


South African Renewable Energy Masterplan

(SAREM)

An inclusive industrial development plan for the renewable energy and storage value chains by 2030

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Contents

Abbreviations

AfCFTA	African Continental Free Trade Area
AGOA	African Growth and Opportunity Act
B-BBEE	Broad-Based Black Economic Empowerment
BRICS	Brazil, Russia, India, China, South Africa
BW	Bid Window
CHE	Council on Higher Education
CoGTA`	Department of Cooperative Governance and Traditional Affairs
DFI	Development Finance Institution
DHET	Department of Higher Education and Training
DHS	Department of Human Settlement
DMRE	Department of Mineral Resources and Energy
DPWI	Department of Public Works and Infrastructure
DSBD	Department of Small Business Development
DSI	Department of Science and Innovation
dtic (the)	Department of Trade, Industry and Competition
DWYPD	Department of Women, Youth and Persons with Disabilities
EOC	Executive Oversight Committee
EPC	Engineering, Procurement and Construction
ESIPPPP	Energy Storage Independent Power Producer Procurement Programme
ESOP	Employee Share Ownership Plan
EU	European Union
GDP	Gross domestic product
IDC	Industrial Development Corporation
IDZ	Industrial Development Zone
IRENA	International Renewable Energy Agency
IPP	Independent Power Producer
IPPO	Independent Power Producer Office
IRP	Integrated Resource Plan
ITAC	International Trade Administration Commission
NECOM	National Energy Crisis Committee
NERSA	National Energy Regulator of South Africa
NEVs	New Energy Vehicles
NT	National Treasury
OEM	Original Equipment Manufacturer
REDZ	Renewable Energy Development Zone
PCC	Presidential Climate Commission
PMU	Project Management Unit
PSET	Post-School Education and Training
PV	Photovoltaic
R&D	Research and development
RDP	Reconstruction and Development Programme
RE	Renewable energy
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RMIPPPP	Risk Mitigation Independent Power Producer Procurement Programme
SADC	Southern African Development Community
SAEEC	South African Electrotechnical Export Council
SANEDI	South African National Energy Development Institute
SAREM	South African Renewable Energy Masterplan
SAPP	Southern African Power Pool
SAPVIA	South African Photovoltaic Industry Association
SETA	Sector Education and Training Authority
SEZ	Special Economic Zone
SMME	Small, micro and medium enterprises
SPP	Strategic Partnership Programme
SSEG	Small-scale embedded generation
TIA	Technology Innovation Agency
TVET	Tertiary Vocational Educational Training
VRFB	Vanadium redox flow battery
WECONA	Women's Economic Assembly Initiative

01

INTRODUCTION

INTRODUCTION

RENEWABLE ENERGY TECHNOLOGIES PROVIDE THE LEAST-COST AVENUES TO GENERATE ELECTRICITY.

Globally, solar photovoltaic (solar PV) and wind energy technologies reached, on average, US$0.048 (R0.71) and US$0.033 (R0.49) per kilowatt-hour (kWh) respectively in 2021.[1] In South Africa, the most cost competitive projects reached R0.485 per kWh for solar PV and R0.497 per kWh for wind energy technologies in 2021.[2] Economic dynamics have seen renewable energy costs drop significantly (-88% for solar PV and -68% for onshore wind between 2010 and 2021). In addition, public policies, primarily targeted at fast-tracking the decarbonisation of economies in the pursuit of climate change objectives, have further driven an exponential rollout of renewable energy technologies worldwide. In turn, primarily driven by e-mobility applications, the rise of renewable energy technologies has supported a similar growth in storage technologies. The annual global energy storage market for stationary applications grew from 0.09 GWh of capacity added in 2010 to 22 GWh in 2021. Correspondingly, average lithium-ion battery (LIB) costs decreased from US$1036 per kWh in 2010 to US$141 per kWh in 2021.[3] Currently dominated by a few countries (led by China and Japan), the vanadium redox flow battery (VRFB) market is set to grow exponentially, reaching close to 30 GWh of annual installed capacity in 2030, compared to just over 1 GWh in 2021.[4]

Globally, the renewable energy sector has risen from 18.6% of global electricity supply in 2000 to 28% in 2021. In 2000, a total of 849 GW of renewable energy was installed worldwide. This reached 3 258 GW in 2021.[5] Global trade in solar panels, wind energy generation sets (turbines), inverters and LIBs respectively reached US$66 billion, US$6 billion, US$95 billion, US$100 billion in 2022.

In South Africa, the early deployment of renewable energy and battery technologies consisted of pilot projects and niche applications, such as the electrification of remote communities and back-up for telecommunication towers. The rollout of renewable energy technologies took off from 2011 with the launch of the government-led Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). Large-scale battery procurement started only in 2021. The private sector market, historically constrained, has been progressively unlocked. Following ongoing efforts in the 2000s and 2010s, widespread, decisive reforms since mid-2021 have

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1 Data based on a Levelised Cost of Energy from IRENA, 2022. Renewable Power Generation Costs in 2021. Abu Dhabi: International Renewable Energy Agency.

2 These correspond to the lowest prices achieved in the fifth bid window of the REIPPPP, awarded in 2021, for projects that had reached financial close by October 2023. Further information can be found at **https://www.ipp-renewables.co.za**.

3 Data from Bloomberg New Energy Finance. Available at **https://about.bnef.com**.

4 Data from Guidehouse Insights. Available at **https://vanitec.org**.

5 Data from the International Energy Agency (IEA). Available at **https://www.iea.org**. Renewable energy here includes hydropower.

materially opened up the private sector market. Many local governments have also taken steps to foster the residential and commercial market, with the number of municipalities allowing small-scale embedded generation (SSEG) installations (which generally combine solar PV and battery systems) progressively rising. The contribution of renewable energy technologies to electricity generation (in terawatt-hours – TWh) increased from less than 1% in 2000 to almost 7% in 2022.[6]

Looking ahead, by 2030, the global renewable energy market is forecasted to reach between 5.4 TW (based on the existing trends) and 10.8 TW (based on what is required to achieve climate goals), as decarbonisation efforts continue and new sources of demand, such as green hydrogen and New Energy Vehicles (NEVs), arise.[7] The global market for stationary battery storage is similarly set to grow exponentially, to 277 GWh of additional yearly new capacity in 2030 (compared to about 35 GWh of capacity added in 2022).[8]

In South Africa, the rollout of renewable energy technologies is similarly set to increase rapidly, as the country aims to achieve energy security for all as well as decarbonise its electricity supply. Utility-scale renewable energy and battery storage public procurement of 22.9 GW is planned from 2022 to 2030 according to the 2019 Integrated Resource Plan (IRP). In addition, various spheres of government have plans for an extensive rollout of renewable energy, such as the Department of Public Works and Infrastructure (DPWI) (up to 4 000 megawatt (MW)), the Gauteng and Western Cape provinces, and the Garden Route Municipality.

The Department of Human Settlement (DHS) has announced it is considering the installation of solar energy on newly-built Reconstruction and Development Programme (RDP) houses. Private sector investment in large-scale renewable energy projects is set to balloon.

As of February 2023, more than 13 GW (5 GW of wind and 8.3 GW of solar PV) of private sector-led projects (>1 MW) were in advanced development[9] in the country. Small-scale installations (<1 MW), which encompass both grid-connected SSEG and battery-based uninterrupted power supply and solar systems,[10] are also expected to rise significantly in the country, driven by grid electricity price increases, energy security concerns and government support. The Presidential Climate Commission (PCC) points to the need to roll out 6-8 GW of renewable energy per year for the foreseeable future, summing up to a total of 50-60 GW of renewable energy, supported by co-located storage, by 2030.[11]

This booming market, both domestically and globally, presents an opportunity for South Africa to foster economic development, employment creation and social transformation. The fast-rising rollout of renewable energy and storage technologies opens the door for both demand- and supply-side opportunities.

[6] Data based on South Africa's energy balances.

[7] IRENA, 2022. Renewable Energy Targets in 2022: A Guide to Design. Abu Dhabi: International Renewable Energy Agency.

[8] Data from Bloomberg New Energy Finance. Available at **https://about.bnef.com**.

[9] These projects were at "budget quote" stage with the national utility. Budget quotes are final cost calculations and technical specifications that Eskom issues to Independent Power Producers (IPPs) for the necessary grid connections.

[10] Small-scale installations are defined as systems below 1 MW in size. They can be a two main types:
• systems that have the ability of synchronise with the grid (and, if allowed, export to the grid). These systems must comply with the NRS097 standard; and • battery-based uninterrupted power supply and solar systems that are not able to export to the grid and do not have to comply with the NRS097 standard.

[11] PCC, 2023. Recommendations from the PCC on South Africa's Electricity System. Johannesburg: Presidential Climate Commission.

The development of industrial value chains, leveraging South Africa's existing manufacturing and service provision capabilities, is one such opportunity. The push for more inclusive renewable energy and storage value chains, notably to the benefit of all, is another. The window of opportunity is, however, rapidly closing. Domestically, the development of the value chain ought to coincide with the demand trajectory, which is currently booming. Globally, manufacturing capacity is ramping up, and companies are developing salient advantages in intellectual property, securing access to raw materials and key inputs, and seizing market shares, making competition more intensive.
The South African Renewable Energy Masterplan (SAREM) articulates a vision, objectives and an action plan for South Africa to tap into these opportunities.

It aims to leverage the rising demand for renewable energy and storage technologies, with an initial focus on solar energy, wind energy, LIB and vanadium-based battery technologies, to unlock the inclusive, industrial development of associated value chains in the country. This initial technological focus is aligned with global and domestic demand dynamics as well as South Africa's supply-side capabilities. In time, other technologies will receive increased focus, as they mature and industrial capabilities are developed. The Masterplan builds on the draft documents released in March 2022 and July 2023,[12] and an extensive research and stakeholder engagement process, detailed in Annexure A.

It is anchored on four key areas:

1. Supporting the local demand for renewable energy and storage by unlocking market demand and system readiness, as a large-scale rollout of renewable energy systems is a critical pre-condition to achieving the core objectives of SAREM.

2. Driving industrial development by building renewable energy and storage value chains, through localisation drives on both the public and private sector markets and supportive trade and industrial policy.

3. Fostering the inclusive development of renewable energy and battery storage value chains, by driving the transformation of the industry, supporting the development of emerging suppliers, and contributing to a just transition.

4. Building local capabilities in terms of skills and technological innovation to enable the rollout of renewable energy and storage technologies and associated industrial development.

Section 2 details the vision of SAREM, its scope as well as its key objectives and targets. It also highlights SAREM's four pillars and catalytic interventions. Section 3 to Section 6 unpack the key pillars of SAREM, setting the context and fleshing out associated interventions. Section 7 concludes by capturing the support from social partners. Annexures provides further details on the process and opportunities associated with SAREM.

[12] Draft SAREM documents are available **here** (March 2022) and **here** (July 2023).

02

VISION, SCOPE, KEY OBJECTIVES AND PILLARS

CORE ELEMENTS

The renewable energy and battery storage value chain has a core role to play in South Africa's sustainable development and achieving the socio-economic objectives laid out in the country's National Development Plan.

SAREM aims to make a direct contribution to the National Development Plan's objective of achieving a low-carbon, resource-efficient and pro-employment development pathway, notably by leveraging the green economy agenda to "promote deeper industrialisation, energy efficiency and employment."[13] SAREM is also directly aligned with the vision of the National Industrial Policy Framework, the objectives of the Science, Technology and Innovation Decadal Plan, and government's *Re-imagining our Industrial Strategy for Inclusive Growth* framework.

The development of the local renewable energy and battery storage industry is also expected to foster the implementation of South Africa's energy policy, notably the Integrated Energy Policy and Integrated Resource Plan for electricity. South Africa has experienced several years of energy insecurity, a key factor hindering successful industrialisation. SAREM will address this directly by enhancing energy security at main industrial nodes, ensuring reliable, affordable and low-carbon power supply for manufacturing.

Furthermore, SAREM, by spearheading the development of new green economic activities, will positively contribute to the country's climate change and other environmental sustainability goals, such as South Africa's National Determined Contributions under the Paris Agreement, and inclusive development objectives, such as the pursuit of South Africa's Just Transition Framework.

In line with this opportunity, SAREM's overarching vision is to achieve a well-developed renewable energy and storage value chain that enables a transformed industry and inclusive industrialisation. It is underpinned by the localisation of key inputs, technologies and systems, based on "the use of actual or anticipated imports to indicate when demand would warrant local production, an explicit emphasis on local production of inputs for export industries and infrastructure as well as final consumer goods, and a focus on restructuring public and private procurement to promote local production, rather than relying primarily on tariff protection."[14]

[13] National Planning Commission, 2011. National Development Plan: Vision 2030. Pretoria: National Planning Commission, p. 150.

[14] Makgetla, 2023. Localisation and industrial policy: Scopes, debates and instruments. Pretoria: Trade & Industrial Policy Strategies, p.8.

In addition, investing in critical infrastructure (such as access to reliable, efficient and affordable energy, water, roads, rail, port and broadband services), along with providing an enabling business environment, is paramount to the success of SAREM and the country's broader industrialisation goals.

The six key objectives underpinning this vision are to:

1. **Grow the economy by fostering the rollout of renewable energy and battery storage projects.** Direct investment in projects make a notable contribution to the local economy. For instance, REIPPPP projects from BWs 1 to 4 injected over R200 billion into the local economy.[15] In addition, access to reliable, affordable and low-carbon energy enables further economic activity in the country, by providing energy security, reducing costs, and protecting against climate risks (such as foreign and local carbon taxes).

2. **Expand the industrial capacity in the renewable energy and storage value chain.** Industrial value chains, particularly manufacturing operations, have inherent positive linkages and spill over effects in the economy (such as employment multiplier effects) that lead to increased employment and economic activity. In addition, in a context of exponentially rising demand and supply constraint, the development of local industrial capabilities in the production of renewable energy and storage components, parts and systems is a strategic avenue to ensure the availability of supply for the domestic market as well as shield the local market from excessive price volatility.

3. **Create and sustain decent employment across the value chain, from manufacturing, construction and services, to end-of-life management.** Renewable energy and battery value chains create a wide range of employment opportunities, particularly for skilled and semi-skilled workers. Over the first four BWs, REIPPPP projects committed to the creation of 63 291 job-years (48 110 in construction and 15 182 in operations).[16] It is further estimated that about 20 000 people were directly employed in the solar energy value chain in South Africa in 2022.[17]

4. **Build the capabilities needed for the industry.** Building the skills base can enable the upskilling of workers already in the energy and manufacturing industries as well as open opportunities for new individuals. Support for research, development and innovation as well as technology commercialisation, to bring local or foreign innovation to the domestic market, can contribute to bridging the "valley of death" and improve South Africa's technology readiness, in turn increasing competitiveness and export opportunities.

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[15] IPPO, 2022. Independent Power Producers Procurement Programme (IPPPP): An Overview as at 31 December 2021. Independent Power Producer Office. Pretoria and Johannesburg: Department of Mineral Resources and Energy, Development Bank of Southern Africa and National Treasury.

[16] Ibid. Job-year is the metric used by the IPP Office to monitor job creation. A job-year is a unit of employment that counts a quantity of time worked, benchmarked at an average equivalent for a year of employment for one person, working full-time. A job-year is not necessarily attributed to a particular working person. Several part-time or short-term jobs can be added to comprise a single job-year. The IPP Office defined a job-year as 174 hours a month for 12 months for BW1 and BW2. Thereafter, a job-year has been defined as 160 hours a month.

[17] Urban-Econ Development Economists, Urban-Econ:NIKELA and Blue Horizon Energy Consulting Services, 2022. The localisation potential of the South African solar photovoltaics (PV) industry and recommendations to support local manufacturing in South Africa. Johannesburg: South Afri can Photovoltaic Industry Association.

5. **Build a transformed industry throughout the value chain.** As a new, fast-rising value chain, the renewable energy and storage sector offers a platform for inclusive development. The REIPPPP provided important foundations in this respect, with 83% of local procurement expenditure sourced from Broad-Based Black Economic Empowerment (B-BBEE) suppliers and 22% Black shareholding in Engineering, Procurement, and Construction (EPC) contractors.[18] Building on this platform, and the significant growth in renewable energy and storage, the value chain can actively foster broad-based inclusivity at all stages. Notably, the broadening of the local supplier base can further deepen the local value chain and its associated benefits to the country.

6. **Contribute to a just transition and support the inclusive shift of South Africa's electricity supply industry from a centralised, carbon-intensive model to a decentralised, low-carbon structure.** The uptake of renewable energy and storage remains (worldwide and in South Africa) mainly limited to middle- and high-income households as well as medium- and large-scale businesses. Widening access to all is not only socially imperative but would further augment the scale of the local market, underpinning industrial development. Renewable energy and storage activities (both power plants and industrial operations), if located in just transition hotspots, such as Mpumalanga's coalfields, can also contribute to addressing the impacts associated with the closure of coal-based activities.

Figure 1 depicts the "SAREM house" with its vision, key set of objectives and four key pillars, namely supporting demand for renewable energy and storage technologies; driving industrial development in the associated value chains; fostering inclusive development of the industrial value chain; and building the necessary capabilities. SAREM, like other industrial development masterplans, is focused on short-term implementation. As such, the initial timeframe for action is 2030. However, SAREM is established as a 'living plan', of which this document is the first iteration. Successfully developing South Africa's renewable energy and battery storage value chain will undoubtedly extend beyond this inception period.

Value chain

SAREM is focused on the development of the industrial value chain, as depicted in Figure 2 (green shading). This is centred on the manufacturing of key technologies and systems that form a renewable energy or battery storage plant and the balance of plant (civil engineering and electrical works). Importantly, this also includes value added inputs (such as beneficiated products) required to manufacture parts and components. Manufacturing-related services (such as testing and certification) and end-of-life management are other critical components of the value chain. Other components of the sector (such as the supply of raw materials, the provision of critical infrastructure and ecosystems, and the development of energy projects) fall outside the scope of SAREM. As such, they are only covered insofar as they have an influence on the industrial value chain.

