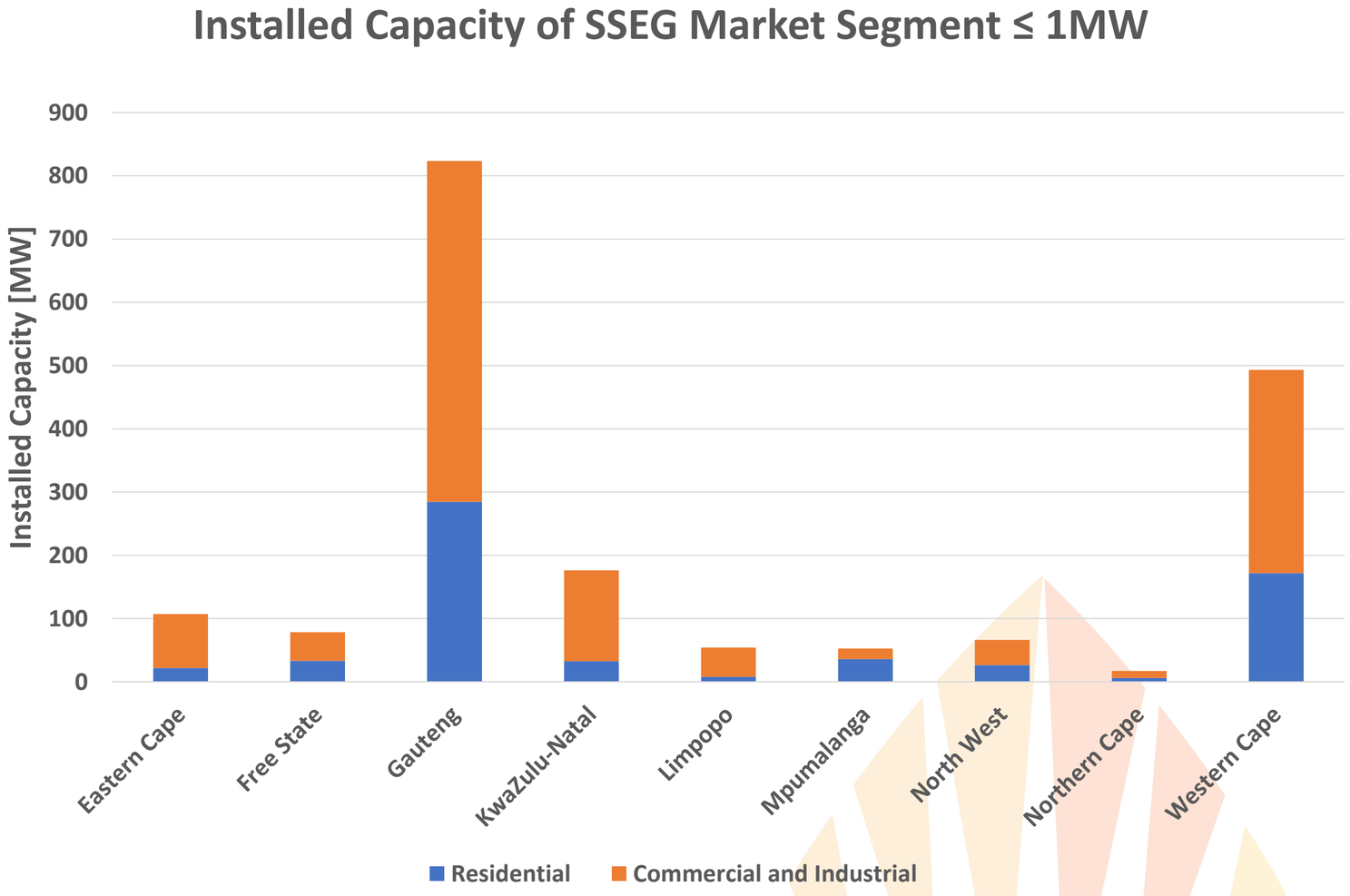
SAPVIA INSTALLED CAPACITY DATASET

GIS and AI Solution to quantify Known-Unknown

Q1 2023 Data Highlights:

SSEG Market Segment Capacity:

- Gauteng: 823MW
- Western Cape: 493MW
- KwaZulu-Natal: 176MW



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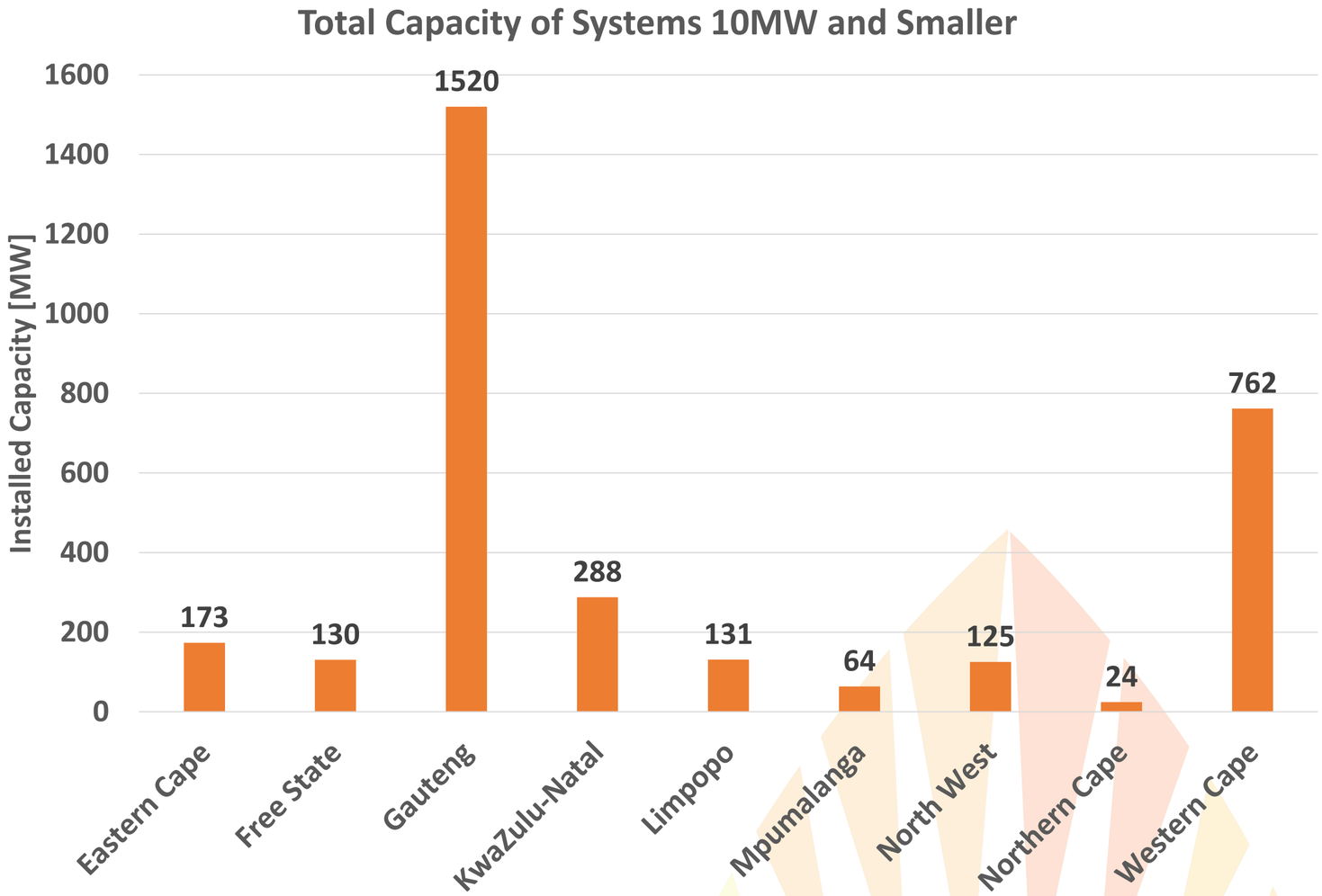
EMBEDDED GENERATION NETWORK IMPACT