SAREM has, in time, the ambition of covering all relevant technologies. As a starting point, solar PV, onshore wind, LIB and VRFB technologies form the basis of SAREM. This results from the intersect of multiple factors, including global technological trends, local and regional market demand as well as existing and emerging domestic capabilities. Other technologies, from bio-energy, offshore wind and wave energy, to thermal energy technologies, to solid-state batteries and compressed air energy storage, will be included in SAREM as both supply- and demand-side dynamics mature.

In addition, while not within the direct scope of SAREM, strong industrial development opportunities exist in other parts of the energy value chain. This is notably the case with the rollout of transmission and distribution infrastructure (including smart grids) and the improvement of energy efficiency. For instance, the rollout of transmission powerlines envisaged in Eskom's Transmission Development Plan (2023-2032) points to local industrial development opportunities in steel lattice towers, poles, conductors, insulators, optical ground wires, earth wires and other hardware and accessories. Similarly, the construction of sub-stations brings significant opportunities in transformers and shunt reactors, switchgears, capacitators, protection, telecommunications, metering and control equipment, smart grid technologies, steelwork, and other hardware.[19]

[18] Numbers based on projects from BW1 to BW5 that had reached financial close by 31 March 2023, as published in IPPO, 2023. Procurement expenditure is defined as the monetary spend on the procurement of goods and services for purposes of undertaking the project activities (with out double counting), excluding costs of imported goods and services, taxation, salaries and wages.

[19] For an extensive analysis, see Rhythm Power Solutions, 2023. *Value Chain Mapping of the South African Transmission and Distribution Networks and the Allocation of the South African Manufacturing Capability to the Value Chain Elements.* Johannesburg: Localisation Support Fund.

Figure 1: The SAREM house

VISION

Industrialisation of the renewable energy and battery storage value chain to enable inclusive participation in the energy transition, serving the needs of society, and contributing to economic revival

KEY OBJECTIVES BY 2030:

- Grow the economy by fostering the rollout of renewable energy and battery storage projects
- Grow the industrial capacity in the renewable energy and battery storage value chain
- Create and sustain decent employment across the value chain
- Build the capabilities needed for the industry's sustained growth
- Build a transformed industry throughout the value chain
- Contribute to a just transition

Supporting demand

- Market certainty
- System readiness

Driving industrial development

- Localisation
- Input materials
- Trade promotion

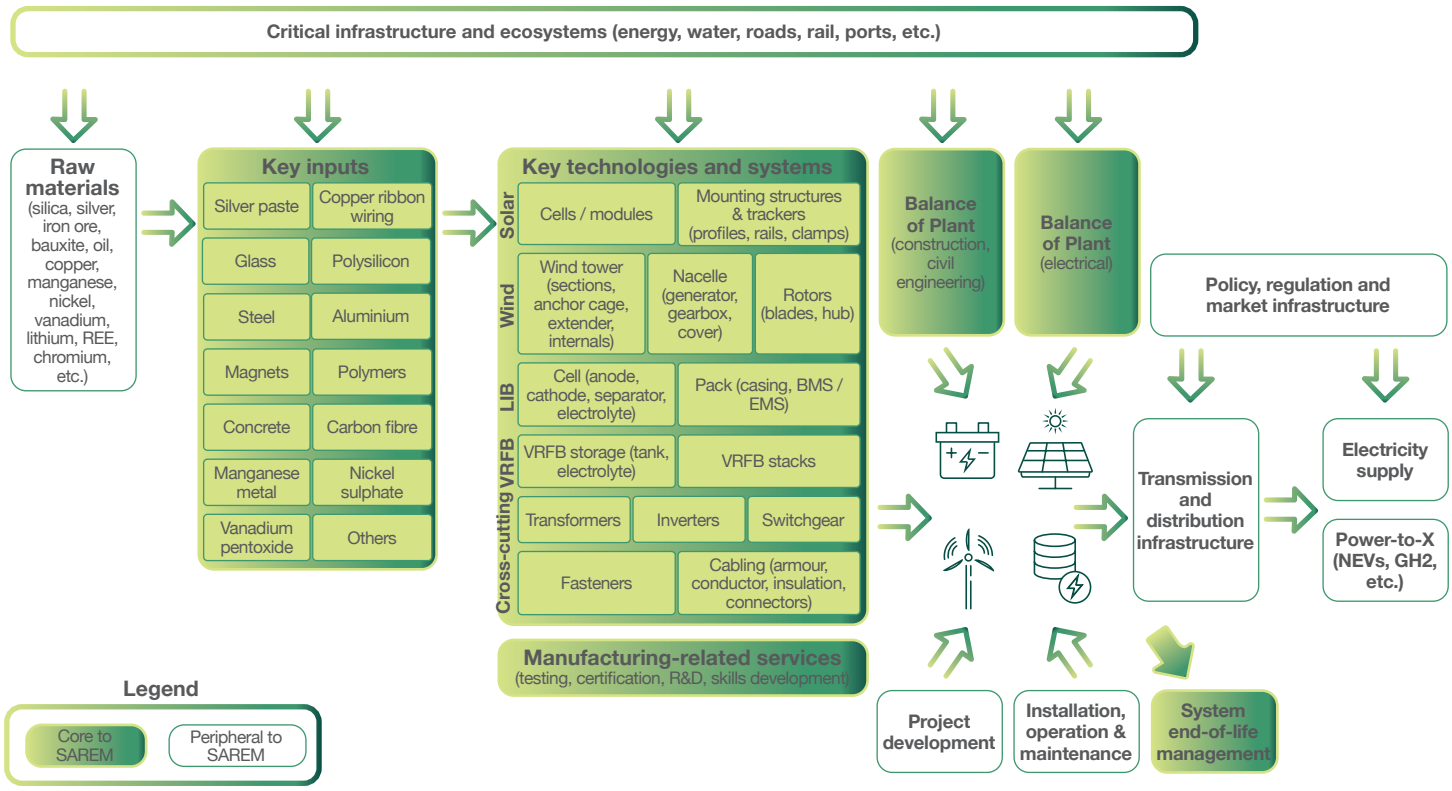
Fostering inclusive development

- Transformation
- New entrants
- Just transition

Building the capabilities

- Skills and technology development

Figure 2: SAREM's value chain



Targets

SAREM aims to foster the industrial and inclusive development of renewable energy value chains, in line with the vision and objectives detailed above. In addition to the 49 interventions identified as part of the masterplan process, unpacked in following sections, this goal is embodied in a series of realistic yet ambitious national targets to be pursued by the stakeholders in the sector. Targets were negotiated and agreed upon by social partners through a facilitated process and will be actively monitored by a dedicated Project Management Unit (PMU) and associated multi-stakeholder task teams.

Importantly, targets will be monitored and evaluated through a set of specific, measurable, achievable, relevant, and time-bound (SMART) indicators. In addition, targets, in their design, establish a logical "ramp up" trajectory. In this inception phase, targets provide the initial set of objectives to be achieved by 2030. Targets are set nationally, covering all market segments and across technologies, unless otherwise specified. They are summated in Table 1. In due course, further targets will be determined beyond this timeframe.

Importantly, such targets and the overall ambition of SAREM to unlock meaningful local industrial development in South Africa are based on a minimum rollout of renewable energy of 3 GW per annum, ramping up to 5 GW per annum by 2030. Considering that most component manufacturing requires 1 GW or less of annual demand (over a minimum period of five years) to be economically viable, such a scale would be sufficient to support the growth of local manufacturing operations. Any additional rollout, in line with the country's requirement to achieve energy security and climate change objectives, would then enable further industrial development.

Crucially, stable demand, breaking away from the historical stop-start pattern, is a fundamental pre-requisite for any successful industrial development strategy. Enabling such a smooth demand profile requires a consistent rollout of renewable energy and battery storage technologies across market segments. This calls for a redesign of public procurement (both utility and smaller scales) to enable continual, anchor demand from the public sector.

An ongoing rollout, with a procurement system including local value addition as a competitive element, would foster competition (minimising volatility as well as disincentivising predatory pricing) while opening the door for smooth demand for local manufacturing operations (avoiding the boom/burst pattern that creates a constant mismatch between local supply and demand). It also requires lifting the bottlenecks that hinder investment in renewable energy and battery storage technologies by the private sector and households (particularly physical and market infrastructures) and establishing a conducive framework to incentive demand, at least in the short term.

Complementarily, ambitious supply-side support is paramount to enhance the competitiveness of locally manufactured products. In a highly competitive global environment, securing manufacturing in the renewable energy and battery storage value chains is underpinned by a compelling value proposition, including the re-activation of the 12i tax incentive and the extension of Special Economic Zone (SEZ) benefits.

The strategic application of import duties, along with mandatory quality standards, is furthermore fundamental to ease the import of critical inputs and components while protecting local manufacturing against cheap, often sub-standard and subsidized, imported products. In addition, structural blockages, in the access to energy, water and transport, must be addressed to enable sustainable economic activity.

Beyond these demand- and supply-side considerations, the broader value chain ecosystem must be geared towards the development of local capacity and capabilities. Supplier development, including through an Original Equipment Manufacturer (OEM)-led cluster and the establishment of a Transformation Fund, must unlock substantial support for new entrants and emerging suppliers, particularly from previously-disadvantaged groups.

This should go together with the implementation of clear, bespoke B-BBEE requirements for the sector. Then, the development of skills must follow a demand-led approach anchored on the collaboration between education and training institutions and industry, to ensure skills supply and demand match in quantity and quality.

Table 1: National targets for the South African Renewable Energy Masterplan

Outcome	Target area	Indicator	Baseline	2030
Industrial development	Increase local content in the renewable energy and battery storage manufacturing and associated services sectors.	Local content as a share of total project value: – Solar – Wind – Storage	 45% 47% 20%	 50% 47% 60%
Competitiveness	Strengthen the competitiveness of local renewable energy and battery storage manufacturers.	Trade balance for selected renewable energy and battery storage products (LIBs, solar panels, inverters, transformers).	Negative trade balance	Neutral or positive trade balance
Economic growth	Increase investment in the renewable energy and battery storage manufacturing and associated services sectors.	Value of cumulative investment in the renewable energy and battery energy storage key component manufacturing.	R2.5 billion	R15 billion
Job creation	Grow employment in the renewable energy and battery storage manufacturing and associated services sectors.	Number of people (full-time equivalent) employed in renewable energy and battery energy storage key component manufacturing. Youth employment target (share of jobs created).	2 500 jobs n/d	25 000 jobs 50%
Transformed industry	Achieve a higher level of transformation (race and gender) in the renewable energy and battery storage manufacturing and associated services sectors.	Procurement (capital expenditure) from Black-owned manufacturers (defined as 50%+1 ownership). Procurement (capital expenditure) from woman-owned manufacturers (defined as 50%+1 ownership). Share of female employees in the value chain. Rollout of Employee Share Ownership Plans (ESOPs), and ownership by youth, persons with disabilities and other designated groups.	<1% <1% 30% To be determined within 6 months of launch.	5% 5% 50% To be determined within 6 months of launch.
Capacity building and new entrant support	Augment funding for incubation and capacity building of the sector.	Funds allocated by the project company to supplier development: – Construction (share of capital expenditure) – Operation (share of net profit after tax)	 1% 1%	 1.5% 2%

Table 1: National targets for the South African Renewable Energy Masterplan continued...

Outcome	Target area	Indicator	Baseline	2030
Youth participation and empowerment	Widen sector contribution to youth empowerment and skills activation.	Share of the renewable energy and battery storage sector participating in Yes4Youth and/or other programmes (such as the South African Wind Energy Association internship programme).	<5%	75%
Skills development	Grow the skill base in the RE and BES manufacturing and associated services sectors.	Skills development expenditure, as a percentage of revenue. Share of renewable energy and battery storage manufacturing companies submitting their workplace skills plans and annual training reports.	n/d 20%	0.5% 75%
Technology development	Increase R&D funding in the RE and BES manufacturing value chain.	R&D expenditure in renewable energy-relevant fields.	R500 million	+100% in real terms

Notes:

- *The baselines for the local targets are based on historical public procurement only while the 2030 targets are set nationally, across market segments.*
- *"Total Project Value" means the total project cost that involves the capital costs and costs of services procured for the construction of a project, but excludes finance charges, land costs, mobilisation fees to the operations contractor and the costs payable to the distributor, national transmission company and/or a contractor for the distribution or transmission connection works.*
- *In 2022, South Africa's trade balance for selected renewable energy and battery storage products was as follows: -US$683 million for LIBs, -US$327 million for solar panels, -US$573 million for inverters, and -US$1.6 million for transformers.*
- *R&D expenditure in renewable energy-relevant fields include the following socio-economic objectives: renewable energy (S20502), energy distribution (S20503), conservation and efficiency (S20504).*

Catalytic interventions

As part of a broader mix of measures (see following sections), SAREM is anchored on a number of catalytic interventions across the four key pillars of action. Table 2 provides an overview of the 14 catalytic interventions which form the backbone of the masterplan.

Table 2: SAREM's catalytic interventions

Pillar	Objective	Intervention	Rationale
Supporting demand	Clarify the market for renewable energy and storage	Publish and update quarterly the pipeline of public procurement (e.g. REIPPPP, ESIPPPP, DPWI, provinces, municipalities) for renewable energy and storage technologies.	Public procurement can operate as the anchor market for an inclusive, industrial development. Industrial development is conditioned on continual market demand. Public procurement generally sets the tone in terms of inclusive development. A clear picture (on a yearly basis) of public procurement to 2030 (all spheres of government and organs of state) is necessary to support SAREM objectives.
		Publish and update quarterly the pipeline of private procurement (large-, medium- and small-scale projects) for renewable energy and battery storage technologies.	Private procurement is forecasted to account for the majority of renewable energy and battery storage demand in the foreseeable future. As such, private procurement is set to drive the market going forward. Existing stocktakes, such as the one done by the Minerals Council, are a starting point but only provide a partial understanding. A clear picture (on a yearly basis) of private procurement to 2030 (all market segments, including small-scale generation) is necessary to support SAREM objectives.
Driving industrial development	Establish clear localisation objectives	Establish a consistent set of local content targets and criteria for future public and private procurement programmes, in line with agreed SAREM targets.	For public and private procurement to act as the anchor market for industrial development, consistent, realistic local content targets for localisation (as part of general tender specifications) are required alongside a clear picture of yearly rollout.
	Align industrial policy and programmes with renewable energy and storage localisation	Re-activate the 12i tax allowance incentive with a focus on supporting the development of renewable energy and battery storage manufacturing value chains.	A few cross-cutting programmes provide a degree of support to local manufacturing. Based on international experience, ambitious industrial development in the renewable energy and battery value chains requires dedicated supply-side support and is a no-regret intervention given spillover benefits associated with manufacturing. The existing, but currently inactive, provisions for the 12i tax incentive provide an effective avenue for such support.
		Align existing public sector programmes and policy support with SAREM's localisation objectives (e.g. Energy Resilience Scheme, Industrial Development Corporation (IDC) funding, Department of Small Business Development (DSBD) Bounce Back scheme, municipal/ provincial procurement).	Government programmes, policies and support schemes directly or indirectly support a large number of entities in rolling out renewable energy and storage systems. To support SAREM objectives, particularly industrial development, such measures must include localisation objectives and/or conditionalities.
		Formulate and implement value proposition (including energy security) to attract investment in the country, particularly SEZs/Industrial Development Zones/industrial parks (including incentives where relevant).	The global competition to attract industrial investment in the renewable energy and storage value chain is extremely high. The lack of a clear value proposition from South Africa (particularly industrial parks), harnessing all possible tools at disposal and supported by all spheres of government, has hindered their ability to attract investment.
		Launch solar PV rollout programme for schools/clinics/etc. based on panels replaced by large projects.	A large number of well-functioning solar panels are replaced by utility-scale IPPs on a yearly basis. Projects for early REIPPPP rounds are also considering partial repowering. These panels could be utilisedwww to power public and community structures, enhancing the sustainability of the value chain. A dedicated programme is required to drive the collection, refurbishment (if needed), installation and maintenance of such panels.

Table 2: SAREM's catalytic interventions continued...

Pillar	Objective	Intervention	Rationale
Fostering inclusive development	Establish clear transformation objectives	Develop and implement B-BBEE sector specific scorecard for renewable energy and storage, in line with agreed SAREM targets.	The lack of a sector-specific B-BBEE scorecard for renewable energy and storage has hindered progress in terms of inclusive development. The development of the scorecard will provide a clear trajectory for the industry.
	Foster integration of emerging suppliers	Develop, resource and establish Transformation Fund to support new entrants in the value chain (such as competitive rates for factory investment capital as well as warrantees/guarantees).	Local suppliers in the renewable energy and storage value chain face several finance-related challenges. A dedicated fund targeting new entrants and emerging suppliers is required to support their growth.
	Direct renewable energy and storage activities to just transition hotspots	Launch public procurement rounds for renewable energy and storage for Mpumalanga and other just transition hotspots (based on grid availability), notably leveraging Renewable Energy Development Zones (REDZs).	Less than 2% of South Africa's renewable energy and storage generation capacity is located in Mpumalanga. Given the imperative of a just transition and the infrastructural assets of the province (e.g. the grid and proximity of the load centre of Gauteng), a significant ramp-up of the rollout of projects is not only possible, but sensible economically, socially and environmentally. Multiple other areas, such as REDZs, also host significant potential.
Building the capabilities	Map and build skills	Develop and run a digital match-making platform (PowerUp) between industry, education providers and social compact partners, creating a demand-led skills and planning communication hub, to address skills priorities in the sector.	The availability of skills is rapidly becoming a hindering factor for the growth of the industry. A dedicated platform (inspired by the HighGear platform for the automotive value chain) focused on matching the skills required by industry with the broader education system is necessary to address the growing constraint. In turn, educational institutions require further support in facilitating the entry of graduates into the labour market.
	Activate skills	Consolidate and expand internship opportunities in the renewable energy and storage sector by participating in Yes4Youth and other industry-wide programmes, in line with agreed SAREM targets.	Entering the labour market is generally conditioned on experience. Existing on-the-job training opportunities are largely unstructured. A clear pipeline for graduates to enter the labour market is necessary. Yes4Youth, along with other industry-wide programmes, provides a trusted and beneficial platform to that effect.
	Foster technology upgrading and commercialisation	Establish a match-making platform between innovators and possible users to accelerate the adoption of new renewable and energy and storage technologies, along with an innovative funding model for de-risking costs of running trials.	Commercialisation of innovations is a key challenge, particularly due to the lack of a track record. A dedicated platform (inspired by the Trial Reservoir developed in the water and sanitation sector) focused on matching renewable energy and storage innovators with technology users is needed to support technology adoption. The platform also provides an innovative model to de-risk the funding of trial costs.
		Establish an OEM-led cluster platform linking the different parts of the value chain (OEMs, Tier 1 and Tier 2 companies) to enhance transparent communication on OEM specifications/expectation and well as support the upgrading of local manufacturers' technical capabilities and quality standards (including technology transfer).	An ongoing mismatch between local supply and demand of parts, components and systems, in volume and quality, exists on the South African market. Local manufacturers do not have direct access to information regarding the expectations from OEMs, leading to difficulties in meeting volume and specifications. Access to skills and technology aligned to OEM requirements is also problematic. A cluster would contribute to bridging these gaps.