Embedded Generators, Grid Tied, Hybrid, Off-Grid: Configuration and Impact on the Grid

Embedded Generation:

- Power quality
- Grid stability important to EG
- Wheeling, export etc. require energised network.
- Impact of EG exporting vs EG own consumption
- Grid tied: Full Gen, No Load vs No Gen, Full Load
- NRS 097-2-1
- NRS 097-2-3
- Grid Code compliance



EMBEDDED GENERATION NETWORK IMPACT

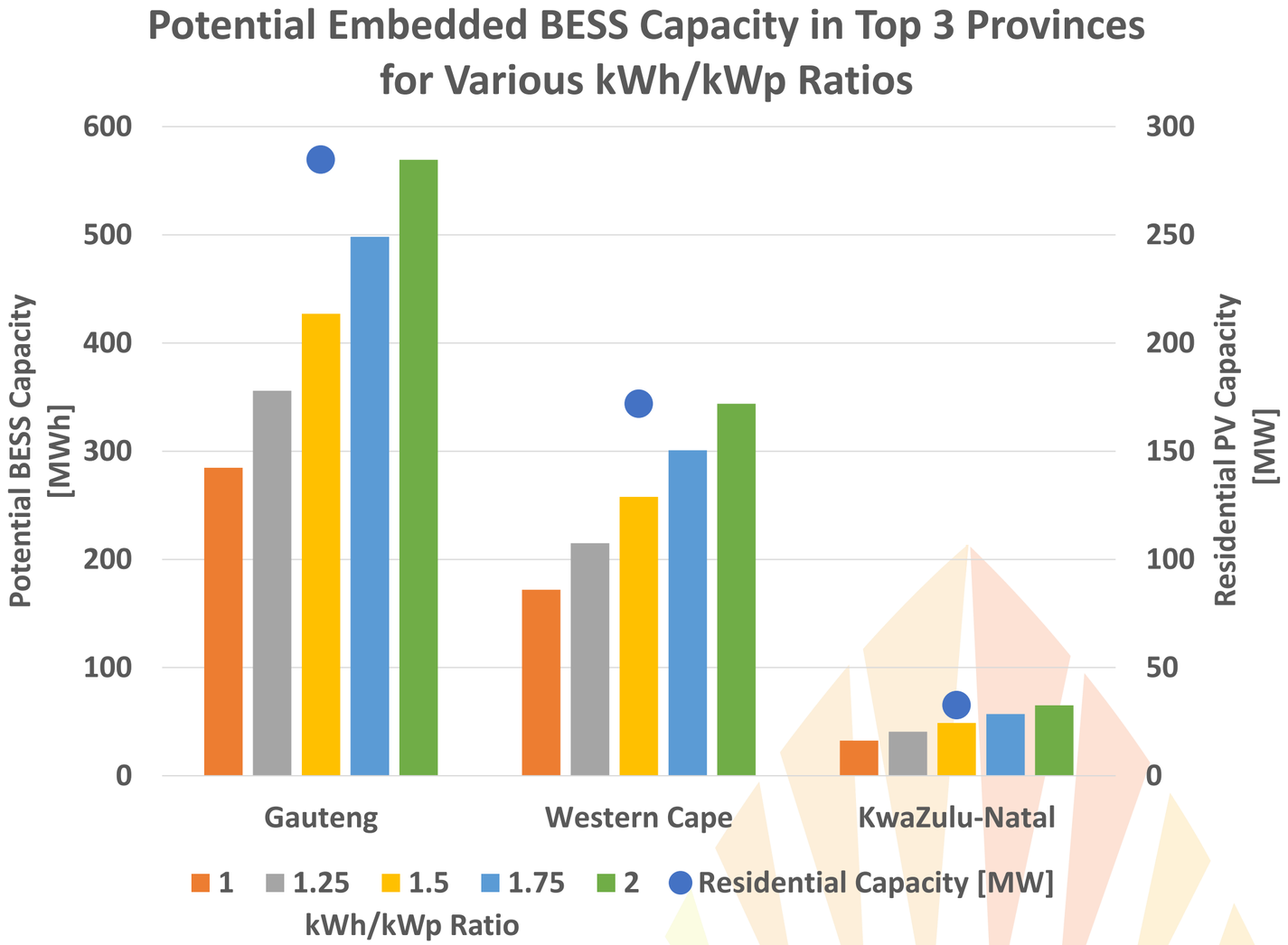
BESS and Impact on Network: Risks and Opportunities

Embedded Generation with BESS:

- Cold load pickup and Network Stability
- Load Shifting vs Load shedding
- Residential TOU Tariffs
- Demand side management tool
- NRS 097-2-3 – BESS charging rate 25% of UIC
- BESS Charging regime, SOC Anxiety

Total Potential BESS Capacity for kWh/kWp ratios:

- 1.00: 620 MWh
- 1.25: 776 MWh
- 1.50: 931 MWh
- 1.75: 1086 MWh
- 2.00: 1241 MWh



EQUIPMENT IMPORT DATA – PANELS

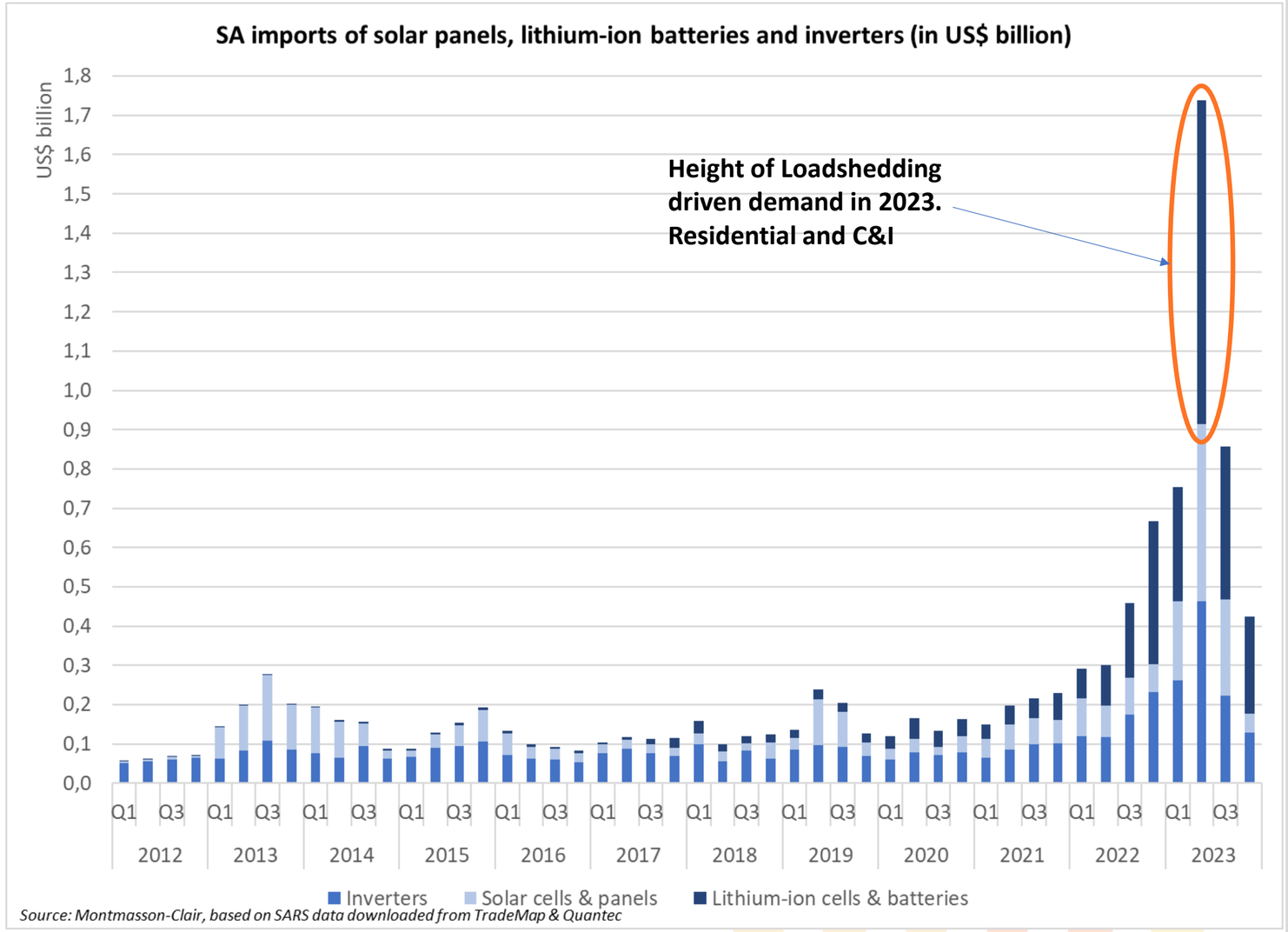
Solar PV Equipment Imports in 2023:

- Solar Panels: R17.5bn
- Lithium Batteries and Cells: R32.5bn
- Inverters: R30bn
- **Total for Solar PV and BESS: R80bn**

- Total in 2022: R31.6bn ($1.7bn)
- 2014 -2023: R187.9bn ($10.1bn)

Details

- Panel cost in range of $0.2-0.3/W equates to 3200-4700 MW imports panels in 2023. Residential, C&I and Utility scale
- Total imports since 2010: $2.6 billion or R35 billion worth of panels.
- 2013 Peak of public procurement can be seen in data, Q3 2013. Q1 2023 surpassed previous peak.



Source: Gaylor Montmasson-Clair, TIPS

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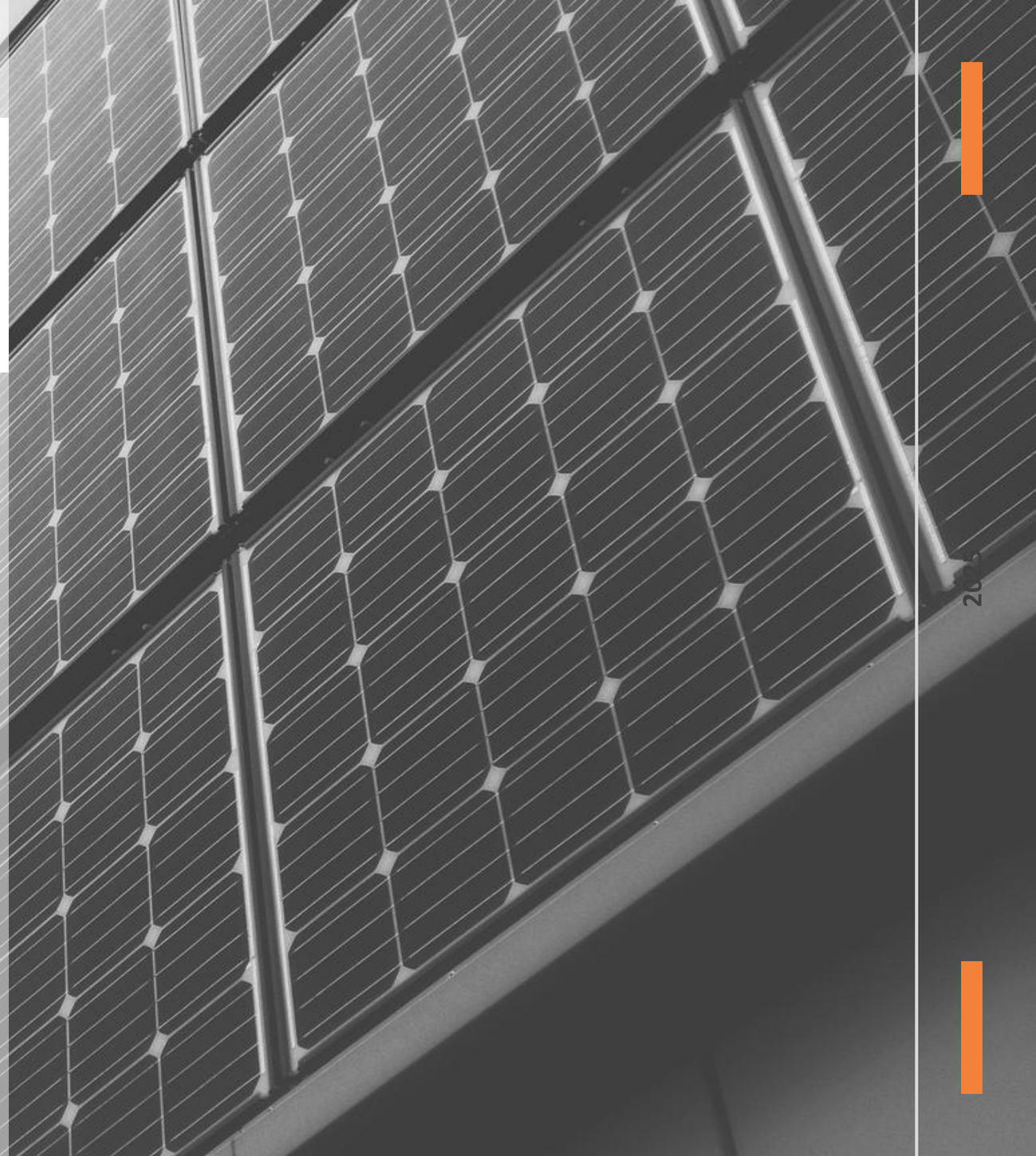
Regulatory Compliance