03

FOSTERING DEMAND FOR RENEWABLE ENERGY AND STORAGE TECHNOLOGIES

FOSTERING DEMAND

Achieving SAREM's core objectives of fostering inclusive, industrial development is pre-conditioned on demand for renewable energy and storage technologies in the domestic market (as well as export markets to a lesser extent).

Widespread, continual demand is necessary to justify investment in industrial capacity. It also underpins a more inclusive development of the value chain.

Context

South Africa's renewable energy and storage market has been historically concentrated on utility-scale government-led procurement, through the REIPPPP. This has kick-started the industry domestically, notably from 2011 to 2015. Since 2011, the REIPPPP, along with the Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP), has procured 11 590 MW of renewable energy technologies[20] and 415 MW of battery storage capacity. This has supported many learnings (for policy and market development) as well as material cost reductions. Procurement programmes for battery storage technologies were also initiated directly by Eskom (500 MW, with 343 MW[21] already awarded in 2022), and through the Energy Storage Independent Power Producer Procurement Programme (ESIPPPP) (513 MW released for procurement in March 2023).[22]

Bushveld Energy is additionally spearheading the installation of the first hybrid mini-grid system in the country using 1 MW/4 MWh VRFB storage along with a 3.5 MW solar plant.

The REIPPPP has, however, been undermined by a series of difficulties, leading to a stop/start pattern of demand. The programme was stalled between 2015 and 2019 due to institutional issues, and the implementation of procurement rounds has been haphazard since then. The procurement of solar PV projects under BW5 was hamstrung by the implementation of local content rules. Grid constraints undermined the procurement of wind energy under BW6. Numerous delays and changes to the procurement framework have also created policy uncertainty. As a result, market confidence in South Africa's utility-scale public procurement appears too low to underpin inclusive, industrial development on its own.

[20] Total of 6 323MW from BW1-4, 2 583MW from BW5, 1 000MW from BW6 and 1 684MW from the RMIPPPP.

[21] This also includes 60MW of solar PV capacity. Further information available at **https://www.eskom.co.za**.

[22] See **https://www.ipp-storage.co.za** for more information.

Figure 3: Power generation capacity registered with NERSA under licensing exemption conditions

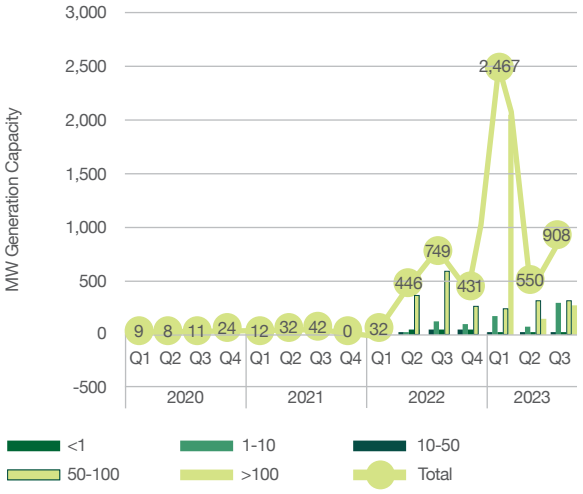
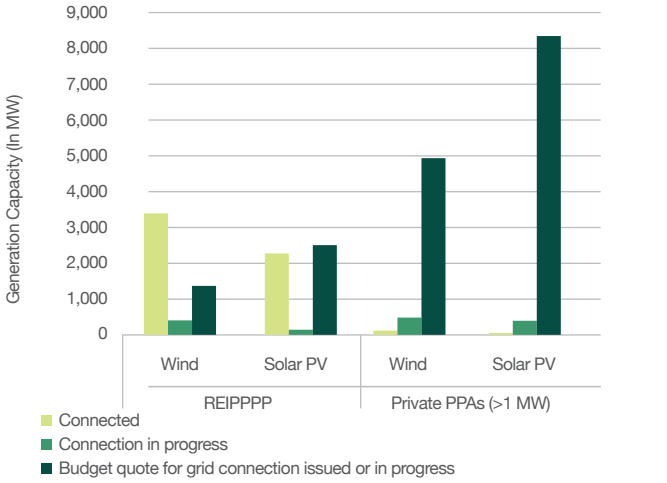


Figure 4: Renewable energy generation capacity (>1 MW; Eskom grid) in South Africa (as of February 2023)



Source: Montmasson-Clair, based on data from NERSA and Eskom

Further public procurement is nevertheless on the cards, which could provide foundational anchor demand. As of November 2023, a BW7 of possibly 5 000 MW is planned for procurement, followed by another 5 000 MW procurement window (BW8). In line with the 2019 IRP, substantial generation capacity remains to be procured by the public sector, as the plan envisages to add 14 400 MW of wind, 6 400 MW of solar PV, 2 088 MW of storage and at least 4 000 MW of embedded generation over the 2022-2030 period.

Despite ongoing efforts and several pioneering projects over the past two decades, the private sector market was, until recently, constrained. Since 2021, regulatory reforms have materially opened up the market, by significantly loosening (in August 2021) and then removing (in December 2022) the licensing requirements for IPPs. Despite some persisting regulatory challenges, these policy changes have triggered a massive development of renewable energy projects by the private sector. They are complemented by a tax incentive scheme, first implemented in 2005 and enhanced in 2012, 2015 and 2023. In addition, fast-rising electricity prices, combined with increasing carbon pricing domestically and border carbon taxes in export markets (the European Union (EU) notably), have further strengthened the business case. As showed in Figure 3, in 2022, about 1.6 GW of renewable energy projects were registered with the National Energy Regulator of South Africa (NERSA), compared to 86MW in 2021. In the first three quarters of 2023, 3.9 GW were registered. Eskom data, depicted in Figure 4, furthermore indicates that, as of February 2023, a total of 13 GW of renewable energy projects (above 1 MW) were at advanced stages of development (i.e. with budget quote for grid connection issued or in progress). As of March 2023, according to the South African Photovoltaic Industry Association (SAPVIA), about 1.5 GW of large-scale private solar generation capacity (>1 MWp) was operating in the country.

Other streams of demand have also progressively emerged. SSEG has been increasingly enabled and, in some cases, incentivised, by municipalities. In September 2023, 67 municipalities (out of 187 licensed municipal authorities) allowed SSEG, 60 developed application processes that allow customers to get authorisations for installations and 34 had an approved SSEG tariff.[23]

In 2023, National Treasury announced a tax incentive for households to invest in solar systems (and enhanced the existing incentive for businesses). Furthermore, to instil public confidence in solar systems, SAPVIA has partnered with quality assurer Bravo Scan to validate installation done by PV Green Card-accredited members.[24] National departments (such as DPWI), municipalities (such as Garden Route), provincial governments (such as Gauteng and Western Cape) and state-owned entities (such as Transnet) have also embarked on their own procurement processes. As of March 2023, SAPVIA estimated that residential rooftop solar systems (0-30 kWp) totalled 621 MW of capacity. In addition, commercial and industrial SSEG (30 kWp-1 MWp) stood at 1248 MW.[25]

Yet, access to renewable energy and storage technologies in South Africa (and globally) remains the prospect of a minority. The vast majority of South African households do not have the means to invest in such technologies. While the increasing availability of alternative uptake options (such as rent and leasing) does widen accessibility somewhat, most people remain unable to afford it. For instance, in 2014/2015, 90% of households spent less than

[23] Data obtained from the SALGA-GIZ-DMRE Municipal Small-Scale Embedded Generation Support Programme implemented by Sustainable Energy Africa.

[24] See **https://sapvia.co.za** for further information.

[25] As of September 2023, Eskom estimated that about 4.9 GW of non-REIPPPP solar capacity were installed across all market segments in the country.

R6 236 on electricity (and R6 437 on energy) per year.[26] In 2019/2020, 10.1 million households qualified to receive free basic electricity from municipalities (even though only about 21% actually did benefit from it). Overall, a large share of the South African population (43% in 2013) lives in a situation of energy poverty. Similarly, most SMMEs, particularly micro and small-sized enterprises, do not have the financial resources to access renewable energy and storage technologies. In addition to materially improving inclusivity and social progress, fostering wider uptake by low-income households and small businesses would unlock additional market segments for local industries.

Action plan

Overall, all data indicates a massive pipeline of both public and private sector-led projects in the years to come. In addition, in the longer run, new demand drivers from power-to-X applications, such as green hydrogen and NEVs, should further support the market. Regional demand from the African continent, notably through the Southern African Power Pool (SAPP), is also forecasted to drive South Africa's export market.[27] In the long run, opportunities could be unlocked by the implementation of the African Continental Power System Masterplan, aimed at establishing a long-term continent-wide planning process for power generation and transmission involving all five African power pools. Yet, numerous issues, in terms of market demand and system readiness, continue to hamper the rollout of renewable energy and storage in the country. SAREM acknowledges the existing efforts undertaken by the National Energy Crisis Committee (NECOM), Eskom, municipalities and the private sector to address such issues.

As such, SAREM aims to leverage such work streams, rather than duplicate them. Table 3 lists all the initial interventions included in this pillar.

First, a clear picture of both public and private sector-led demand over the next years is required, across market segments. An update on the pipeline of both public and private procurement (across segments) for renewable energy and storage technologies in South Africa will be published quarterly. This is crucial to provide existing and prospective manufacturers with a robust view of the upcoming market demand in the country. Clarity is required from government (all spheres and entities) on the scale, nature and specifications of public procurement. A yearly schedule of public procurement, across programmes, would provide foundational demand. To be effective, this should be accompanied by clear, consistent and enforced bidding rules and timelines. Similarly, a robust understanding of the pipeline of projects on the private market, across market segments, is central to scaling the size of the market. Steps to track markets currently under-monitored, such as small-scale rooftop solar systems, will be prioritised. In time, the monitoring system will be further refined and granular, notably to separate between projects for electricity supply and projects for green hydrogen or any other power-to-X applications.

As detailed previously in the section on targets, while a yearly rollout of 6 to 8 GW of renewable energy, totalling 50-60 GW by 2030, is deemed necessary to achieve energy security and enable economic activity in the country,[28] SAREM's initial ambition is based on a minimum yearly rollout of renewable energy of 3 GW, ramping up to 5 GW per annum by 2030.

Second, a number of cross-cutting issues, particularly affecting utility-scale, mining, commercial and industrial, and municipal-level market segments, remain to be addressed. Expansion of the physical infrastructure, i.e. the transmission and distribution networks, along with clear rules for an open and non-discriminatory access to the network (i.e. a transparent grid queuing system), is paramount to the large-scale rollout of renewable energy. Investment in grid infrastructure, as per the Transmission Development Plan, is urgently necessary. Over the 2023-2032 period, Eskom foresees the rollout of 14 218 km of transmission lines, 170 transformers (almost 106 gigavolt ampere of capacity), 40 capacitators (2700 megavolt ampere reactive) and 52 reactors (14 713 megavolt ampere reactive).[29] This will be accelerated by the development of an Implementation Plan (updated yearly). As of October 2023, the national grid had significant availability constraints in some areas. No grid capacity was available in the Cape provinces, which offer the best renewable energy resources. The remaining grid capacity (19 940 MW, mainly in KwaZulu-Natal, Gauteng and Mpumalanga, as of October 2023) is expected to be rapidly utilised.[30] The distribution network is further in dire condition, with a significant maintenance backlog nationwide. Importantly, alternative models to improve the country's infrastructure network (such as partnerships between the public and private sectors) as well as optimise its usage (such as curtailment) should be explored. For instance, the capacity of the existing Western Cape grid to connect renewable energy plants could be doubled under a scenario where no more than 10% curtailment was implemented, enabling the rapid integration of an additional 4 GW.[31]

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[26] Data from Statistics South Africa, 2017. Living Conditions Survey 2014/2015. Pretoria: Statistics South Africa. More recent data are not available at the time of writing.

[27] For instance, over the 2020-2022 period, over 90% of South Africa's exports of lithium-ion batteries (which totalled US$ 50 million in 2022) were to African countries, principally to Nigeria, Uganda and Zimbabwe.

[28] PCC, 2023. *Recommendations from the PCC on South Africa's Electricity System*. Johannesburg: Presidential Climate Commission.

[29] Eskom, 2022. *Transmission Development Plan 2023-2032*. Johannesburg: Eskom.

[30] Eskom, 2023. *Generation Connection Capacity Assessment (GCCA) 2025*. Johannesburg: Eskom.

[31] Creamer, 2023. Renewables hosting capacity of existing Western Cape grid could be doubled with 10% curtailment, Engineering News, 14 September 2023, available at **https://www.engineeringnews.co.za**.

In parallel, the development of the market infrastructure, i.e. tariffs, licensing/registration, wheeling and trading frameworks as well as a fully-fledged power exchange (as envisaged as part of the Eskom unbundling process), will be fast-tracked to ensure the growth of all market segments. The integration of regional markets, particularly through the SAPP, should additionally be further enhanced to create a more sustainable electricity market. The capacity of private offtakers to develop and/or contract projects directly on their balance sheet or through long-term power purchase agreements, which has been the main model in 2022-2023, is inherently limited and long-term growth of large-scale private sector-led renewable energy projects is conditioned on effective and efficient market infrastructure. The implementation of SSEG frameworks with associated tariffs is a precondition for the efficient integration of prosumers into the electricity system. It will also help better understand the scale of SSEG installations in the country, in turn improving their integration and management. Additionally, it is proposed that energy storage systems be recognised as a new, separate asset class. Along with cost-reflective, Time-of-Use tariffs, this would expand the use-cases of storage systems, enabling them to provide services to all parts of the electricity value chain and further support their large-scale rollout.

The launch of InvestSA's Energy One Stop Shop is geared towards improving the ease of doing business, by providing investors with services to fast-track projects and reduce red tape when establishing a business. InvestSA is already actively working on streamlining the 58 approvals required to set up a renewable energy or storage plant. Given the critical importance of transmission and distribution infrastructures, it is recommended that such investments also be included under the mandate of the One Stop Shop.

Third, dedicated interventions are necessary to unlock other market segments. In addition to supporting demand, assisting industrial parks (i.e. SEZs, IDZs), and other industrial zones in rolling out renewable energy and battery systems will increase energy security for industrial activities, a key impeding factor to manufacturing development in the country. Similarly, SMMEs, especially industrial, commercial and farming operations, constitute another stream of largely untapped demand. As for industrial parks, measures targeted at SMMEs will both support demand for renewable energy and storage and ensure the energy security of such businesses. Along with awareness raising and capacity building, access to concessional finance and other funding support is instrumental to assist SMMEs in installing renewable energy and battery systems.

Complementing existing initiatives by the DPWI and other organs of state (such as municipalities), dedicated programmes focused on the rollout of solar and battery systems on all suitable public structures (such as office blocks, car parks, schools, universities, hospitals, clinics, community halls and libraries), using local solution providers, should be actively pursued by all government entities.

The electrification drive through mini-grids, under the Integrated National Electrification Programme (INEP), should also be accelerated in un- or under-served areas, again using local suppliers. Such programmes should also leverage the use of second-hand panels where sensible (see Section 4) and the beneficiaries of the Transformation Fund (detailed in Section 5).

In addition, the possibility of scaling up community-owned projects as well as fostering a widespread rollout for low-income households will be explored through several pilot projects. These projects will be focused on ascertaining the potential to scale up interventions. As such, the opportunity to learn from and partner with existing community-focused initiatives, such as the Development Bank of Southern Africa's DLab programme, will be particularly explored. Importantly, based on findings from piloting, dedicated policy interventions (such as low-interest loans, grants, dedicated funds, skills development and capacity building, technology transfer plans) should be implemented to enable socially-owned projects to prosper.

In the longer run, aligning with existing initiatives to foster power-to-X applications (such as green hydrogen, NEVs and thermal load conversion) will ensure consistent demand for renewable energy and storage technologies, even once the demand linked to traditional electricity use plateaus. The implementation of the Green Hydrogen Commercialisation Strategy, approved in October 2023, is notably forecasted to drive significant demand for renewable energy in the coming decades.

Table 3: SAREM interventions aimed at supporting demand for renewable energy and storage technologies

Implementation plan element	Category	Intervention	Timeframe	Mandate/ decision maker	Implementer
Clarify the market demand for RE and storage	Catalytic intervention	Publish and update quarterly the pipeline of public procurement (e.g. REIPPPP, ESIPPPP, DPWI, provinces, municipalities) for renewable energy and storage technologies.	Quarterly	Department of Mineral Resources and Energy (DMRE), NECOM	Project Management Unit (PMU)
	Catalytic intervention	Publish and update quarterly the pipeline of private procurement (large-, medium- and small-scale projects) for renewable energy and storage technologies.	Quarterly	Private sector, NECOM	PMU
Address cross-cutting issues hindering demand for RE and storage	Supporting intervention	Develop an Implementation Plan (updated yearly) for infrastructure, i.e. transmission and distribution networks, along with clear grid access rules, to enable best renewable energy resource deployment.	Yearly	Eskom	Eskom
	Supporting intervention	Develop the market infrastructure, i.e. registration/licensing, wheeling, trading and SSEG frameworks as well as a fully-fledged power exchange (and build institutional capacity of key stakeholders).	1 year for regulatory frameworks 3 years for power exchange	Presidency, NECOM, InvestSA, DMRE, Cooperative Governance and Traditional Affairs (CoGTA), National Treasury (NT)	DMRE, NERSA, Eskom, municipalities, industry
	Supporting intervention	Establish one-stop-shop for renewable energy and storage.	By launch	Department of Trade, Industry and Competition (the dtic), Presidency	InvestSA

Table 3: SAREM interventions aimed at supporting demand for renewable energy and storage technologies continued...

Implementation plan element	Category	Intervention	Timeframe	Mandate/ decision maker	Implementer
Support demand for RE and storage from additional market segments	Supporting intervention	Design and implement programme for energy security (through renewable energy and storage) in industrial parks, in line with SAREM's localisation objectives.	1 year	the dtic, CSIR, NCPC	SEZs, IDZs, industrial parks
	Supporting intervention	Design and implement a R1.3-billion Energy Resilience Scheme (blended finance to support companies affected by loadshedding, and grant financing for township and rural enterprises aiming to invest in solar back-up solutions), in line with SAREM's localisation objectives.	1 year	the dtic	IDC
	Supporting intervention	Design and implement concessional financing mechanisms for small and medium-size industrial, commercial and farming operations to procure renewable energy and storage, in line with SAREM's localisation objectives.	1 year	the dtic, DSBD, NT, Department of Agriculture, Land Reform and Rural Development	IDC, Land Bank, National Empowerment Fund, sefa, SEDA
	Supporting intervention	Design and implement dedicated programmes (or enhanced existing ones) for the rollout of renewable energy systems on all suitable public structures and un- or under-serviced communities, using local solution providers.	1 year	DPWI, DMRE. NT	Eskom, municipalities, provinces
	Supporting intervention	Pilot programmes to explore options to support rollout to low-income households (e.g., renewable energy systems through RDP programme; implementing Property Assessed Clean Energy programmes, expansion of free basic alternative energy for renewable energy systems).	1 year	DHS, CoGTA, municipalities	Municipalities, civil society
	Supporting intervention	Implement pilot projects to test community-led ownership models for scale up.	1 year	DHS, CoGTA, municipalities	Municipalities, civil society
Support demand for RE and storage from power-to-x markets	Alignment intervention	Coordinate with initiatives aimed at fostering power-to-X market (e.g., green hydrogen, NEVs, Country Investment Strategy) (PMU-PMU quarterly sessions).	Ongoing	Department of Science and Innovation (DSI), IDC, the dtic, DMRE	PMUs

04

DRIVING INDUSTRIAL DEVELOPMENT

INDUSTRIAL DEVELOPMENT

Driving the industrial development of the renewable energy and storage value chains in South Africa is one of the two core objectives of SAREM (the other being fostering its inclusive development).

As demand for renewable energy and storage grows domestically, in the region and globally, an opportunity exists to build domestic industrial value chains to supply the booming market.

Context

To date, South Africa's attempts at building industrial capabilities in renewable energy and storage have delivered mixed results. As discussed in the previous section, market demand has historically been concentrated, almost entirely, on the REIPPPP. Since 2015, the stop/start nature of the procurement, combined with local content rules often out of sync with market dynamics, and a lack of policy consistency, has not supported the development and growth of domestic industrial capacity. Much of the industrial capability built in the inception period of the REIPPPP (2011-2015) has been dormant or lost. As a result, besides balance of plants (e.g., civil works, electricals) and a few exceptions (such as towers for wind turbines), the sector has relied primarily on imports. By end 2021, projects from BW1-4 had procured 50% of their project value locally. In BW5, local content commitments stood at 44% for construction and 41% for operations.[32]

At the same time, from 2010 to 2022, South Africa's imports of solar panels, inverters, LIBs and wind turbines respectively totalled R31 billion, R54 billion, R22 billion and R30 billion. In the first nine months of 2023 alone, a further R17 billion, R17 billion, R28 billion, and R2 billion were additionally imported (see also Figure 6, 7 and 8).[33]

Despite these shortcomings, utility-scale public procurement delivered R63.3 billion of local content over the 2011-2021 period. Combined with South Africa's broad industrial capabilities in connected or related value chains (such as steel, aluminium, shipbuilding, capital equipment and electro-technical equipment), the historical rollout of renewable energy, however imperfect, has displayed wide-ranging domestic capacity in supplying the renewable energy and storage sector (see Annexure B and the SAREM draft of March 2022 for details on this).

- In the solar PV value chain, local industries have capabilities in the assembly of mounting structures, trackers and modules. Production capacity is, however, often limited and at times mothballed. Cell and wafer productions, which are heavily dependent on raw materials sourcing and economies of scale, are at

[32] IPPO, 2022.

[33] Data from Trade Map. Available at **https://www.trademap.org**. Data for lithium-ion battery from 2012 only.

exploratory stages while the production of 'green polysilicon', leveraging South Africa's silica deposit, could be investigated in the future.

- In the wind energy value chain, the manufacturing of both steel and concrete towers as well as some internals and the assembly of rotors can be provided locally. The production of blades, which existed previously, constitutes the next frontier while hub manufacturing and the production and assembly of nacelles could be considered in the medium term.
- The LIB value chain is, apart from battery cells (primarily imported from China), well developed, with capabilities in mineral beneficiation, casing and assembly and electrical systems (including battery and energy management systems). Whether cell production would be economically viable in South Africa remains to be established.
- The vanadium-based battery value chain, although nascent domestically, also boasts material local capabilities, including vanadium mining and refining, electrolyte production and VRFB assembly. The manufacturing of stacks, dependent on intellectual property, would be a logical next step for the industry.
- Across the value chains, local capabilities also exist in the manufacturing of inverters, civil works, balance of plant (such as cables and fasteners) as well as numerous services (such as some testing and certification). In the future, existing capabilities could also be leveraged to develop opportunities around end-of-life management (reuse, remanufacturing and recycling) of components, such as batteries, panels and blades.

Accordingly, Table 4 lists the principal existing manufacturers in a position to service the solar, wind and battery sectors in the country.

Table 4: Main existing manufacturing companies in the renewable energy and battery storage value chains in South Africa

Solar PV value chain	Wind energy value chain	Battery storage value chain
Modules: ArtSolar, Seraphim*, Ener-G Africa	Concrete towers: Concrete Units, Nordex/ WBHO, Colossus*	Mineral refining: MMC (manganese metal), Thakadu (nickel sulphate), Hulamin (aluminium foil), vanadium pentoxide (Bushveld Minerals)
Mounting structures and trackers: ModeTech, Caracal Engineering, K2 Systems, PVH, Barnes Tubing, IMAB Technologies, Lumax Energy, KD Solar	Steel towers: GRI Towers	Casings, modules and cooling: multiple steel, aluminium and plastics suppliers, machining operations and aluminium extruders (e.g., Hulamin, Wispeco).
Inverters: Rubicon (MLT), Microcare, Ario#	Primary steel: ArcelorMittal South Africa	LIB Pack assembly: Balancell, Blue Nova, Freedom Won, Hubble Lithium, Maxwell & Sparks, Polarium, Rubicon, SolarMD, Creslow Energy Solutions

Table 4: Main existing manufacturing companies in the renewable energy and battery storage value chains in South Africa continued...

Solar PV value chain	Wind energy value chain	Battery storage value chain
Transformers: Actom, Reliable Transformers, ArmCoil Afrika, Zest Weg	Tower internals: ModeTech	BMS/EMS: Balancell, Blue Nova, Freedom Won, Hubble Lithium, Maxwell & Sparks, Polarium, Rubicon, SolarMD
Cables: Aberdare, CBI African Cables, SOEW	Anchor cages and extenders: Modetech	LIB recycling: Circular Energy, Reclite, eWaste Africa
Fasteners: CBC Fasteners, Impala Bolts & Nuts	Transformers: Actom, Powertech, Matlakse, SGB-Smit Power Matla	Second-life LIB: Revov
Combiner boxes: HellermannTyton, Weidmuller and Allbro	Fasteners: SA Bolts	VRFB electrolyte: Bushveld Energy
Switchgears: RWW Engineering and Switchgear Unlimited	Cables: CBI African Cables, M-tech, Aberdare	VRFB assembly: Bushveld Energy (Enerox)

Source: Montmasson-Clair, based on multiple sources, including Barnes et al. 2023, Manufacturing Localisation Potential in Renewable Energy Value Chains, Johannesburg: Localisation Support Fund
*Note: # awaiting certification; * currently mothballed*

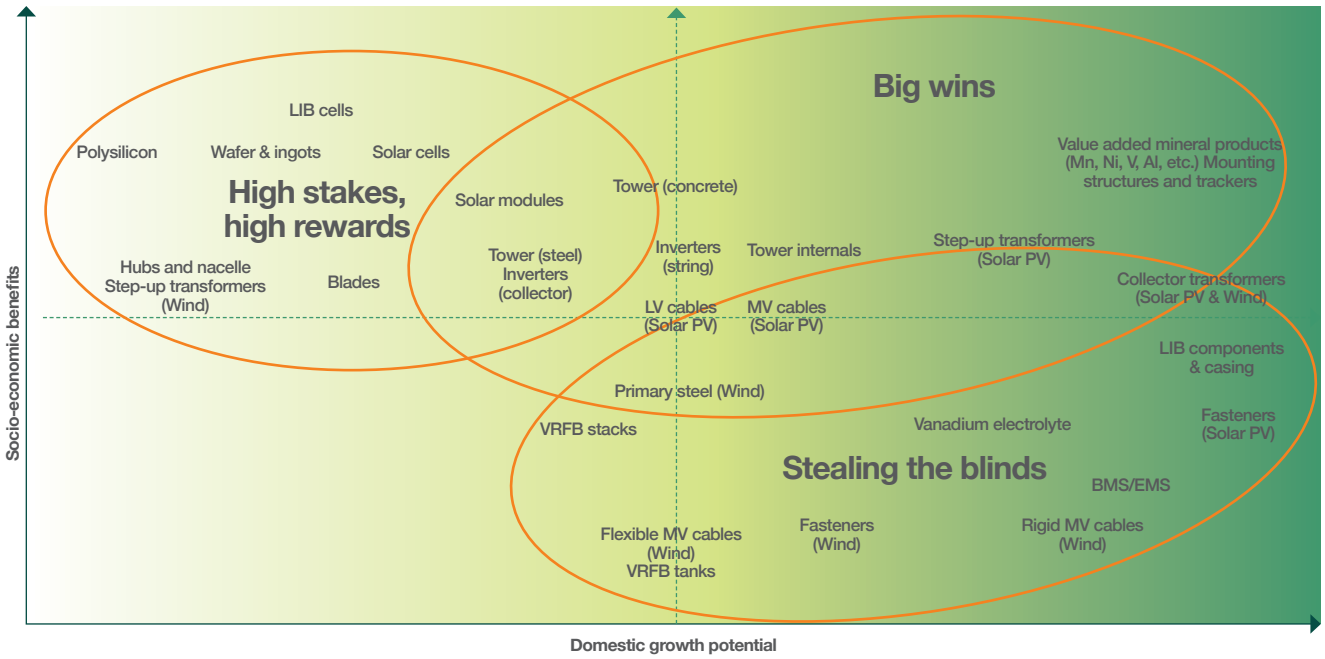
Looking forward, compared to its peers, South Africa is considered an attractive location for manufacturing investment in the value chain. Based on an assessment of operating costs (i.e., labour, utility and transport costs) and ten-year profitability, South Africa offers a competitive value proposition for renewable energy and battery storage manufacturing investment outside of China. Key advantages include an attractive local market as well as regional and global market access, competitive labour and utility costs along with a relevant labour pool of both experienced and non-experienced staff (especially in Gauteng), and an existing domestic supply base. Below average corporate taxation also compensates for relatively limited policy support. And, although permitting procedures remain burdensome at times, the regulatory environment, specifically related to trade and the labour market, is comparatively conducive to business operations. [34] However, the extremely competitive nature of the global renewable energy and battery storage industry points to the need for South Africa to put forward a compelling investment case to the market.

As illustrated in in Figure 5, a number of industrialisation opportunities can be identified for prioritisation by 2030 if a minimum demand of 3-5 GW per annum is realised. First, a clear zone of opportunity is present across technologies, ranging from the beneficiation of South Africa's minerals (such as refining manganese to battery grade) and the manufacturing of mounting structures, trackers and tower internals, to the production of certain transformers, cables and inverters. Generally, local production is already present domestically and would be well positioned to grow in line with demand. New activities, such as the casting of hub nose (steel), the production of coil steel and the manufacturing of flanges and door frames for wind towers or inverter fans, could also be developed locally. In addition, quick wins are present for some items, predominantly in the balance of plant, such as fasteners, VRFB tanks and cables. Again, existing capabilities could here be leveraged to expand the industry going forward.

Across these two groups, the establishment or expansion of input production locally could furthermore support the industrial development of some components, increasing l ocal content and competitiveness. This is, for example, the case of copper rods for transformers and cables. Beyond these opportunities boasting existing capabilities and a relatively strong growth potential, some high value components, such as solar and LIB cells or blades, could be potentially localised by 2030. Building local industrial capabilities in these components would however require material, sustained demand as well as strategic partnership with existing, foreign OEMs.

[34] IBM Plant Location International, 2023, Renewable Energy Investment Competitor Benchmarking, New York: IBM.

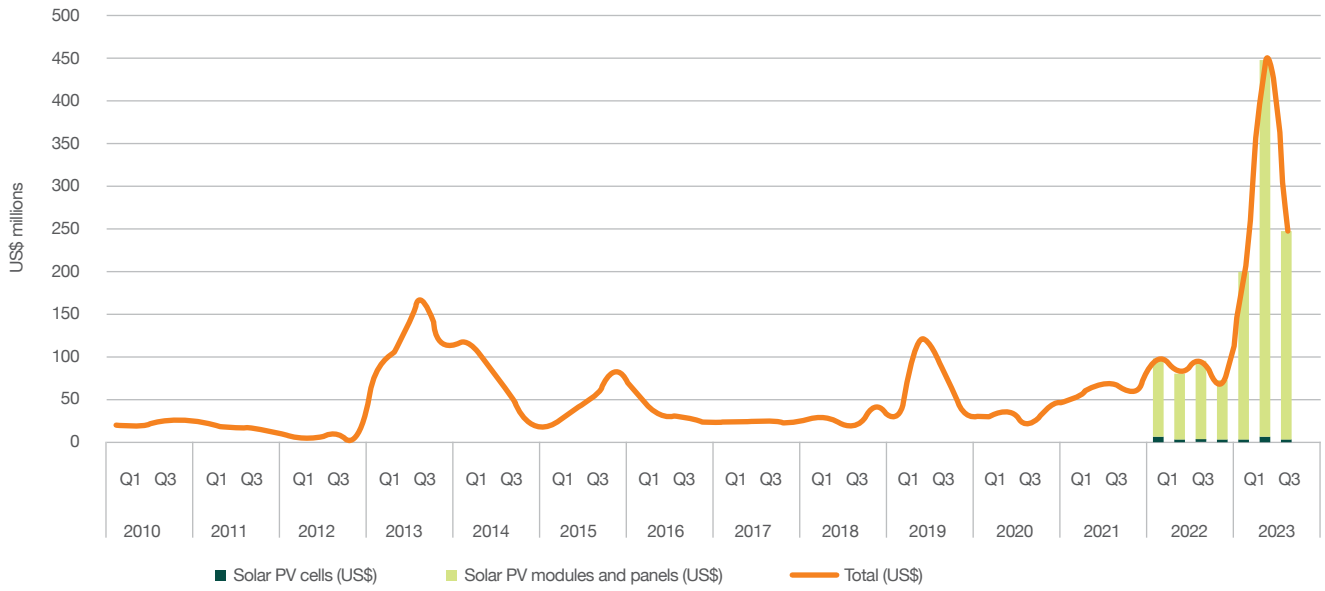
Figure 5: Prioritisation matrix for renewable energy and battery storage industrial development opportunities for South Africa by 2030



Montmasson-Clair, based on various inputs, including the Draft SAREM document of March 2022, Urban-Econ et al. 2023, Rivett-Carnac, 2022a & 2022b, Montmasson-Clair et al., 2021, Moshikaro, 2023, Barnes et al. 2023 and key informant interviews[35]

Notes:
While individual component manufacturing would benefit from domestic value chain integration, most can be developed independently of each other. A few stages, such as wafers to cells or step-up transformers to nacelles, require integration.
Opportunities related to end-of-life management are not included due to the lack of information on their domestic economic viability.

Figure 6: South Africa's imports of solar cells, modules & panels (in US$ millions)



[35] References not previous mentioned are: Rivett-Carnac, 2022a. Insights into the solar photovoltaic manufacturing value chain in South Africa. Pretoria and Cape Town: Trade & Industrial Policy Strategies and WWF-SA; Rivett-Carnac, 2022b. Insights into the wind energy value chain in South Africa. Pretoria and Cape Town: Trade & Industrial Policy Strategies and WWF-SA; Montmasson-Clair, Moshikaro and Monaisa, 2021. Opportunities to develop the lithium-ion battery value chain in South Africa, Pretoria: United Nations Industrial Development Organisation, Department of Trade, Industry and Competition, Department of Transport, Department of Environment, Forestry and Fisheries; and Moshikaro, 2023. Localising vanadium battery production for South Africa's energy security. Pretoria: Trade & Industrial Policy Strategies.