REGULATORY COMPLIANCE

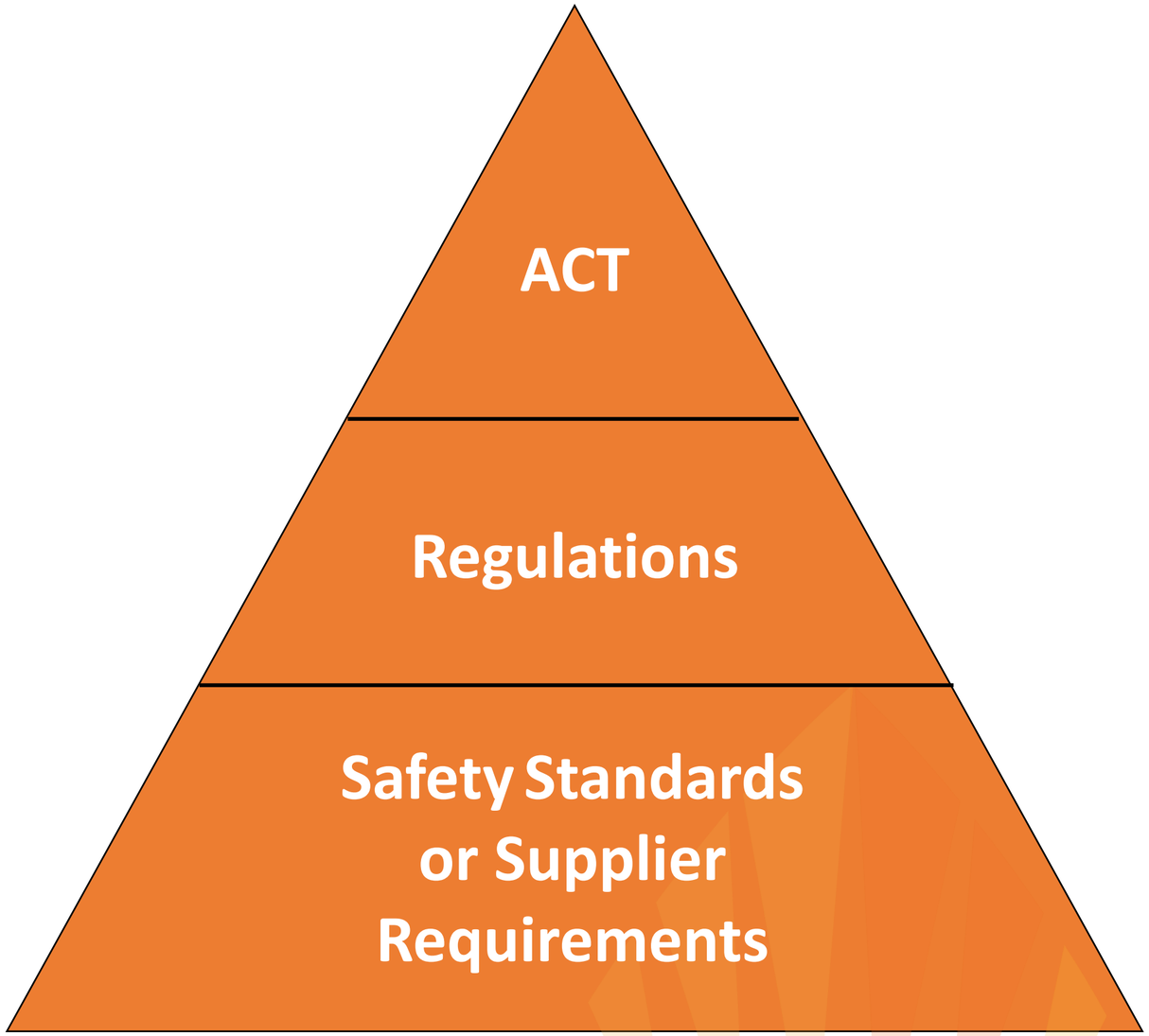
Hierarchy of legislation: Act, Regulation, Standards

The electrical industry falls under the jurisdiction of the Department of Employment and Labour which would include PV Work.

Occupational Health and Safety Act of 1993 (OHS Act)

Electrical Installation Regulations of 2009 (EIR)

South African National Standards (SANS)/International Electrotechnical Commission (IEC) OR Supplier Requirements (EIR defined - Municipality or ESKOM)



REGULATORY COMPLIANCE

All electrical installations regulated by the Electrical Installation Regulations EIR of the OHSA No. 85 of 1993

Electrical Installation Regulations (EIR) 2009 – OHSA No. 85 of 1993

Design and construction

5. (1) No person may authorise, design, install or permit or require the installation of an electrical installation, other than in accordance with a health and safety standard incorporated into these Regulations under section 44 of the Act.

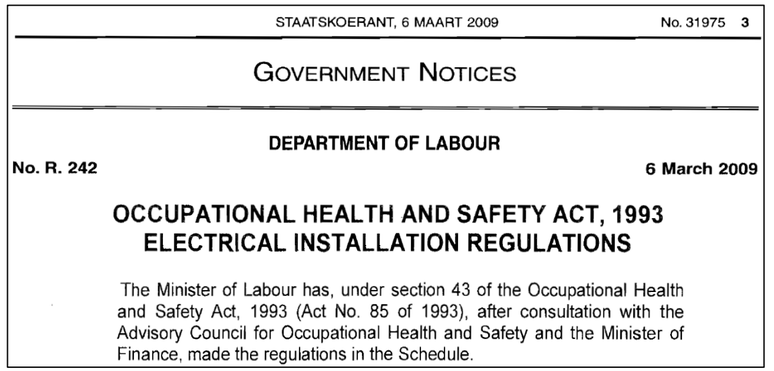
Notes:

1 . The incorporated health and safety standard referred to is the **SANS 10142-1 Code of practice for the wiring of premises** as published in Government Notice No. R.243 of 6 March 2009 or any updated revision of the standard.

Sub-regulation 3

(3) Items of an electrical installation not covered by an incorporated health and safety standard, and the conductors between the **point of supply** and the **point of control**, shall be installed in accordance with the by-laws or regulations of the **supplier** concerned.

Supplier – ESKOM or Distribution Entity (MUNIC), **point of supply** and **point of control** – defined terms in EIR.



STAATSKOERANT, 6 MAART 2009 No. 31975 3

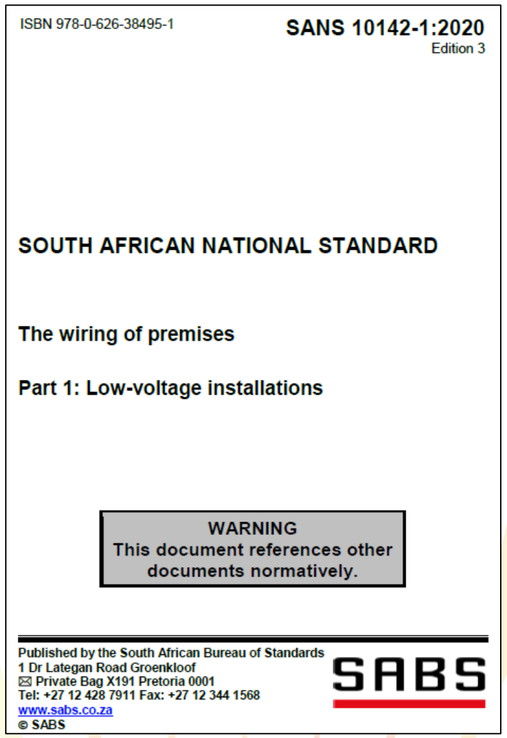
GOVERNMENT NOTICES

DEPARTMENT OF LABOUR

No. R. 242 6 March 2009

OCCUPATIONAL HEALTH AND SAFETY ACT, 1993
ELECTRICAL INSTALLATION REGULATIONS

The Minister of Labour has, under section 43 of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), after consultation with the Advisory Council for Occupational Health and Safety and the Minister of Finance, made the regulations in the Schedule.



ISBN 978-0-626-38495-1

SANS 10142-1:2020
Edition 3

SOUTH AFRICAN NATIONAL STANDARD

The wiring of premises

Part 1: Low-voltage installations

WARNING
This document references other documents normatively.

Published by the South African Bureau of Standards
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References:

OCCUPATIONAL HEALTH AND SAFETY ACT, 1993 ELECTRICAL INSTALLATION REGULATIONS, No. 31975 GOVERNMENT GAZETTE, 6 MARCH 2009

NOTICE 258 OF 2012, Explanatory notes on the Electrical Installation Regulations, 2009. Guidance Notes, Department of Labour Occupational Health and Safety Act, 1993, No.35180 GOVERNMENT GAZETTE, 26 MARCH 2012

REGULATORY COMPLIANCE: CERTIFICATION

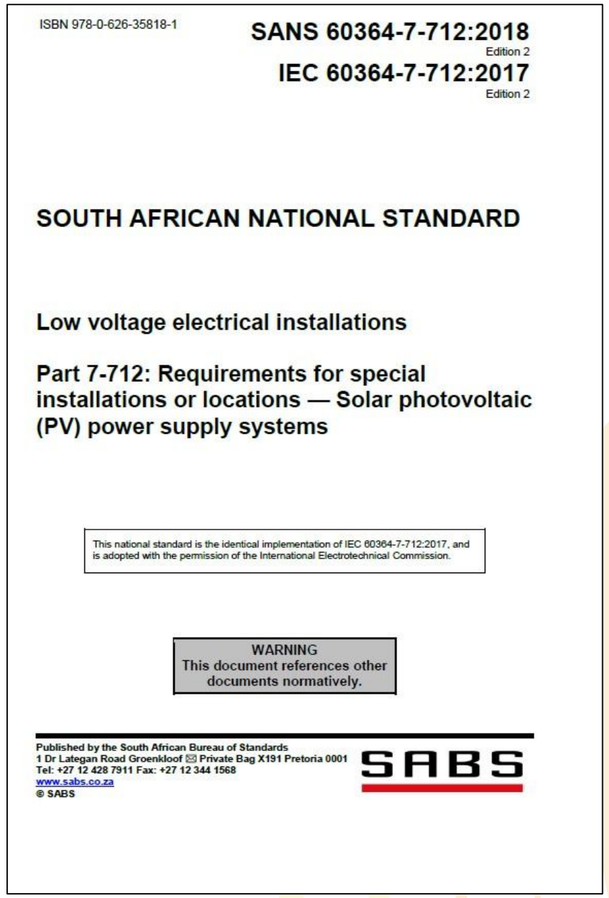
Installation Standards

SANS 10142-1: Low voltage Wiring Guide

- Safety standard
- A requirement of the Wireman's licence registration – SANS 10142 National Exam
- **Section 7.12.7** Specific requirements for Solar PV installations
- Wording creates confusion and allows non-compliance – “alternative to the main supply”
- “Alternative to the main supply” risks mitigated by NRS 097-2-1 and Equipment specification.
- **SANS 60364-7-712** installation standard for Solar PV systems based on an IEC standard

7.12.7 Additional requirements for photovoltaic (PV) and similar installations that provide a supply as an alternative to the main supply

7.12.7.1 The photovoltaic installation shall comply with SANS 60364-7-712 and the solar panels shall comply with SANS 61215 (for poly and mono crystalline) or SANS 61646 (for thin-film).



ISBN 978-0-626-35818-1

SANS 60364-7-712:2018
Edition 2
IEC 60364-7-712:2017
Edition 2

SOUTH AFRICAN NATIONAL STANDARD

Low voltage electrical installations

Part 7-712: Requirements for special installations or locations — Solar photovoltaic (PV) power supply systems

This national standard is the identical implementation of IEC 60364-7-712:2017, and is adopted with the permission of the International Electrotechnical Commission.

WARNING
This document references other documents normatively.

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REGULATORY COMPLIANCE: EQUIPMENT

Equipment Standards: Shortfall in NRCS specifications for Inverters and Batteries

Inverters:

- No National compulsory specification
- NRS 097-2-1 has become a de facto inverter standard/ specification
- National Rationalised Specification – Limited reach to municipalities that have a SSEG policy, SSEG By-Law and SSEG requirements.
- Test certificate “Cape Town Approved Inverter list”
- IEC 62109-1 and IEC 62109-2 normative reference in SANS 60364-7-712

Batteries

- No National compulsory specification
- No NRS specification. IEC Standards and international best practice

Panels

- SANS 10142-1 Normative standards
- SANS 61215:2015 (Poly and Mono Crystalline) and SANS 61646:2016 (Thin film)

DC Cables

- SANS Standard – to be incorporated in SANS-10142-1 in next iteration
- SANS 62930:2021

7.12.7 Additional requirements for photovoltaic (PV) and similar installations that provide a supply as an alternative to the main supply

7.12.7.1 The photovoltaic installation shall comply with SANS 60364-7-712 and the solar panels shall comply with SANS 61215 (for poly and mono crystalline) or SANS 61646 (for thin-film).

Aspect	NRS 097	SANS 10142-1
Type of Document	Technical specification	National standard (SABS)
Purpose	Regulates **grid interconnection** of embedded generation	Governs **all electrical installations**, ensuring safety and compliance
Scope	Applies **only to grid-connected systems**	Applies to **all installations**, including grid-tied, off-grid, and UPS systems
Regulatory Authority	Developed by **Eskom & municipalities**	Recognized by **SABS, OHS Act (EIR 5)**
Product Certification	**Does not certify products**	References **specific product standards** but governed under the NRCS (SABS)
Enforcement	**Enforced by municipalities** in some by-laws	**Legally required** for all electrical installations
Applicability	Limited to **grid-tied generation installations**	Applies to **all registered electricians and users**

SAPVIA

South African Photovoltaic Industry Association

Risks and Mitigation Measures

2025

RISKS AND MITIGATION MEASURES

Non-Compliance: Inferior Installation and Equipment quality

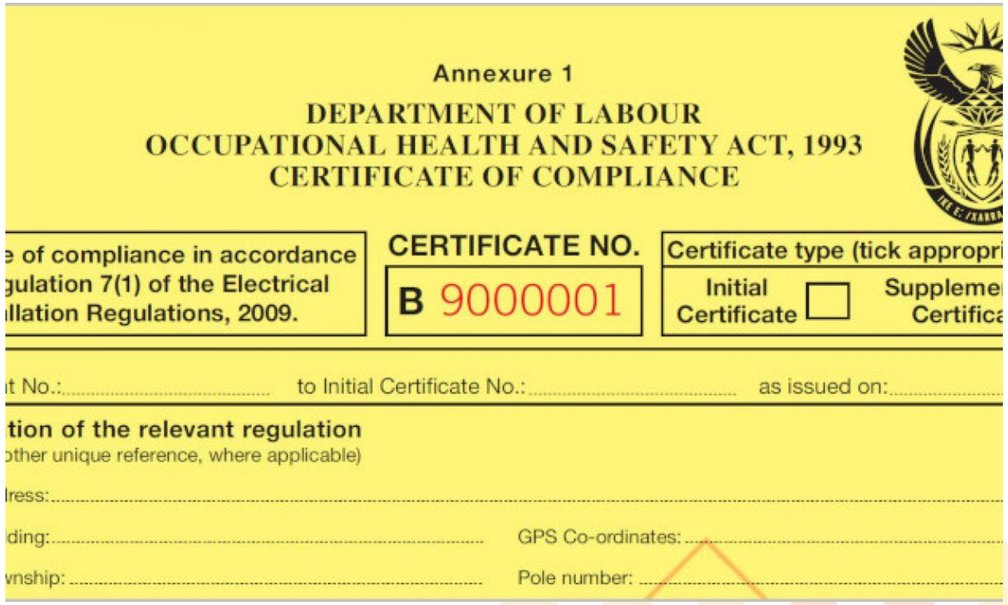
Compliance is based on:

- Eliminating or minimizing risk to life, property and equipment
- SANS 10142-1 compliance for electrical safety
- COC the measure of compliance
- Large percentage of COC's issued in SA are not valid due to non-compliance with underlying safety standard.

"**certificate of compliance**" means —

(a) a certificate with a unique number obtainable from the chief inspector, or a person appointed by the chief inspector, in the form of Annexure 1, and issued by a registered person in respect of an electrical installation or part of an electrical installation; or

(b) a certificate of compliance issued under the Electrical Installation Regulations, 1992;



Annexure 1

DEPARTMENT OF LABOUR
OCCUPATIONAL HEALTH AND SAFETY ACT, 1993
CERTIFICATE OF COMPLIANCE

e of compliance in accordance
gulation 7(1) of the Electrical
llation Regulations, 2009.