Figure 7: South Africa's import of wind energy generators (in US$ millions)

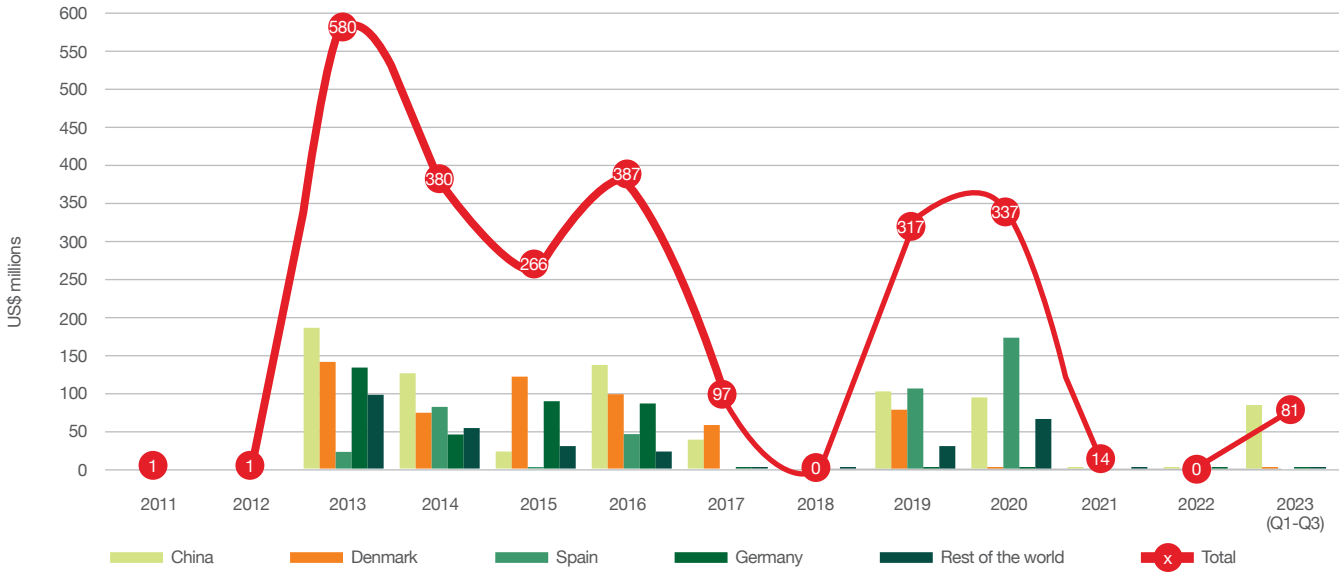
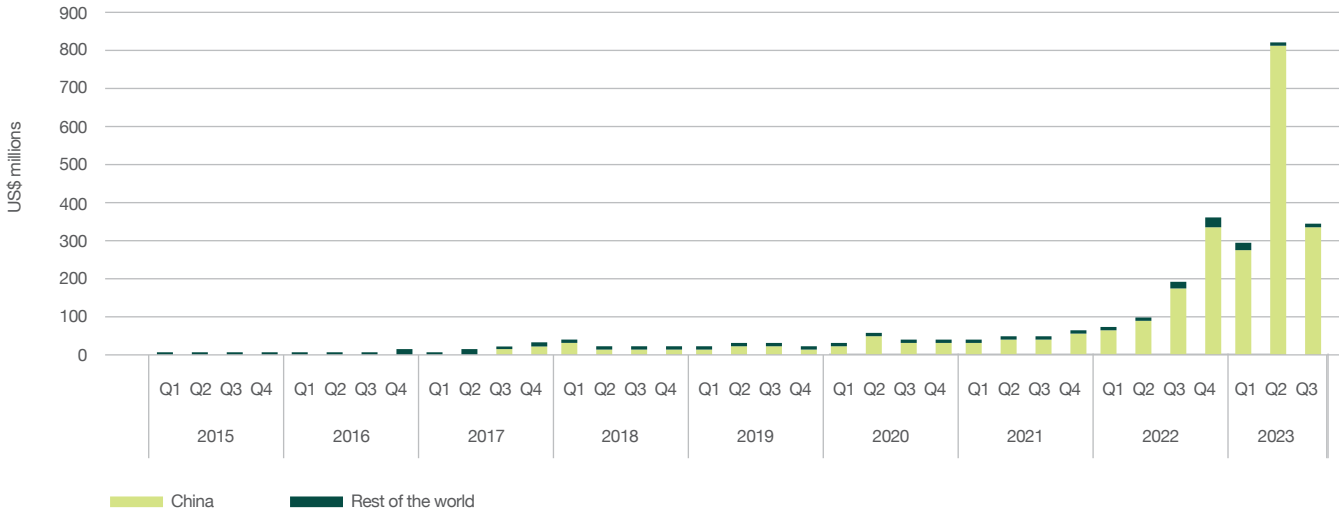


Figure 8: South Africa's import of lithium-ion cells & batteries (in US$ millions)



Source for Figures 5, 6 and 7: Montmasson-Clair, based on data from TradeMap and Quantec

Action plan

Looking ahead, as detailed in the previous section, industrial development in the renewable energy and storage value chains first and foremost depends on local (and to some extent export) demand. Then, the availability of skills represents another condition for growth. This is unpacked in Section 6.

Overall, the broader political-economic environment, such as the quality of (physical and market) infrastructure (such as roads, railways and ports) and the ease of doing business, also has an impact on the prospect of developing industrial value chains. This is acknowledged but falls beyond the scope of SAREM. In this stream, the focus is on addressing issues which are specific to (or particularly prevalent in) the development of industrial capacity in renewable energy and storage value chains. Table 7 provides the list of interventions forming this pillar.

First, clear localisation objectives, encompassing both the public and private sector markets, must be established, in line with the agreed targets detailed in Section 2. The adoption of a realistic, yet ambitious, trajectory for ramping up localisation across market segments is the backbone of any ambitious industrial development plan aimed at leveraging the growing market for renewable energy and storage.

Such a "ramping curve" should be in line with market realities (in terms of existing industrial capacity, demand and lead times for industrial investment) and encompass both public and private sector markets.[36] Correspondingly, public procurement criteria relating to local content (such as scoring mechanisms, thresholds, targets) should be clear, consistent and enforced. For public procurement, it is proposed that the entirety of economic development points (i.e., 10 out of 100 points, as per the Preferential Procurement Policy Framework Act, 2000[37]) is allocated to local content. Points could then be awarded competitively, over and above compulsory minimum thresholds.[38]

In addition to local content requirements included in public procurement programmes, several products used in the construction of renewable energy plants have been earmarked ("designated" in South African terms) by the dtic for local procurement by public entities. Table 5 lists main products. These include solar modules, frames, combiner boxes, mounting structures, inverters, cables, transformers and switchgears.[39] Cement, which is central to the construction of plants, is also 100% designated. Pipes (100% for plastic pipes, 80-100% for steel pipes), pumps (70%) and valves, which are required for VRFBs, have also been identified.[40]

Importantly, however, the ability of the dtic to enforce minimum local content threshold has been rescinded by the interim Preferential Procurement Regulations gazetted by National Treasury in November 2022 following a Constitutional Court judgement setting aside previous regulations. Until the publication of a new Public Procurement Act, organs of state must then determine their own preferential procurement policies in accordance with the Preferential Procurement Policy Framework Act and the 2022 regulations.

Table 5: List of designated products related to the renewable energy and battery storage value chain

Product	Local content threshold	Comment
Laminated solar PV modules	15%	Includes tabbing and stringing of cells, encapsulation and lamination, final assembly and testing in compliance with IEC Standards.
Solar PV module frames	65%	All aluminium PV Module Frames, PV mounting structures/racks, clamps, brackets, foundation components and fasteners are to be manufactured from locally produced extruded, rolled, cast or forged products.
DC combiner boxes	65%	Enclosures must be made from sheet moulding compound and moulded in South Africa.
Mounting structures	90%	All aluminium PV module frames, PV mounting structures/racks, clamps, brackets, foundation components and fasteners are to be manufactured from locally produced, extruded, rolled, cast or forged products.
Inverters	40%	Inverters must be assembled locally
Electrical cables	90%	Includes low, medium and high voltage power cables as well as telecommunication cables. Excludes key inputs (copper, aluminium, polyvinyl chloride, cross-linked polyethylene, aramid yarn, and optical fibre) used for fabrication of cable products to encourage local manufacturers to seek the best global competitive prices for primary materials.
Transformers, shunt reactors and associated equipment	20-90%	Class 0: 90%; Class 1-3: 80%; Class 4: 20% Further details included in the regulations on the level of local content to be achieved for specific inputs into the manufacturing of transformers and shunt reactors.
Air-insulated MV switchgear	50%	Includes the following additional thresholds: instrument transformers (15%); busbars (5%); housing (25%) and switching devices (5%).

Source: the dtic

[36] The development of a voluntary Sector Charter to galvanise support from offtakers as well as IPPs / developers is aligned with SAREM objectives. It will be included as an intervention subject to progress at the level of industry associations.

[37] A new Public Procurement Act is expected in the coming months, which may provide more flexibility in designing procurement specifications. Accordingly, the possibility of enhancing the weight given to industrial and inclusive development in public procurement will be investigated in due course.

[38] As discussed in the next section, it is proposed that other economic development objectives, notably transformation, are positioned as entry requirements, rather than competitive elements.

[39] A database of suppliers for designated products is available here: **https://greencape.co.za/designated-local-content-market-intelligence-supplier-database/**

[40] Other products in the energy sector have also been designated, namely solar water heaters (70%), electricity meters (70% for post- and pre-paid meters and 50% for smart meters) and powerline products (100%).

Second, a mix of trade and industrial policy measures aimed at supporting local value chains is needed to foster local demand and improve the competitiveness of domestic suppliers.[41] At the core, public policy related to renewable energy and storage must be aligned with localisation objectives. Public procurement programmes from all spheres of government and organs of state, as well as government support programmes (such as incentives, subsidies and funding schemes) must integrate localisation objectives into their design. This will be targeted through fit-for-purpose design, not to hamstring the rollout of such programmes as a result of a lack of domestic supply. For instance, additional and/or more advantageous support should be awarded to beneficiaries procuring locally. The opportunity to promote the use of Transformation Fund beneficiaries (put forward in Section 5) by recipients of public support should also be explored. Furthermore, projects developed by organs of state, such as Eskom's repowering projects at coal-fired power plants in Mpumalanga, should strive to achieve ambitious levels of local content. This would serve both as anchor demand for local manufacturers and a demonstration of expertise and capabilities.

In addition, Proudly SA will launch consumer education and localisation campaigns for locally manufactured renewable energy and battery storage products. This is particularly important to foster 'buy local' behaviour in the small-scale market, but extends to all market segments. This will include digital media campaigns, highlighting the importance of buying from local manufacturers in the renewable energy and battery storage space. Local products will furthermore be included in Proudly SA's industry events, catalogues, online procurement platforms targeting both businesses and individual consumers, and partnerships with existing e-commerce platforms (which give access to preferential listings, reduced commission structures, product highlights and the use of the Proudly SA logo and 'Made in SA' label of origin). In addition, Proudly SA will feature the domestic renewable energy and battery storage industry with public and private sector buyers, with whom it actively pursues localisation commitment pledges, and include the sector in its tender monitoring and supplier database development activities.

Furthermore, besides this demand support, supply-side interventions would improve the investment case. Most countries seeking to attract investment in green industries have offered substantial supply-side support in the form of grants, tax incentives and concessional funding. This is clearly illustrated by the widespread "green industrial policy" packages promulgated by governments in the United States, the EU, China and multiple other jurisdictions. Accordingly, a clear industrial development value proposition will be formulated for South Africa. Here, opportunities to leverage funding from South Africa's partners, as illustrated by the Implementation Plan of the Just Energy Transition Partnership Investment Plan, will be particularly investigated. As detailed in Table 6, a set of cross-cutting industrial policy measures provides a degree of support to existing and prospective manufacturers in the country.

Dedicated policy support for "greentech" manufacturing value chains is, however, necessary to decisively bolster investment in the sector. As such, the implementation of a targeted incentive will be pursued by re-activating the existing (but currently inactive) 12i tax allowance incentive with a focus on renewable energy and battery value chains (and possibly other "green technologies"). The scheme provided a tax incentive for both greenfield and brownfield manufacturing investments, through which the value of qualifying assets (up to a certain amount) could be deducted from taxable income. Projects meeting certain criteria were furthermore awarded more generous support, enabling the scheme to drive specific objectives.[42] Such an incentive is considered a no-regret intervention given the spill over benefits associated with manufacturing.

In addition, dedicated support for energy security in industrial parks will address the single largest supply-side constraint on the development of industrial capacity. This will include but not be limited to access to the full suite of incentives promulgated for SEZs. Importantly, the promulgation of existing tax incentives (namely the Sections 12R and 12S of the Income Tax Act) to all SEZs will be actively pursed.

Establishing adequate testing and certification capabilities across the value chain will prevent existing (and prospective) manufacturers from having to obtain certifications overseas (generally in the EU and the United States).[43] Testing capabilities exist in some parts of the value chain, such as solar modules, LIBs, transformers, cables or fasteners.

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[41] See the **Draft SAREM document of March 2022** for an international policy review of frameworks in favour of renewable energy and battery storage manufacturing value chains.

[42] The scheme provided a tax incentive for manufacturing projects of a minimum of R50 million for greenfield projects and R30 million for brownfield projects. An Investment Allowance could be deducted from taxable income in the financial year when assets were brought into use:
- 55% of qualifying assets or a maximum of R900 million for greenfield project with a preferred status (100% if located in a SEZ);
- 35% of qualifying assets or a maximum R550 million for other greenfield project (75% if located in a SEZ);
- 55% of qualifying assets or a maximum of R550 million for brownfield project with a preferred status;
- 35% of qualifying assets or a maximum of R350 million for other brownfield project.

A Training Allowance was also available, of the lesser of R36 000 per full time employee or total training expenses (to a maximum of R20 million for a qualifying project, or R30 million for a preferred project).
B-BBEE compliance by beneficiaries was voluntary. However, applicants needed to meet at least four of the following criteria: skills development expenditure above 2.5% of the average annual wage bill (mandatory requirement); improve energy efficiency by at least 12.5% (mandatory requirement); innovation to improve production time, reduce costs, improve product quality or longevity; increase local production or improve global competitiveness; acquire at least 10% of inputs including services from SMMEs; located in a SEZ.

[43] LIBs for stationary storage applications notably need to pass performance testing (IEC 62620) and safety testing (IEC 62619 and UN 38.3).

Additional capabilities are deemed necessary for batteries, solar panels, inverters, transformers, cables and fasteners. The possibility of developing other testing capabilities, such as anemometer calibration, should also be explored in the future. In the case of LIBs, testing and certification require ISO 17025 accredited facilities, located at existing manufacturers or independent institutions. While some local capabilities exist, testing and certification of large batteries remain particularly problematic in the country. Most facilities are not equipped to test large equipment and those that can are expensive and/or over-subscribed.

Importantly, the enhancement of testing capabilities must be accompanied by mandatory standards to prevent the import of unsafe and poor-quality products. The development and enforcement of such standards by the National Regulator for Compulsory Specifications, notably for LIBs, inverters, solar panels and mounting structures, will be actively pursued. [44] Similarly, while a compulsory local safety standard exists for medium voltage cables (SANS 97 or 1339), the standard for low voltage cables has been developed (IEC 62930) but is yet to be adopted.

On the trade front, a comprehensive review of the trade balance and duties on the bills of materials for renewable energy and storage value chains (at the component level) will inform further intervention, namely duty relaxation/ exemption or duty protection. It is counterproductive if the import of a final product is duty free while one or more of the inputs needed to manufacture this final product domestically attract high tariffs. It is for instance the case for local manufacturers of combiner boxes, who pay an import duty on some electrical sub-components, such as PC boards and fuses.

In turn, duties could play a role in protecting the domestic manufacturers of solar panels, mounting structures made with locally-sourced steel (by imposing higher tariffs on imported mounting structures) as well as LIBs (by imposing tariffs on imported fully-assembled battery packs). As of November 2023, a request for a 10% tariff on imported solar modules and panels (along with a temporary rebate facility) was being processed by the dtic and NT while an application to ITAC for a tariff on imported LIB packs had been initiated by the local industry.[45] In addition, the enforcement of custom duties (i.e. ensuring that products are imported under the correct tariff codes) and mandatory quality standards on imported goods would play a significant role in preventing the entry of sub-standard products in the country as well as the circumvention of existing tariff protection. This would directly support the local manufacturing of several products, such as batteries, cables, mounting structures, fasteners, transformers, steel towers and tower internals.

To support exports, in addition to the value proposition highlighted in the previous paragraph, the implementation of a Customs Control Area and associated zero-rated VAT/ duty-free benefits by SEZs which have not yet done so (such as the Atlantis SEZ) will be fast-tracked. This will complement existing trade promotion measures, such as the dtic's Capital Projects Feasibility Programme and the Export Marketing and Investment Assistance Scheme. Then, the launch by the South African Electrotechnical Export Council (SAEEC) of a database of African renewable energy projects which local manufacturers could supply will be complemented by a broader investigation into the potential of harnessing existing trade relationships (such as the African Continental Free Trade Area (AfCFTA), the Southern African Development Community (SADC), the Southern African Customs Union, the SADC-EU Economic Partnership Agreement, the African Growth and Opportunity Act (AGOA) and the BRICS group) and trade promotion tools. Strategic collaboration opportunities, particularly within the spectrum of the SADC, the African Union's African Green Minerals Strategy[46] and the BRICS group, will be prioritised.

Third, further work is required to unpack and strengthen linkages between the existing renewable energy and storage value chain and connected industries.[47] The Steel Masterplan, launched in 2021, has the potential to foster the use of local steel inputs into the renewable energy and storage value chains, for instance to produce towers and mounting structures. The Automotive Masterplan implemented since 2019 as well as the Battery Minerals and Critical Minerals Masterplans (both in development at the time of writing) can help grow the battery value chains, notably by unlocking other markets driving demand for batteries, such as NEVs and facilitating access to key technologies and input materials. As highlighted earlier, a localisation drive linked to the rollout of transmission and distribution infrastructure would also have positive linkages for some industries covered in SAREM.

Then, further work is required to promote circularity (and environmental sustainability more broadly) in the value chain, in line with South Africa's National Environmental Management: Waste Act of 2008. This is particularly relevant for LIBs but impacts every component, from solar panels and inverters to cables and blades.

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[44] Such a mandatory standard already exists in the country, for instance, for power banks.

[45] Customs duty investigations can be initiated by industry (through an application to ITAC) or ITAC itself. Upon completion of the investigation (4-6 months), a recommendation is provided to the dtic for decision-making. The NT is then requested to implement the decision by the dtic.

[46] The African Green Minerals Strategy of the African Union was in draft form at the time of writing, in October 2023.