CERTIFICATE NO.
B 9000001

Certificate type (tick appropri
Initial Certificate ☐ Supplemer Certifica

t No.: ..... to Initial Certificate No.: ..... as issued on: .....

tion of the relevant regulation
other unique reference, where applicable)

lress: .....

ding: ..... GPS Co-ordinates: .....

wnship: ..... Pole number: .....

Mitigation Measures to combat Non-compliance:

- Experienced electrical contractors with multi year track record
- Electrical contractors with DoEL registered person in direct employment. No outsourcing of COC.
- Well defined DoEL recourse mechanism for non-compliance by registered electrical contractors.
- Independent 3rd party verification of COC and compliance inspection
- AIA - **Approved Inspection Authority**

RISKS AND MITAGTION MEASURES

Non-Compliance and Inferior Installation and Equipment quality

Compliance vs System Performance:

- Compliance with minimum electrical safety standards does not ensure optimum system performance
- Non regulatory mechanisms needed to guarantee system performance

Non-Compliance vs Installation Quality:

- Compliance with minimum electrical safety standards does not necessarily ensure a quality installation
- Installation quality can become a subjective topic.
- Much harder to police than non-compliance
- “Quality cannot be legislated for: it must be self-imposed” - Hugh Johnson OBE

PVGC Program Overview

PVGreenCard

SOLAR POWER INTERNATIONAL ASSOCIATION

PVGreenCard

Powered by SAPVIA
South African Photovoltaic Industry Association

An industry led skills development, quality assurance, and small business support initiative. The programme focuses on skills development and training to build installer capacity to improve installation quality standards and compliance in line with local and international best practice.

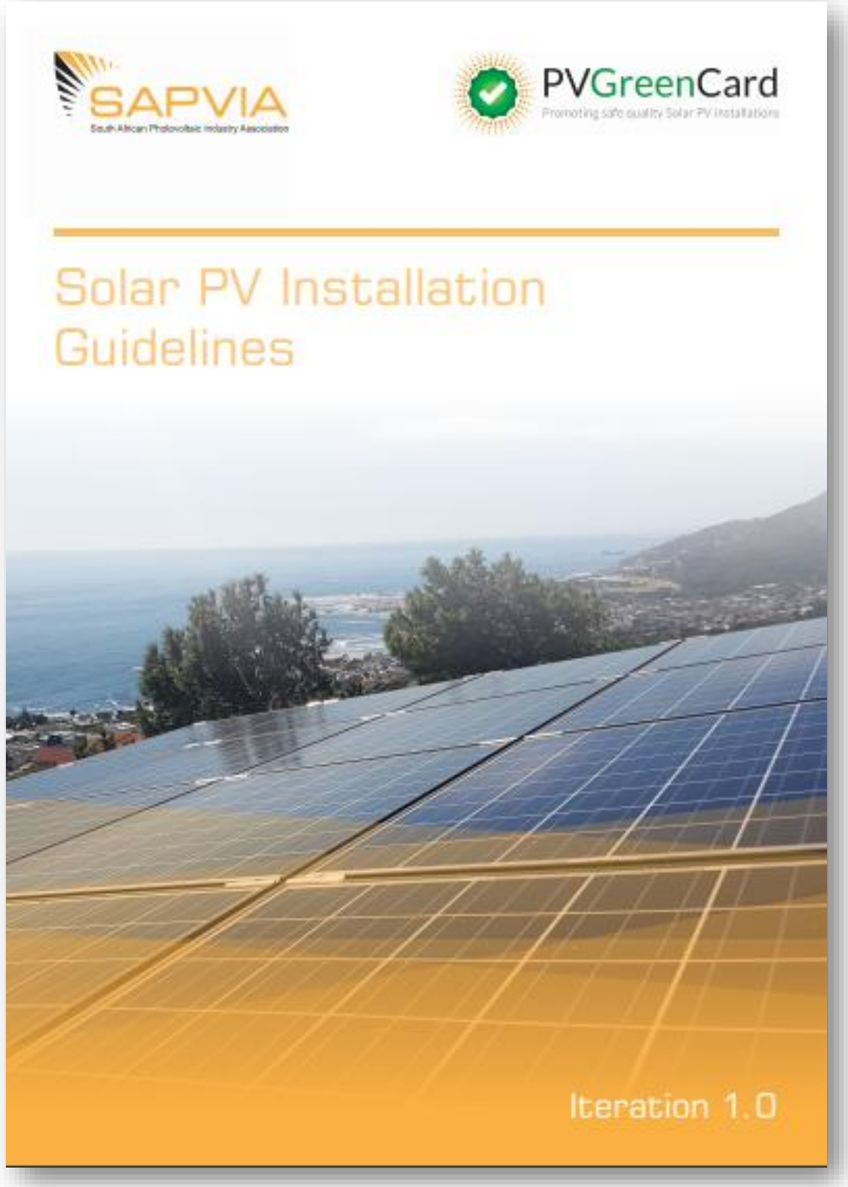
THE PV GREENCARD PROGRAM IS BASED ON THREE KEY PILLARS:

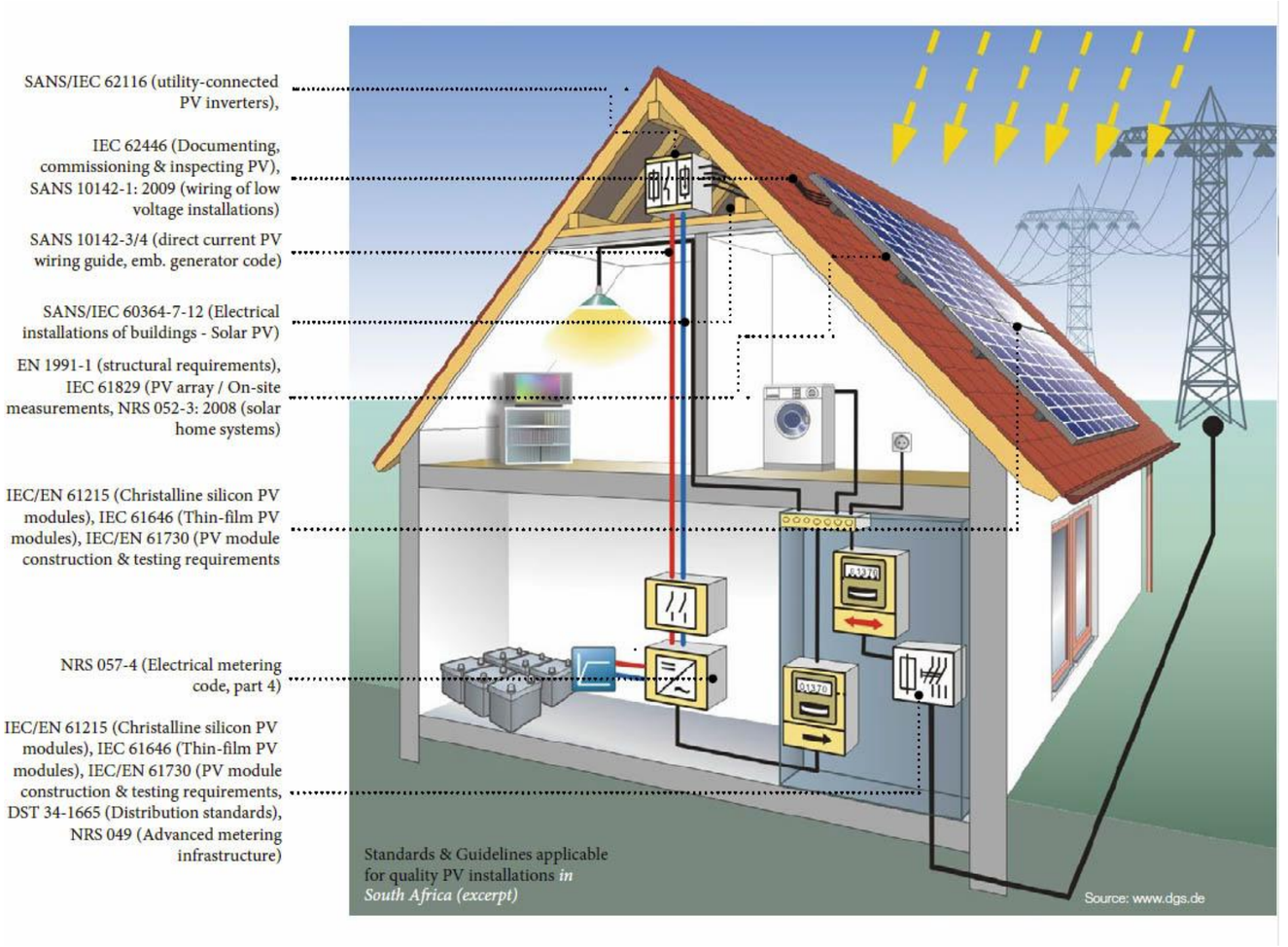
Skills Development	Quality Assurance	Business Support

- Officially launched in 2017
- SAPVIA with partners support developed reference training material for a 5-day Solar PV Installer Training Course
- The course was developed to present the minimum knowledge requirements for Solar PV installers and prepare candidates to undertake the PV GreenCard Assessment.
- Currently **513** Active Certified PVGC Installation Companies nationwide.

Quality Assurance: Installation Guidelines and Best Practice

PVGreenCard





Quality Assurance: PV GreenCard As-Built Report

PVGreenCard

PVGC ABR: System Specific. Grid-Tied, Hybrid, Of-Grid, UPS

PVGreenCard™ Promoting safe quality Solar PV installations

Date of Approval : 09-01-2024 08:42
Date of Customer Approval :

PVG-3816949

PVGC Assessed individual : Gayle Mc Lennan
Installation Electrician : John White

DOeL # : GC1203/2021
COC # : COC-8678878/NY/87859

PVG Account # : INST-3913749-2

Owner Information		PV GreenCard Assessed Individual	
Full Name	John Nobody		
Company	ZYG Plumbing		
Email	info@yeabla.com		
Mobile	(076) 656 5656		
Installation Address			
Street, house no	456 Klipfontein Rd	Installer Company	Yeabla Digital PTY(Ltd)
Suburb	Surrey Estate	Installer	Gayle Mc Lennan
Province	Western Cape	Street, house no	123 Smith St
Postal Code	7764	Suburb	Muckleneuk
GPS Latitude	-33.970569	Province	Gauteng
GPS Longitude	18.550548	Postal Code	0002

Installation Configuration

Installed Capacity: **4.30 kWp**

Alignment 32 degrees
Roof Pitch 22 degrees

Installation Type

HYBRID SOLAR SYSTEM
Roof integrated
My Notes are important. The roof is very slippery.

Demand and Yield Forecasts

Annual electricity consumption (kWh/year)	2321.00
Estimated PV-Yield (kWh/year)	4232.30
Assumed own consumption (%)	89%
Multiple orientation/inclination	Yes

System Components

10 Modules

QTY Installed	Module Manufacturer	Type	Power rating (W)	Total Power(kWp)
10	Axitec	AXIblackperfect FXXL TOPCon 108 Cells (AC-430TFM/108BB) 420 - 430 Wp	430W	4.3 kWp

2 Inverters

QTY Installed	Inverter Manufacturer	Inverter Model	Inverter Type
2	Afore	HNS3600HS	Hybrid PV Inverter Grid-tiedW

1 Mounting System

QTY Installed	Mounting Manufacturer	Mounting Type	Mounting Location	Mounting Design
1	Space X	Model T-YU	Flat-roof	Roof-parallel

4 Batteries

QTY Installed	Battery Manufacturer	Battery Chemistry	Depth of Discharge (DOD)	Storage Capacity (kWh)
4	Huawei iSite Power	Sodium-ion	50W	5.0 kWp

PVGreenCard™ Promoting safe quality Solar PV installations

Date of Approval : 09-01-2024 08:42
Date of Customer Approval :

PVG-3816949

DC - Cables and Power Lines		AC - Cables and Power Lines	
DC Cable Manufacturer	H1Z2Z2-K	AC Cable Manufacturer	RS Components
DC Cable Type	SINGLE-CORE DC CABLE	AC Cable Type	5 Core: L1, L2, L3 + N+ E
DC Cross-section (mm²)	6.00	AC Cable Cross-section (mm²)	1.50

Commisioning

COC Number	COC-8678878/NY/87859

Electrical Safety

The Solar PV system is installed in accordance with SANS 10142-1	YES
The Solar PV system is installed in accordance with SANS 60364-7-712	YES
All DC components are rated for a voltage greatar than the system operating DC voltage	NO

Fire Safety

Smoke and heat extraction systems are fully functional.	YES
Firewalls and fire compartments have been taken in consideration in accordance with the fire protection regulations.	YES

Lightning and voltage surge protection

Has a lightning/surge risk assessment been done? (SANS62305-2)	YES
Building has lightning protection system.	YES
No additional external lightning protection necessary due to technical, legal or contractual reasons.	YES
PV generator is within protection angle of the lightning protection system.	YES
Separation distances kept to all PV components (modules, substructure, cables...).	YES
Equipotential bonding of mounting structure has been carried out for the mounting structure, cross section 6mm² for copper or comparable.	YES
Type 2 DC surge arrester installed near the DC and AC inputs of the inverter.	YES
Type 1 and 2 combination arrester at the building grid connection point (required when external lightning protection installed!).	YES

PVGreenCard™ Promoting safe quality Solar PV installations

Date of Approval : 09-01-2024 08:42
Date of Customer Approval :

PVG-3816949

Documents

Regulatory compliance / Electrical Certificate of Compliance (COC), completed and signed by the designated registered person (IE or MIE).	YES
Regulatory compliance / Electrical single line diagram showing main components and utility interconnection.	YES
Regulatory compliance / Roof / array layout and string plan with inverter allocation.	YES
For the PV-Modules used / Technical data sheets	YES
For the PV-Modules used / Installation manual	YES
For the PV-Modules used / Manufacturer warranty document.	YES
For the PV-Modules used / Copies of test certificates	YES
For the inverter(s) used / Technical data sheets.	YES
For the inverter(s) used / Installation manual.	YES
For the inverter(s) used / Manufacturer warranty document.	YES

Photos of Installation

1 - Inverter Installation

2 - Module Installation (From the ground)

3.1 - AC point of connection to client network (DB Covers on)

3.2 - AC point of connection to

4 - *If Hybrid - Battery installation

Business Support: Certified PVGC Installation Company

PVGreenCard™
Promoting safe quality Solar PV installations
Certified Installation Company