[47] For instance, Manufacturing Circle (2022) identified that wind energy plants (with a steel tower) require, per 1 MW installed, 9.6 tons of flat, special steel (in nacelle), 110.4 tons of flat steel (tower and other steel), 38 tons of reinforcing bar (steel), 20 tons of cast iron, 71.4 tons of cement, 8.2 tons of glass/carbon composite, 1.4 ton of aluminium, 2.0 tons of copper, 5.5 tons of zinc and 2.9 tons of plastics. Similarly, ground-mounted solar PV projects require, per 1 MW installed, 68 tons of long (galvanized) steel, 3.7 tons of reinforcing bar (steel), 10.2 tons of cement, 46.4 tons of glass, 7.5 tons of aluminium, 4.6 tons of copper, 3.4 tons of zinc, 8.6 tons of plastics and 0.04 ton of silicon (wafer). See Manufacturing Circle, 2022. *South African Renewable Energy Material Demand Study*, Johannesburg: Manufacturing Circle.

Extended producer responsibility regulations for the lighting, electrical, electronic equipment and battery sectors require the industry (manufacturers and importers) to implement take-back systems and waste management plans, already covering most components used in renewable energy and battery storage. In addition, all hazardous e-waste, including LIBs, is banned from being landfilled since August 2021.

Research on the potential to develop an end-of-life management industry in South Africa, covering reuse, remanufacturing and/or recycling, will be conducted to inform the development of the sector. Heightened supply chain diligence and participation in global efforts to enhance the traceability of minerals entering the renewable energy and battery storage value chain, particularly when manufacturing occurs domestically, should also be encouraged going forward.

As a start, a programme to collect, refurbish (if necessary) and reuse solar panels replaced by IPPs (routinely and through repowering programmes) will be developed for rollout on public and community buildings, such as nurseries, schools, clinics, libraries and community halls.[48] A study on the possibility of establishing a battery refurbishing and recycling industry should also be prioritised. The viability of local recycling and the potential role of municipal and community-led depots should notably be explored.

Table 6: Key industrial policy support for renewable energy and battery manufacturing in South Africa

Scheme	Institutions	Intent	Key benefits and conditions
Black Industrialist Programme	the dtic & DFIs (e.g. IDC)	The Black Industrialist Programme supports the growth of black-owned and -managed businesses in industrial value chains, through financial and non-financial interventions.	The scheme offers a cost-sharing grant ranging from 30% to 50% of total investment cost, to a maximum of R50 million. The quantum of the grant depends on the level of Black ownership and management control, the economic benefit of the project and the project value. Eligible costs include capital investment as well as feasibility studies, post-investment support (such as product design and patent costs) and business development services. Only Black-owned and -managed businesses (>50% shareholding and management control) with a minimum investment of R30 million are eligible. Additional criteria (such as benefits in terms of employment; pricing, quality of products; use of green technology and resource efficiency, local procurement, localisation of production activities and B-BBEE level) also apply.
Manufacturing Competitiveness Enhancement Programme (MCEP)	the dtic / IDC	MCEP supports the growth of domestic manufacturers through concessional financial loan facilities.	The programme offers working capital loans as well as plant and equipment loans to Black-owned manufacturing firms at a preferential rate fixed of 4%. The working capital facility is capped at R50 million per annum, while plant and equipment loans are capped at R50 million per applicant. Business support is also offered at a maximum of R3 million. Only businesses with B-BBEE levels 1-4 (within 24 months of approval) are eligible.
Industrial financing	IDC and other development finance institutions (DFIs)	Local DFIs support the enhancement and growth of South African industrial capabilities, through a variety of funding instruments.	Local DFIs offer a suite of niche and innovative funding products. For instance, the IDC provides concessional debt, equity and quasi-equity, guarantees, trade finance and venture capital to industrial development projects. It also runs targeted, manufacturing-related programmes, focused on SMME development (Khoebo Innovation Promotion Programme SME-Connect, SME and MIDCAP companies programme) and youth entrepreneurship (GRO-E Youth Scheme).

[48] Due consideration should here be given to ensure the quality of the products as well as their safety, notably through a mandatory safety sign-off by a relevant registered body.

Table 6: Key industrial policy support for renewable energy and battery manufacturing in South Africa continued

Scheme	Institutions	Intent	Key benefits and conditions
Special Economic Zones (SEZs)	the dtic, NT and individual SEZs	SEZs are geographically designated areas reserved for targeted economic activities to promote trade, economic growth and industrialisation. SEZs are supported through special arrangements (including laws) and systems that are different to those that apply elsewhere in the country.	Companies carrying on business within an SEZ are eligible for tax relief, including a corporate income tax rate of 15%, instead of 27%, provided at least 90% of their income is derived from the carrying on of business or provision of services within that SEZ. Businesses in an approved SEZs are also eligible for an accelerated depreciation allowance on capital structures (erecting or improving buildings and other fixed structures). This allowance may be claimed at a rate of 10% per annum on the cost of such building or improvement. Businesses in a SEZ are eligible to the employment tax incentive, without age limitation (unlike in the rest of the country it is limited to the employment of young persons from 18 to 29 years old). The incentive allows employers to reduce the amount of employees' tax paid on behalf of their employees whilst leaving the wage received by the employee unaffected for employees earning below R60 000 per annum. Businesses located within a customs-controlled area of a SEZ are eligible for tax relief for export, in the form of zero-rated VAT and import duty rebates.
Critical Infrastructure Programme (CIP)	the dtic	The CIP supports businesses, state-owned strategic testing facilities, the revitalisation of state-owned industrial parks, and strategic feasibility studies, by stimulating and encouraging investment through efforts of lowering infrastructure costs.	The CIP is primarily a cost-sharing incentive. The applicant must be at least a level 6 B-BBEE contributor. For generic investments, it can cover 10% to 30% of total qualifying infrastructural development costs capped at R50 million based on an economic benefit criterion. For an investor within a distressed municipality (or a distressed municipality directly), between 15% and 100% of total qualifying infrastructure development costs can be covered by the CIP. For other municipalities, 15% to 50% of total qualifying infrastructure development costs are supported, up to a maximum of R50 million. Strategic Infrastructure Feasibility Studies are supported on an 80:20 cost sharing basis (80% by the dtic) cost sharing for projects inside SEZs, and 60:40 cost sharing for projects outside SEZs. This is capped at 5% of project value to a maximum of R50 million in both cases. In addition, the CIP provides support to state-owned industrial parks (100% of total qualifying infrastructural development costs capped at R50 million, under the Industrial Parks Revitalisation Programme) and state-owned testing facilities (50:50 cost sharing of total qualifying infrastructural development costs capped at R50 million).

Source: the dtic

Table 7: SAREM interventions aimed at driving industrial development in the renewable energy and storage value chains

Implementation plan element	Category	Intervention	Timeframe	Mandate/ decision maker	Implementer
Establish clear localisation objectives	Catalytic intervention	Establish a consistent set of local content targets and criteria for future public and private procurement programmes, in line with agreed targets.	Yearly	NT, DMRE, the dtic, private sector	IPPO, Eskom, private sector
	Supporting intervention	Conduct detailed study of currently available local supply for each component/part in the renewable energy and battery value chain.	By launch	Localisation Support Fund	Localisation Support Fund
Align industrial policy and programmes with renewable energy and storage localisation	Catalytic intervention	Re-activate the 12i tax allowance incentive with a focus on supporting the development of renewable energy and battery manufacturing value chains.	1 year	the dtic, NT	the dtic, NT
	Catalytic intervention	Align existing public sector programmes and policy support with SAREM's localisation objectives (e.g. Energy Resilience Scheme, IDC funding, DSBD Bounce Back scheme, municipal/provincial procurement).	1 year or as programmes develop	Respective departmental leads	Respective programme leads
	Catalytic intervention	Formulate and implement value proposition (including energy security) to attract investment in SEZs/IDZs/ industrial parks (including incentives where relevant).	6 months for design	the dtic	Individual SEZs, IDZs, industrial parks
	Catalytic intervention	Launch solar PV rollout programme for schools/clinics/etc. based on panels replaced by large projects.	1 year	DMRE, CoGTA, Private sector	South African National Energy Development Institute (SANEDI)
	Supporting intervention	Establish comprehensive and affordable testing and certification capabilities for locally manufactured products as well as develop and implement mandatory quality standards for such products.	1 year for batteries and cables 2-3 years for panels and inverters	the dtic / DSI	CSIR, uYilo, National Metrology Institute of South Africa, National Regulator for Compulsory Specifications
	Supporting intervention	Conduct detailed analysis of the potential to build an end-of-life industry (life expansion, reuse, remanufacturing, recycling in the renewable energy and storage value chains).	1 year	the dtic / DSI	the dtic / DSI
	Supporting intervention	Launch consumer education and localisation campaigns to encourage the purchasing of local renewable energy and battery storage products.	6 months	Proudly SA, the dtic	Proudly SA
	Alignment intervention	Align with Steel, Automotive, Battery Minerals and Critical Minerals Masterplans to improve competitiveness of local materials (PMU-PMU quarterly sessions).	Ongoing	the dtic, DMRE	PMUs

Implementation plan element	Category	Intervention	Timeframe	Mandate/ decision maker	Implementer
Harness trade policy to support local manufacturing in renewable energy and storage value chains	Supporting intervention	Map, apply for and obtain import duty exemption or protection on strategic inputs.	Ongoing	the dtic	International Trade Administration Commission (ITAC), individual applicants
	Supporting intervention	Implement Customs Control Area and associated zero-rated VAT / duties at relevant SEZs.	6 months	NT, the dtic	Individual SEZs
	Supporting intervention	Establish, publish (and regularly update) database of African renewable energy projects.	By launch	SAEEC	SAEEC
	Supporting intervention	Design a strategy to harness bilateral arrangements and trade promotion instruments to promote renewable energy and storage exports from South Africa (AfCFTA, BRICS, SADC-EU Economic Partnership Agreement, AGOA).	6 months	the dtic	the dtic, ITAC
	Supporting intervention	Develop a regional collaboration strategy in partnership with other countries, particularly within SADC, BRICS and AU groups.	6 months	the dtic / DMRE	the dtic / DMRE

05

FOSTERING INCLUSIVE DEVELOPMENT

INCLUSIVE DEVELOPMENT

Fostering the inclusive development of the renewable energy and storage value chains in South Africa is the second core objective of SAREM (the other being driving industrial development, as unpacked in the previous section).

The industry remains, to date, largely concentrated in terms of development, manufacturing, supply chain, management, ownership and geography. This has constrained the contribution of the sector to South Africa's just transition.

Context

While the inclusive development of the value chain has been a key component of the rollout of renewable energy through the REIPPPP, it has delivered mixed results. In the absence of a sector-specific scorecard for renewable energy (and storage), thresholds and targets have been static through the various procurement windows. In addition, the first round of the ESIPPPP only included optional economic development objectives.

As such, the design of the tender specifications has not enabled, in most cases, a ramp-up in supply chain inclusivity. The share of expenditure channelled to women-owned businesses has been pegged at 5% over the first four BWs, achieving 5% for construction and 6% for operations on average, compared to the target of 40% set by the Department of Women, Youth and Persons with Disabilities (DWYPD). Similarly, the share of local spend towards Black-owned firms has been fixed at 60%, reaching 85% for construction and 74% for operations on average.

The target for the local expenditure share to Exempt Micro Enterprises and Qualifying Small Enterprises has stood at 10% but achieving 31% for construction and 26% for operation over the first four BWs.

Overall, the integration of new entrants and emerging suppliers into the existing value chain still proves to be a challenge, with suppliers facing issues with access to capital, provision of guarantees and warrantees, and certification. The inclusion of certain groups is also not promoted. The DWYPD has for instance set targets for public procurement at 30% for youth-owned companies and 7% for firms owned by persons with disabilities.

The local equity shareholding across BW1 to BW4 equated to 51% (compared to a requirement of 40%) while Black shareholding reached 34% against a target of 30%. Community ownership has averaged 9% over the same procurement period (for a set target of 5%). For BW5 projects, South African entities hold 49% of shares, while 35% of shares are held by Black South Africans. Black shareholding in EPC contractors stood at 21%, in line with a 20% target. Besides the REIPPPP, little efforts have been made to promote local ownerships by workers and communities.

On the employment front, over BW1-4, Black South Africans took up 81% of opportunities (in percentage of job-years), local community members (50 km radius) 48%, youth 44%, women 10%, and persons with disabilities 0.4%. 68% of top management positions have been held by Black professionals, for a fixed target of 40%. By comparison, South Africa's empowerment strategy for women and persons with disabilities targets 50%, and 3% of total employment, respectively. However, little information currently exists on the nature of employment in the industrial value chain (i.e. outside of construction, installation and maintenance) and whether the sector actively promotes decent work opportunities.

In addition to these project- and procurement-level targets aimed at fostering inclusive development within the industry, renewable energy and storage projects and associated value chains have a role to play in supporting a just transition in South Africa. In the short term, this is particularly focused on the country's coalfields. As of March 2023, less than 2% of South Africa's renewable energy generation capacity was located in Mpumalanga. As coal-based activities phase down, an opportunity exists for renewable energy and storage value chains to contribute to the economic diversification and rejuvenation of the coalfields. Unlike other parts of the country, grid capacity is available and will be progressively released as coal-fired power plants close down, freeing space for renewable energy projects. Industrial opportunities could also be nurtured, notably in the vanadium-based battery value chain.

Action plan

In line with the above context, fostering the inclusive development of the industrial value chain requires a multi-pronged approach and intersects directly with the three other pillars of SAREM, particularly support mechanisms to widen access to renewable energy and storage technologies; skills development; and technology upgrading and commercialisation. In this section, the focus is on increasing transformation, strengthening the entry of new suppliers into the value chain and supporting the imperative of a just transition. Table 8 highlights the series of interventions under this pillar.

The first avenue to promote inclusive development in the renewable energy and storage sector is the establishment of clear transformation objectives. The definition and implementation of sector-specific B-BBEE scorecards for renewable energy and storage projects is a priority for SAREM.[49] As the B-BBEE scorecard is developed, particular attention will be paid to align with national strategies on the inclusion of women, youth and persons with disabilities. Furthermore, it is proposed that B-BBEE scoring becomes an entry requirement to take part in procurement processes, rather than part of the competitive adjudication process. To be effective, compulsory minimum thresholds, in line with current baselines, would be required. Complementarily, proposals to foster Environmental, Social, and Governance certification in the sector, to attract more and better funding, are aligned with SAREM's objectives and supported. This also reinforces the imperative of promoting decent work in new economic sectors.

The second avenue consists of facilitating the integration of new entrants into the various stages of the renewable energy and storage value chain. Existing SMME support programmes by the DSBD (such as the Small Enterprise Manufacturing Support managed by the Small Enterprise Finance Agency), the IDC (such as the Khoebo Innovation Promotion Programme, SME-Connect, the programme for SME and MIDCAP companies) and a few other

[49] Correspondingly, as introduced in Section 5 on industrial development, the development of a Sector Charter covering defined goals in terms of transformation for private sector projects is aligned with SAREM, and will be included should it gain traction at the level of industry associations.

institutions, as well as efforts by OEMs have made a positive contribution but remain insufficient.

A Transformation Fund, aimed at providing capital, but also support guarantees and warrantees (and possibly other support required by beneficiaries, such as skills development), for emerging suppliers into the sector will be established. It will aim to catalyse existing (and additional) funding streams in the sector. The possibility of granting additional benefits, such as recognised spend against targets or enhanced B-BBEE performance, to companies contributing to the Fund or contracting its beneficiaries will be explored during the design phase. This will be supported by an extended focus on supplier development, starting with the launch of the Strategic Partnership Programme (SPP) [50] by the SAEEC and the dtic with an initial 8 companies in the renewable energy and storage value chains. The SPP is a cost-sharing programme (up to 50:50 basis) of the dtic, aimed at incentivising large private-sector enterprises to support, nurture and develop the capacity of SMMEs within their supply chain. This is also complemented by the OEM-led cluster introduced in the next section.

The third avenue speaks to the necessary contribution of the renewable energy and storage sector to South Africa's just transition. This is made of two key areas, namely directing activities into just transition hotspots and fostering an inclusive renewable energy and battery storage industry.

In line with South Africa's Just Transition Framework,[51] renewable energy and storage activities can directly contribute to the economic diversification of the country's coalfields, along with making positive impacts on social progress and environmental sustainability.

Due to grid availability, renewable energy and storage will be increasingly located in the coalfields (as well as other regions with grid capacity). A consistent, sustained pipeline of projects would positively contribute to employment creation in the region and support associated industrial development ventures. Indeed, particular attention will be paid to developing industrial activities linked to the renewable energy and storage value chains in the region, by supporting industrial parks notably, as well as other Renewable Energy Development Zones (REDZs).[52] In this respect, the development of the vanadium-based battery value chain carries notable opportunities in the coalfields.

Then, major efforts are needed to foster a more inclusive renewable energy and storage value chain. To promote decent work in the value chain, a framework for monitoring and evaluating employment opportunities against clear guidelines will be established. This should include the development of a standardised approach (such as quantitative and qualitative metrics) for employment in the value chain.[53] This is critical to ensure that the bulk of employment opportunities created in the value chain offer uplifting remunerations and working conditions as well as inclusive workplaces. The provision of public support (through grants, loans, subsidies or guarantees) and the direct public procurement of renewable energy and battery storage systems should then be accompanied by strict compliance targets in terms of decent work. In addition, worker participation in company boards should be actively promoted.

Then, clear guidelines and best practice for ESOPs, which enable employees to own a share of the company they work for, will be developed, leveraging the experience in other industries. The rollout of ESOPs in the industry will then be piloted, with the aim of ascertaining the potential for upscaling. Recognising that the development of the renewable energy and battery storage industry as an opportunity to contribute towards addressing gender inequality and discrimination, and women's empowerment, a gender inclusivity action plan will be developed. The action plan will build on existing frameworks, such as the DMRE's Women Empowerment and Gender Equality Strategy for the Energy Sector and the Execution Plan for the Women's Economic Assembly Initiative (WECONA): Mainstreaming Electricity Value Chains in South Africa.