Process to register as a Certified PVGC Installation Company

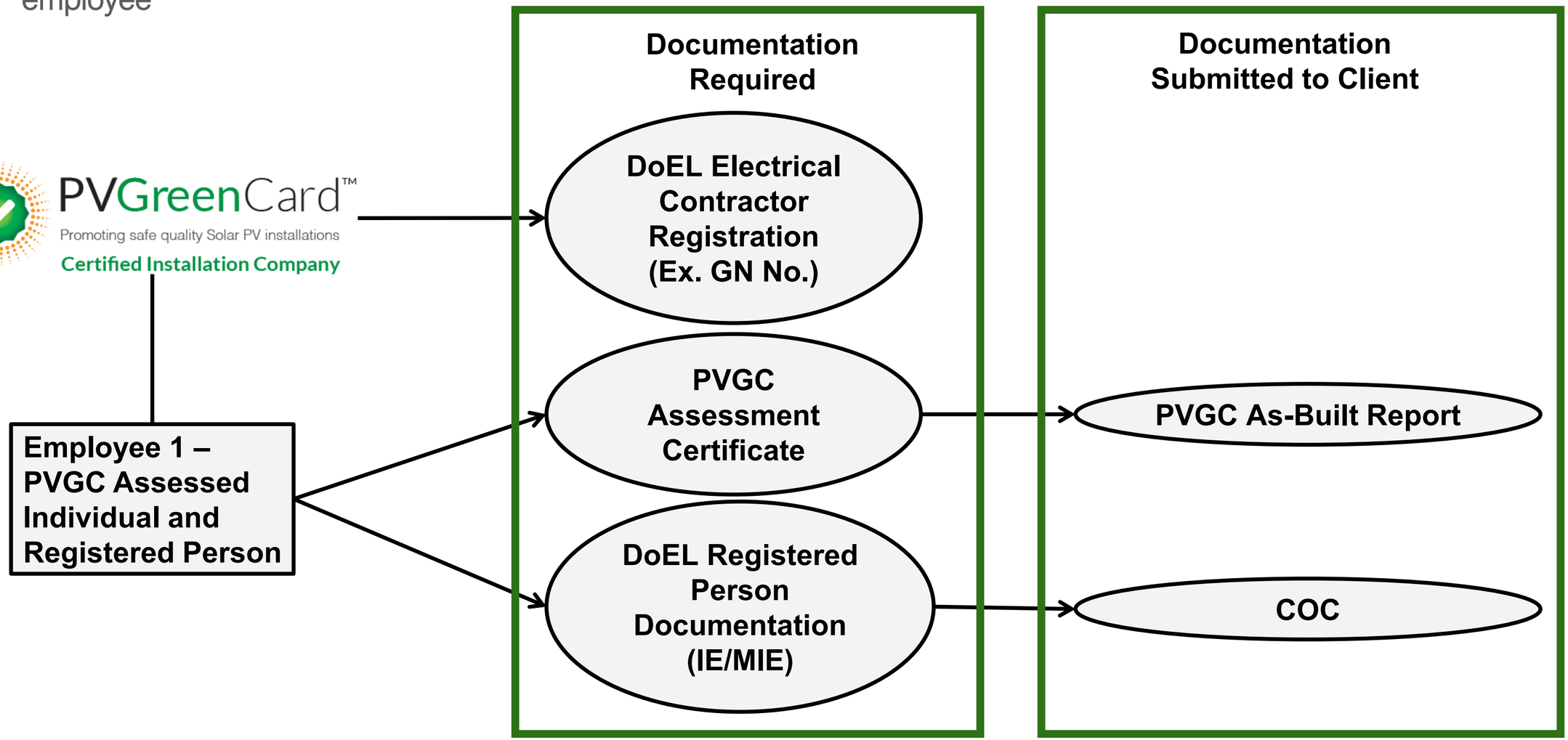
STEP 1:	• www.pvgreencard.co.za
STEP 2:	• Submit PVGC Assessed individual documentation
STEP 3:	• Submit DoEL registration as an Electrical Contractor
STEP 4:	• Verification of submitted documents
STEP 5:	• Pay PVGC Annual fee
STEP 6:	• Company listed on PVGC Website

DoEL Requirements

PVGreenCard™
Promoting safe quality Solar PV installations
Certified Installation Company

All PVGC Installers must be or employ a DoEL registered person

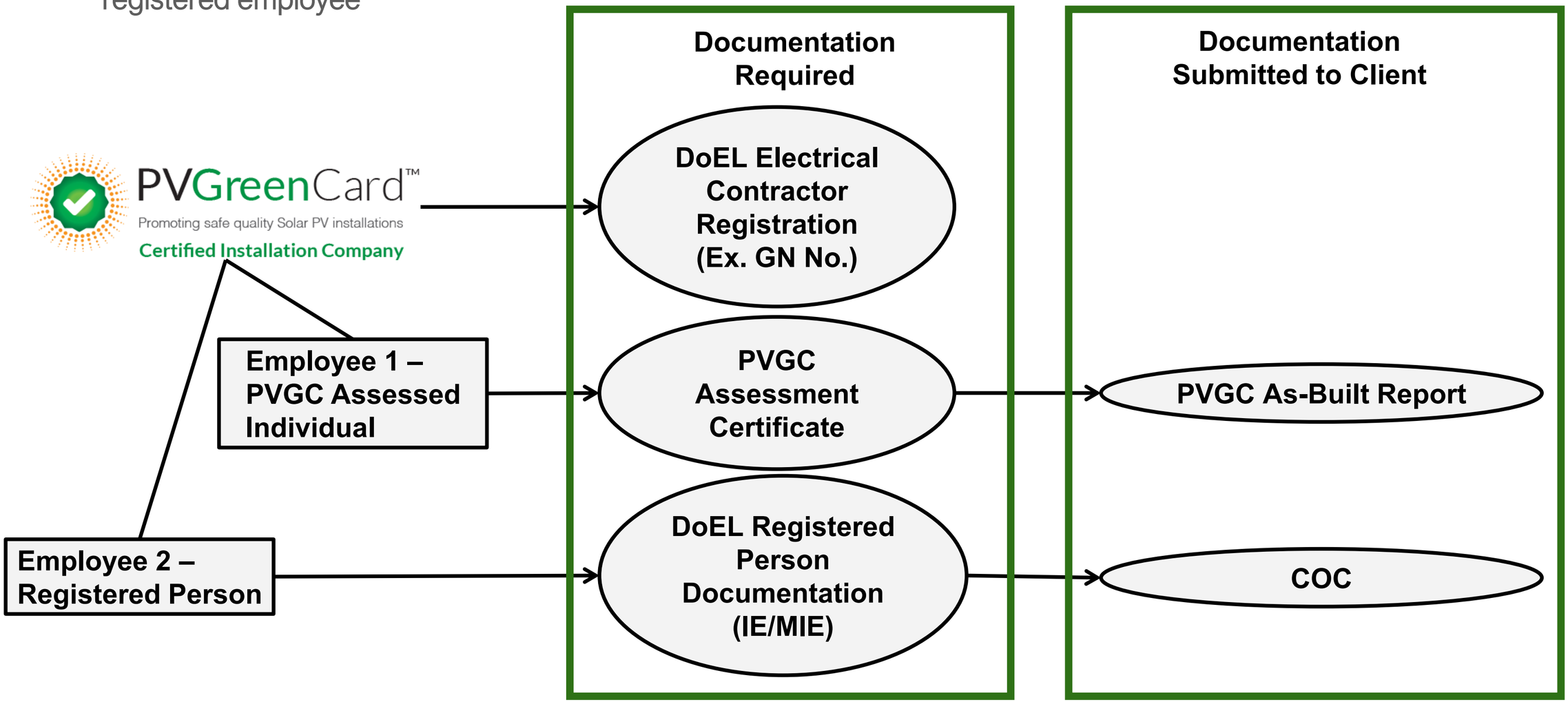
Option 1: Company Registration with PVGC Assessed and DoEL registered employee



DoEL Requirements

All PVGC Installers must be or employ a DoEL registered person

Option 2: Company Registration with 1 employee PVGC Assessed and 1 DoEL registered employee



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2025

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South African Photovoltaic Industry Association

THANK YOU

2025