Importantly, investing in monitoring and data collection about women's participation, representation and benefits, including baseline studies, will be a foundational step towards implementation. Then, structuring elements should include dedicated interventions and commitments in terms of: Inclusive workplace policies and working conditions (equal pay policy, inclusive hiring practices, gender-sensitive employment benefits, punitive measures for sexual harassment and gender-based violence); employment (particularly at the senior and executive management levels); equal representation (at least) of women in renewable energy initiatives (such as the Transformation Fund, incubation and capacity building programmes, Yes4Youth and other internship/apprenticeship programmes); and support for networking and peer mentoring programmes. In addition, the possibility of introducing conditionalities for public support and public procurement linked to gender inclusivity will be actively explored.

[50] See **http://www.thedtic.gov.za** for more information on the programme.

[51] PCC, 2022. A Framework for a Just Transition in South Africa. Johannesburg: Presidential Climate Commission.

[52] A map of the 11 geographically defined REDZs can be accessed **here**.

[53] For an initial discussion on this, see Hermanus, 2022. *Employment metrics in South Africa's electricity value chains: Creating a basis for coherent discourse and decision-making*. Pretoria & Cape Town: Trade & Industrial Policy Strategies and World Wide Fund for Nature South Africa.

Table 8: SAREM interventions aimed at fostering inclusive development in the renewable energy and storage value chains

Implementation plan element	Category	Intervention	Timeframe	Mandate/ decision maker	Implementer
Establish clear transformation objectives	Catalytic intervention	Develop and implement B-BBEE sector specific scorecard for renewable energy and storage, in line with agreed SAREM targets.	6 months	IPPO, the dtic, DMRE	IPPO
	Alignment intervention	Align with the Execution Plan for the WECONA: Mainstreaming Electricity Value Chains in South Africa.	Ongoing	WECONA, DWYPD, Presidency	PMU
	Alignment intervention	Align with the DMRE's Women Empowerment and Gender Equality Strategy for the Energy Sector.	Ongoing	DMRE	PMU
Foster integration of emerging suppliers	Catalytic intervention	Develop, resource and establish Transformation Fund to support new entrants (e.g. competitive rates for factory investment capital as well as warrantees/guarantees).	1 year	DMRE/IPPO, IDC, private sector	Possibly IDC
	Supporting intervention	Launch and progressively expand the SPP for companies in the renewable energy and storage value chains. The SPP aims to incentivise large private-sector enterprises to develop the capacity of SMMEs within their supply chain.	By launch	the dtic	SAEEC
Direct renewable energy and storage activities to just transition hotspots	Catalytic intervention	Launch public procurement rounds for renewable energy and storage for Mpumalanga and other just transition hotspots (based on grid availability), leveraging REDZs.	By launch for first round	DMRE, NECOM	IPPO
	Supporting intervention	Strengthen industrial park(s) in hotspot areas, in alignment with existing REDZs (including a possible SEZ in the coalfields).	6 months (implementation plan)	the dtic	the dtic, provincial governments
Driving inclusivity in the value chain	Supporting intervention	Develop clear guidelines and best practice for ESOPs and pilot the rollout, with the aim of ascertaining the potential for upscaling.	1 year	Labour unions, Industry	Labour unions, Industry
	Supporting intervention	Develop a gender inclusivity action plan for the renewable energy and battery storage value chain.	1 year	Labour unions, DWYPD, Department of Employment and Labour, Industry	Labour unions, Industry
	Supporting intervention	Develop a framework for monitoring and evaluating decent work, and link public procurement and access to state support to specific decent work objectives.	1 year	Labour unions, DWYPD, Department of Employment and Labour, Industry	Labour unions, Industry

06

BUILDING CAPABILITIES

CAPABILITIES

Pursuing the inclusive, industrial development of the renewable energy and storage value chains, by leveraging rising demand, is underpinned by the availability of skills in the domestic economy.

In addition, adequate technology development systems, particularly to adopt and localise innovation, are paramount. The absence or lack of skills and technological awareness would stifle the growth of the value chains and the prospect of inclusive and industrial development.

Context

Companies in the value chain require a range of skills. White collar skills (e.g. project and business development managers) are mostly in demand during the early stages of projects, whilst highly skilled roles, like engineers and designers, are required across various parts of the value chain. Blue collar skills are predominantly located in the later part of the value chain from the EPC stage onwards and in the manufacturing stage. Skilled technicians, such as high voltage electricians, welders, solar PV installers, and wind turbine service technicians, are the most sought-after blue-collar skills.[54] New skills will also be required in the future in end-of-life management. In addition to these "technical" skills, the growth of the renewable energy and battery storage industries (and the broader transitions experienced by the energy sector) require a vast range of skills in governance, policy and planning, legislation and pricing, as well as customer engagement, education and awareness.[55]

The list of renewable energy-relevant qualifications cuts across institutions, fields of study and academic levels. As an illustration, Table 9 provides an overview of the number of people enrolled in selected technically-focused programmes relevant to the renewable energy and battery storage value chain. For instance, in 2021, almost 19 000 and 16 000 people were respectively registered for an 'electrical, electronics and communications engineering' tertiary qualification and a 'civil engineering' qualification at a public higher education institution. In addition, in 2021, about 18 000 people were enrolled for an 'engineering and related design' qualification at a Tertiary Vocational Educational Training (TVET) college while close to 17 000 people studied 'electrical infrastructure and construction' (National Certificate (Vocational) Levels 2-4). About 15 000 people were enrolled for a part-time 'engineering studies' qualification (N6 level) at a TVET college and about 3500 at a private college. Almost 300 people were registered for an EWSETA-supported learnership programme in 2021, and over 1 100 people for a skills programme while over 1 300 people got certificated across both programmes in the same year. Over 3 500 people were enrolled in a MERSETA-supported learnership programme and more than 2 700 people in a skills programme in 2021.

[54] GreenCape, 2022. *Assessment of local skills for the South African renewable energy value chain*. Pretoria and Cape Town: Department of Science and Innovation and GreenCape.

[55] African Energy Leadership Centre and Centre for Researching Education and Labour, 2023. *Energy Skills Roadmap South Africa 2023*, Johannesburg: South African National Energy Association.

Table 9: Number of people enrolled in selected education and training programmes relevant to the renewable energy and battery storage value chain in 2021

Type of institution	Qualification	Level	Number of people enrolled
Public HEIs	Electrical, electronics and communications engineering	Diploma, Bachelor, Honours, Master's or PhD	18 778 people
	Civil engineering		15 622 people
	Manufacturing, Engineering and Technology		330 people
TVET	Engineering and related design	National Certificate (Vocational) Levels 2-4	17 962 people
	Electrical infrastructure and construction		16 945 people
	Engineering Studies	N6 (part-time qualification)	15 065 people
Community education & training college	Technology	General Education and Training Certificate: Adult Basic Education and Training Level 4 qualification	633 people wrote
Private college	Manufacturing, engineering and technology	Occupational Qualifications	1 764 people
	Engineering Studies	N6 (part-time qualification)	3 455 people
SETA-supported programme	Electricity and water	Learnership	157 workers and 634 unemployed people
		Skills programme	1 074 workers and 77 unemployed people
		Internship	45 unemployed people
	Manufacturing, engineering and related services	Learnership	3 209 workers and 379 unemployed people
		Skills programme	2 344 workers and 379 unemployed people
		Internship	45 unemployed people
	Electrician	Artisanal learning programmes	3 016 people

Source: Montmasson-Clair, based on data extracted from DHET, 2023. Statistics on Post-School Education and Training in South Africa: 2021. Pretoria: Department of Higher Education and Training.

Close to 4 300 people received their certification in the same year. Also, more than 3 000 people entered an electrician artisanal learning programme in 2021/2022, including 35% of women while about 5 800 people completed the programme in the same year, 28% of whom were women. Overall, a total of 3 359 and 4 511 artisans obtained a national trade certificate through the support of the EWSETA and MERSETA respectively in 2021.

Completion rates remain, however, very low compared to the 75% target for higher education set in the National Development Plan. For National Certificate (Vocational) Level 4 qualifications in 'electrical infrastructure and construction' and 'engineering and related design', the throughput rate stood at 29% and 30% respectively in 2021.[56]

For N6 level in 'engineering studies', it reached 32% in TVETs and 38% in private colleges in 2021. The throughput rate for 'electrical, electronics and communications engineering' and 'civil engineering' was even lower, at 19% and 21% in 2021.

[56] The completion rate is here calculated by the ratio of the number of people who passed over the number of people registered.

Due to the nascent but fast-growing nature of the industry, the demand for skills in the sector will heavily depend on future developments. A demand-led skills approach is critical to ensure that the right skills, in volume and quality, are developed going forward. To date, companies in the renewable energy and storage value chains have faced a number of skills-related challenges. The lack of skills on the local market is a key constraint to the development of the industry. For instance, technical skills relating to the maintenance of inverters have been identified as a current skills gap. In addition, skills retention, particularly of young professionals, appears problematic. This is primarily a result of the mismatch between the limited supply and rising demand of skills in the industry. These challenges are compounded by the lack of inclusivity and integration of previously-disadvantaged individuals in the sector, particularly women.

A bidirectional misalignment also exists between occupational demand and education supply (particularly, but not limited to, the interplay between industry and academia), hindering ongoing efforts to improve the number and quality of graduates coming out of universities, TVET colleges and other education and training institutions.[57] As a result, the quality of graduates has not, on average, matched the expectation of industries. In turn, education and training institutions require greater industry guidance and support to craft relevant training and provide practical learning opportunities for students and graduates. This mismatch poses a challenge for the development of current as well as future skills.

In addition to skills development and retention, a dynamic, inclusive value chain depends on being technologically ready. The renewable energy and storage sector, like other "greentech", is rapidly evolving. South Africa does not have, on the whole, the capacity to compete with market leaders (namely China, the United States, Japan, South Korea and the EU) in research, development and innovation. Nevertheless, South Africa displays some pockets of excellence (e.g. in the battery value chains, inverters or transformers) which can be leveraged to facilitate local innovation, technology adoption (of both local and foreign origins), as well skills development.

Within the research, development and innovation value chain, technology commercialisation, i.e. the transition from research and development (R&D) to market readiness (and scale-up), remains the primary barrier in South Africa. Despite some existing support mechanisms, such as the Technology Innovation Agency's (TIA) pre-commercialisation and commercialisation programmes, the dtic's Support Programme for Industrial Innovation and the Khoebo Innovation Promotion Programme managed by the IDC, multiple incubation programmes and a number of private sector funders, overall market access remains highly insufficient. A "valley of death", fuelled notably by a lack of venture capital, hinders the innovation journey of local entrepreneurs. Within a context of low expenditure on R&D (0.6% of GDP in 2020/2021, against a target of 1.5%), and less than 3% of that going to energy supply issues, this materially weakens South Africa's technological readiness.[58] As such, South Africa's existing R&D investment, supported by a tax incentive for R&D expenditure,[59] needs to be enhanced in volume (to meet the stated target) and in nature, by interventions aimed at bridging the "valley of death". The rapid pace of technological evolution in the renewable energy and storage value chains requires countries that are not at the frontier (which is South Africa's case) to remain abreast of developments and nurture the capabilities necessary to rapidly adopt technologies as they emerge and mature. This is critical to ensure that local manufacturers are in a position to meet the requirements of OEMs and project developers.

Action plan

Unlocking the capabilities in the value chain is dependent on forming a coherent pathway for skills and technologies to reach the market. Importantly, this pathway and all associated interventions should be directly informed by the gender inclusivity action plan to be developed under the inclusive development agenda. Table 10 details the interventions under this pillar.

Mapping, building and activating skills in the first component of such a pipeline. It starts by understanding the needs through regular mapping of the skills (and their volume) required to grow the value chain. It is crucial to continuously update and deepen existing mappings[60] to inform the amendment of existing qualifications and training, and the development of new ones. In parallel, the rollout of a set of standardised trainings and qualifications, to ensure quality and provide clarity to the market, will be prioritised. Here, it is critical that the need for a multiskilled workforce is adequately internalised in the process. To ensure that skills development aligns with industry needs, a match-making platform, between skills development planners, education providers and firms in the value chain (as well as the broader ecosystem), called PowerUp, has been developed under the auspices of SAREM and will be further enhanced over time. PowerUp will also be a useful platform to improve the understanding of skills in short supply and interventions implemented by employers to upskill employees, by increasing the number of firms submitting their Workplace

[57] Such challenges extent beyond such institutions, starting from primary and secondary education. However, addressing broader issues within the South African education system is beyond the scope of SAREM.

[58] See Centre for Science, Technology and Innovation Indicators (CesTII), 2022. South African National Survey of Research and Experimental Development. Pretoria: Department of Science and Innovation, Human Sciences Research Council and Statistics South Africa.

[59] Section 11D of the Income Tax Act allows for a deduction equal to 150% of expenditure incurred directly for R&D as well as an accelerated depreciation deduction (that is, 50:30:20) for capital expenditure incurred on machinery or plant used for R&D.

[60] See notably GreenCape, 2022, and African Energy Leadership Centre and Centre for Researching Education and Labour, 2023.

Skills Plans and Annual Training Reports to SETAs.[61] Through InvestSA, such efforts should be extended to investors, to further the alignment between skills development and expected skills requirement.

In addition, a Post-School Education and Training (PSET) infrastructure capacitation programme will be established to enhance the accreditation of training providers in the renewable energy and battery storage sector. It will support education and training institutions, such as TVETs, in accessing the necessary equipment (software and hardware), human resources and industry exposure to be (and remain) accredited training providers. This could be complemented, under PowerUp, by an exchange programme between PSET institutions.

Taken together, these interventions will directly contribute to strengthening skills planning processes for the value chain and feed into existing processes, such as the Department of Higher Education and Training's (DHET) Skills Masterplan and the planning processes of the Quality Council for Trades and Occupations (QCTO) and the Council on Higher Education (CHE).

Then, to materially enhance the availability of work-based opportunities for new graduates and assist with the shift from 'learning to earning', SAREM targets the widespread participation of the renewable energy and storage value chain to the Youth Employment Service (Yes4Youth) programme as well as an overall increase in the number of places available in internships, learnerships, apprenticeships and skills programmes relevant to the renewable energy and battery storage value chain, such as those run or supported by Eskom, the South African Wind Energy Association or SETAs. It is the ambition of SAREM to consolidate, to the extent possible, the multiple *ad hoc* internship programmes in the sector through Yes4Youth.[62] Yes4Youth is a business-led collaboration with government aimed at providing jobs for young Black people (through 12-month quality work experience). Yes4Youth also enables any organisation to enhance its B-BBEE score (by one or two levels) by contributing towards reducing youth unemployment and building the skills necessary for the development of the value chain. In addition, dual-track apprenticeships, in which colleges and companies both train apprentices, would help to increase alignment of skills supply and demand, ensure the applicability of skills to industry's requirements, build job experience and enhance employee retention.

Complementarily, a clear pathway for Artisan Recognition of Prior Learning in the value chain will be developed by the industry, in collaboration with the public sector. The identification of existing unemployed graduates where minimal upskilling or on-the-job learning could result in meeting the qualification and competency requirements for different positions is here a priority. Over time, synergies with PowerUp, which has already facilitated the placement of graduates in the value chains, will also be explored.

The second component supporting the development of local capabilities focuses on fostering technology upgrading and commercialisation. An OEM-led cluster platform linking the different parts of the value chain (OEMs, Tier 1 and Tier 2 companies) will be established. The cluster will enhance transparent communication on OEM specifications/expectations as well as support the upgrading of local manufacturers' technical capabilities and quality standards. It will also foster the institutionalisation of processes through which technology absorption occurs and complementary local technical capacity is built. By assisting domestic manufacturers to access intellectual property (by enabling technology transfer through licence agreements for instance[63]), train internal resources (or secure external skilled resources), improve manufacturing excellence, and assist with the approval of new parts, the cluster will contribute to improving the competitiveness of domestic manufacturers and their ability of meeting OEM compulsory specifications.

Complementarily, a platform between innovators and possible users, inspired by the Trial Reservoir initiative in the water and sanitation sector,[64] will be established for renewable energy and storage value chains. It aims to accelerate the adoption of new technologies, through facilitated matchmaking, along with an innovative funding model for de-risking trials. This will be supplemented by a collaborative platform for technology users to review emerging (local and foreign) technologies in the sector and fast-track the development (and rollout) of innovation. Such Technology Approval Groups have been widely used in other sectors, including in South Africa (for water and sanitation).

In addition, public procurement, such as the REIPPPP, could be used as a vehicle for technology piloting and learning. It is recommended that public procurement programmes require successful projects to integrate, at the margin, the trial of new technologies into their design. More broadly, dedicated work is required to investigate how public sector procurement regulations (such as the Public Finance Management Act 1 of 1999 and Municipal Finance Management Act 56 of 2003), which currently do not support the deployment of innovative solutions across all economic sectors, could be harnessed to that effect.

[61] Employers have to pay 1% of their salary bill to SARS as a skills development levy. SARS then assigns the levy to the relevant SETA. Employers can claim back 20% of their total SETA contributions by submitting their Workplace Skills Plans and Annual Training Reports.

[62] Acknowledging the diversity of existing programmes in the sector, such as those run by South African Wind Energy Association, the National Business Initiative and individual companies, the consolidation of internship opportunities through Yes4Youth will be done in close partnership with current programme leads. Market needs may also require the persistence of separate, additional programmes.

[63] Acknowledging the challenges related to the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement, efforts to promote technology transfer should be complemented by a push for the expansion of TRIPS flexibilities for low- and middle-income countries in relation to climate-related goods and services.

[64] See **https://www.isleutilities.com** for further information.

Finally, a material increase in the incubation and capacity building support for innovators in the renewable energy and storage value chains is targeted through SAREM. This will notably include the reopening of the mothballed Manufacturing Technology Centre for renewable energy and storage technologies, located at the South African Renewable Energy Business Incubator (SAREBI). The centre is designed to provide factory space, machinery, tools and testing facilities for entrepreneurs in the value chains. In time, additional centres may also be required. The opening of a Solar Research Facility to enhance the integration of local innovations into existing value chains, supported by the DSI, is also targeted.

Table 10: SAREM interventions aimed at building capabilities in the renewable energy and storage value chains

Implementation plan element	Category	Intervention	Timeframe	Mandate/ decision maker	Implementer
Map and build skills	Catalytic Intervention	Develop and run a digital match-making platform (PowerUp) between industry, education providers and social compact partners, creating a demand-led skills and planning communication hub, to address skills priorities in the sector.	By launch	PowerUp Steering Committee	PowerUp Steering Committee
	Supporting intervention	Continuously update (every two years) and enhance the mapping of (technical and non-technical) skills required for the renewable energy and storage value chain.	Ongoing	DHET, DSI	DHET, DSI, QCTO, CHE, SETAs, PowerUp
	Supporting intervention	Based on mapping, develop and implement a set of standardised trainings and qualifications (made of new and amended trainings and qualifications), in line with agreed SAREM targets.	Ongoing	DHET, DSI	QCTO, CHE, SETAs, TVETs, Universities, SARETEC
	Supporting intervention	Establish a PSET infrastructure capacitation programme to enhance the accreditation of training providers.	1 year	DHET, DSI, SETAs	SETAs and industry
Activate skills	Catalytic Intervention	Consolidate and expand internship programmes/opportunities in the renewable energy and storage sector by participating in Yes4Youth, in line with agreed SAREM targets.	Ongoing	Industry	Yes4Youth, Harambee, industry
	Supporting intervention	Design and roll out a programme for Artisan Recognition of Prior Learning in the renewable energy and battery storage value chain.	1 year	Industry, SETAs	Industry, SETAs, Training institutions
Foster technology upgrading and commercial-isation	Catalytic Intervention	Establish an OEM-led cluster platform linking the different parts of the value chain (OEMs, Tier 1 and Tier 2 companies) to enhance transparent communication on OEM specifications/expectation and well as support the upgrading of local manufacturers' technical capabilities and quality standards (including technology transfer).	1 year	the dtic, OEMs	the dtic, OEMs
	Catalytic Intervention	Establish a match-making platform between innovators and possible users to accelerate the adoption of new renewable and energy and storage technologies, along with innovative funding model for running costs of trials.	1 year	SANEDI, TIA	SANEDI, TIA, Isle

Table 10: SAREM interventions aimed at building capabilities in the renewable energy and storage value chains continued...

Implementation plan element	Category	Intervention	Timeframe	Mandate/ decision maker	Implementer
Foster technology upgrading and commercial-isation	Supporting intervention	Establish a collaborative platform for technology users to review emerging renewable energy and storage technologies.	1 year	SANEDI, TIA	SANEDI, TIA, CSIR, Isle
	Supporting intervention	Scale up business incubation and capacity building support to emerging suppliers, in line with agreed SAREM targets.	Ongoing	DSBD/seda, private sector	SAREBI
	Supporting intervention	Re-establish a Manufacturing Technology Centre for renewable energy and storage technologies.	1 year	DSBD/seda, private sector	SAREBI
	Supporting intervention	Set up Solar Research Facility to support the integration of local innovations into existing value chain.	1 year	DSI	CSIR, industry

07

SUPPORT FOR THE SOUTH AFRICAN RENEWABLE ENERGY MASTERPLAN

ENDORSEMENT

SAREM, like all masterplans developed under the leadership of the South African government, is a social compact between government, business and labour unions.

SAREM is an action-oriented plan that focuses on leveraging investment in the renewable energy and storage value chain to deliver industrial development and decent jobs while supporting inclusive development.

Its development followed an extensive process, rich in engagements and inputs (see Annexure A for more details on the process). It reflects the diversity and complexity of the sector, while channelling resources to bolster the inclusive, industrial development of the value chains in the country.

Operationally, the implementation of SAREM will be supported by a PMU, to be established by the launch, and a series of multi-stakeholder task teams (at first mirroring the four key workstreams identified in the drafting process), but its success depends on the active support of all social partners.

The following parties express support for the Masterplan and commit to working with all social partners towards its outcomes:

Name and institution	On behalf of	Signature

ANNEXURE A:

ANNEXURE A: OVERVIEW OF THE SAREM PROCESS

The development of SAREM was initiated in late 2020 under the leadership of the DMRE and the dtic.

The development of SAREM was initiated in late 2020 under the leadership of the DMRE and the dtic. The process has been overseen by an Executive Oversight Committee (EOC), chaired by the Minister of Mineral Resources and Energy, and comprising selected senior government officials, the IPPO, industry representatives from both the supply and demand side of the sector, labour and civil society representatives, and the project team.

In addition, a Steering Committee, composed of representatives of the relevant renewable energy and storage industry associations, government departments, labour unions and academia, has provided guidance to the project team on a monthly (and at times fortnightly) basis.

The development of SAREM was structured around two phases. The first phase focused on setting up institutional arrangements for SAREM, building the evidence base, mobilising stakeholders and identifying key areas of work for the plan. It culminated with the publication of the first draft document in March 2022. The document provided a thorough understanding of global and local renewable energy and battery storage value chains, the industry's contribution to employment and investment, challenges and opportunities, and recommended policy interventions.

In addition to extensive research, the first phase was informed by four consultation channels:

– An Industry Working Group, made up of representatives from various stakeholder groups, was convened on regular intervals to strategically guide the process;

- Industry Reference Groups, composed of selected industry experts, were convened on an ad hoc basis to provide guidance on specific issues (such as macroeconomic dynamics or global supply chains);

- Task Teams, mirroring each of the nine workstreams identified in the first phase, and consisting of selected representatives from social partners as well as experts, informed the development of policy interventions; and

- Bilateral engagement with stakeholders and key informants on specific issues, as required.

Following the completion of the draft document in March 2022, a stress testing exercise was conducted in October-November 2022. Based on a desktop review of SAREM documents and a series of interviews with selected stakeholders, the stress test provided the platform for a successful finalisation of the process, surfacing points of agreement and contention as well as areas for further work. A facilitator was subsequently appointed in December 2022 by the EOC.

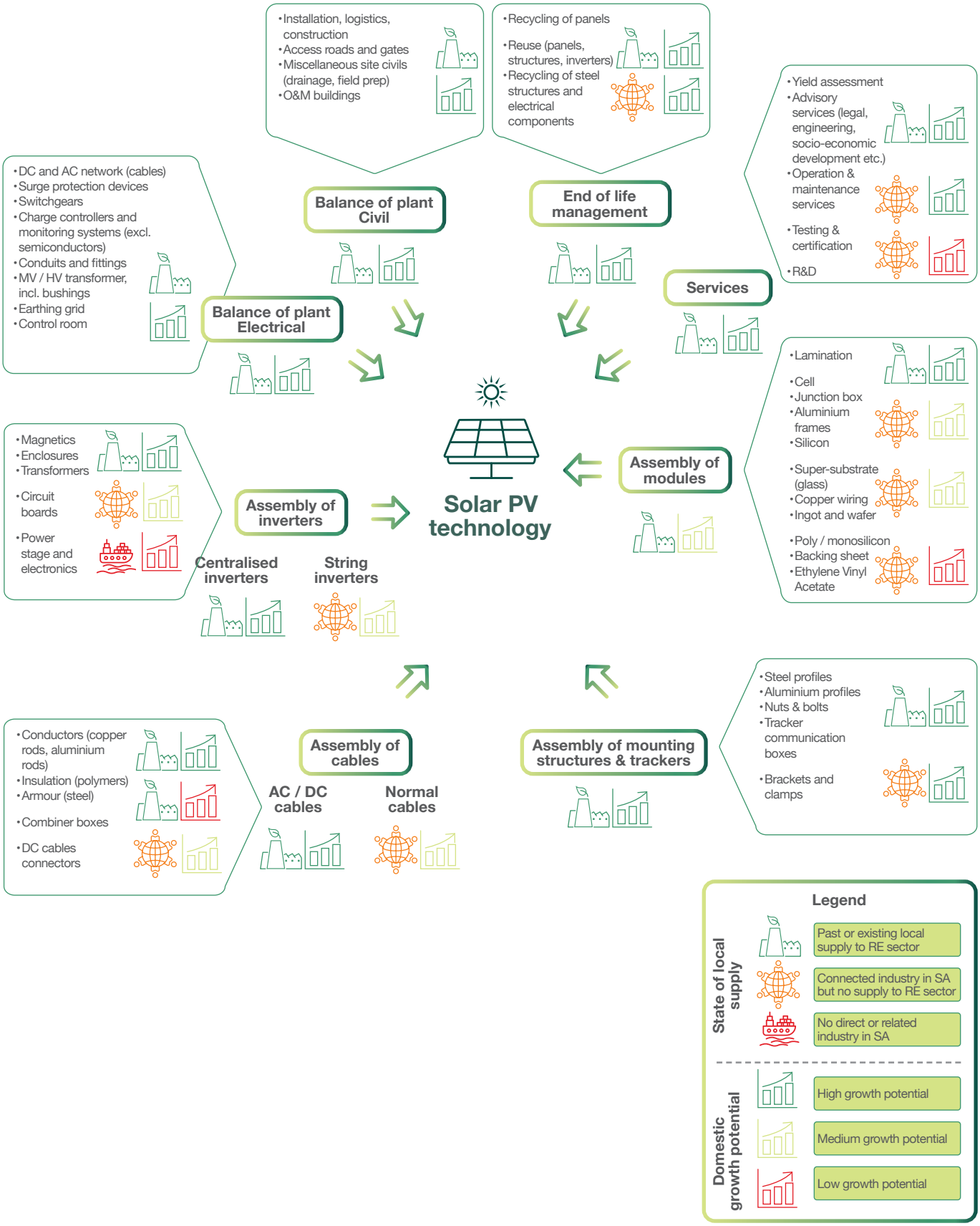
Leveraging the 2022 draft document, the stress testing exercise, further research as well as extensive bilateral and stakeholder-specific engagements (over 200 engagements across manufacturers, service providers, project developers, IPPs, financiers, business associations, labour unions and federations, national, provincial and local government, state-owned enterprises, SEZs, education and training providers, and researchers), a new draft SAREM document was produced in May 2023.

This new draft was subject to further review and engagement in a staggered fashion, first through the SAREM Project Steering Committee, then through four consolidated Task Teams (mirroring the four key pillars of SAREM, but encompassing the nine task teams established in the first phase), and finally through broader stakeholder-specific and public engagement. A public comment process took place in July-August 2023, leading to over 80 submissions. Two public webinars as well as in-person consultations in Mpumalanga, the Eastern Cape and the Northern Cape took place in August and September 2023. In parallel, a facilitated process was hosted for social partners to negotiate and set the masterplan targets. Mandated senior representatives from five key constituencies, namely government, labour unions, manufacturers, IPPs/developers and offtakers, took part in the process.

On completion of the public review and target setting processes, SAREM was presented at the EOC and finalised for endorsement and signature by social partners. A PMU, in charge of the managing, monitoring, evaluating the implementation of SAREM, will be established by the launch.

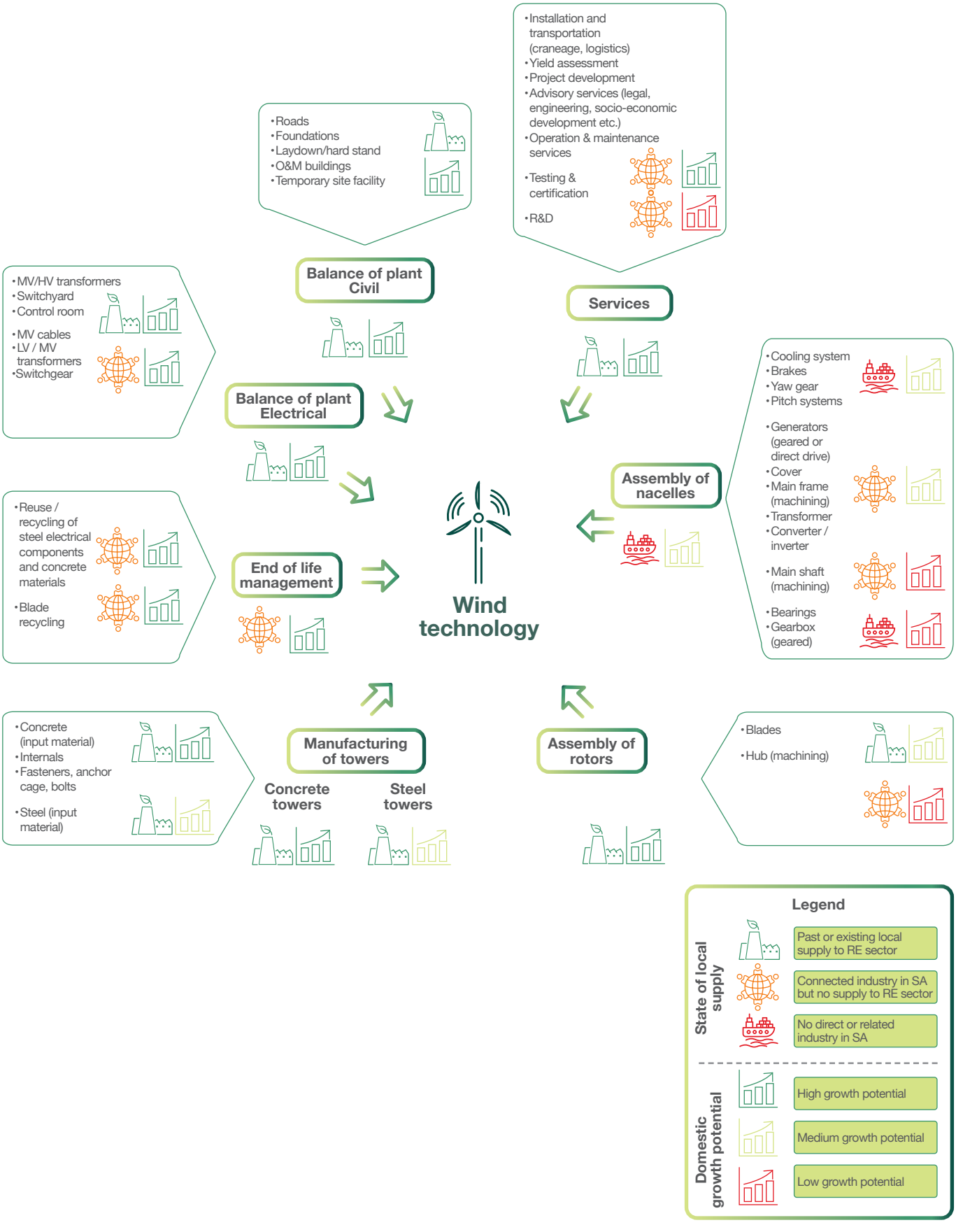
B ANNEXURE B:

Mapping of localisation opportunities in renewable energy and battery storage



ANNEXURE B:

Mapping of localisation opportunities in renewable energy and battery storage



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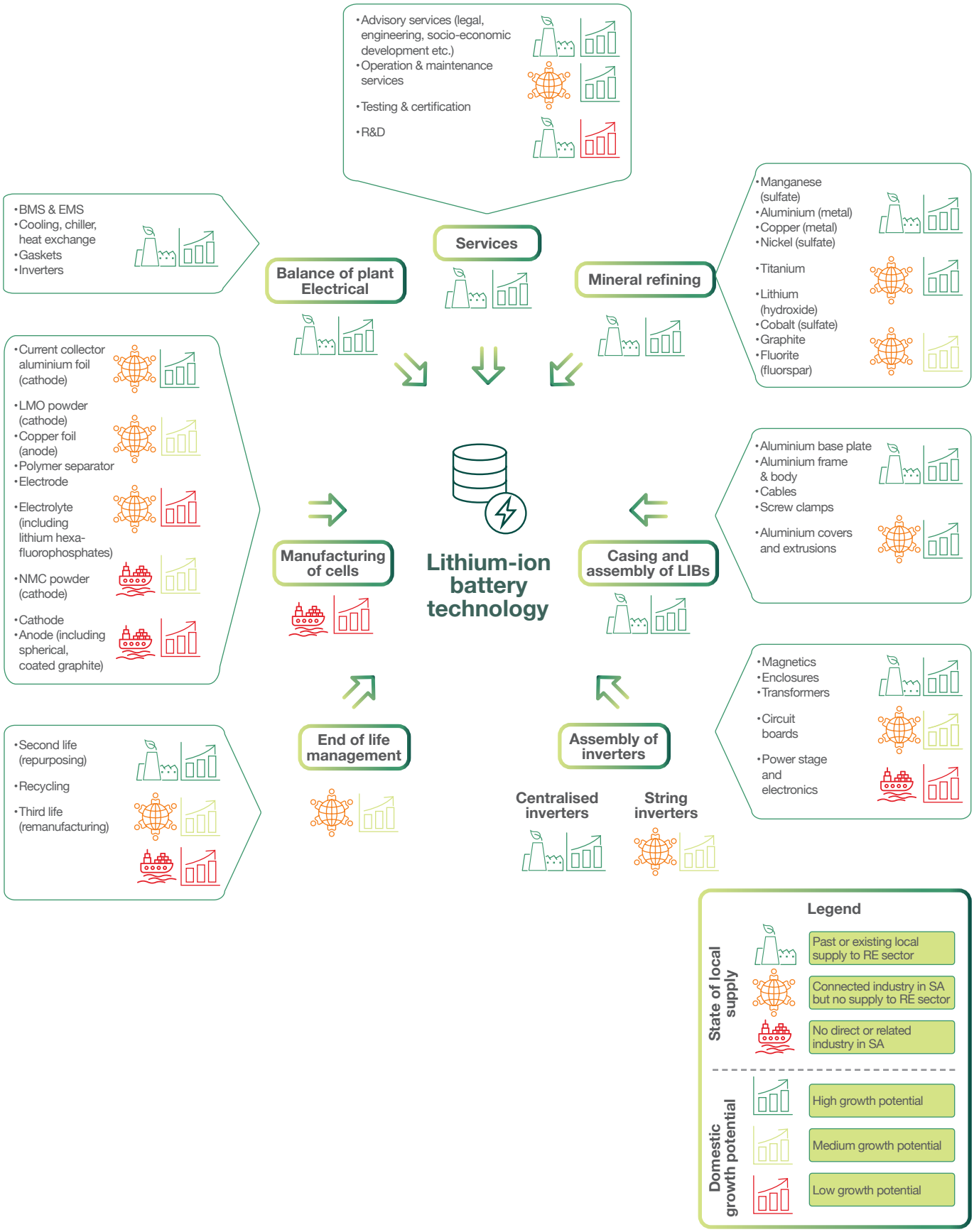

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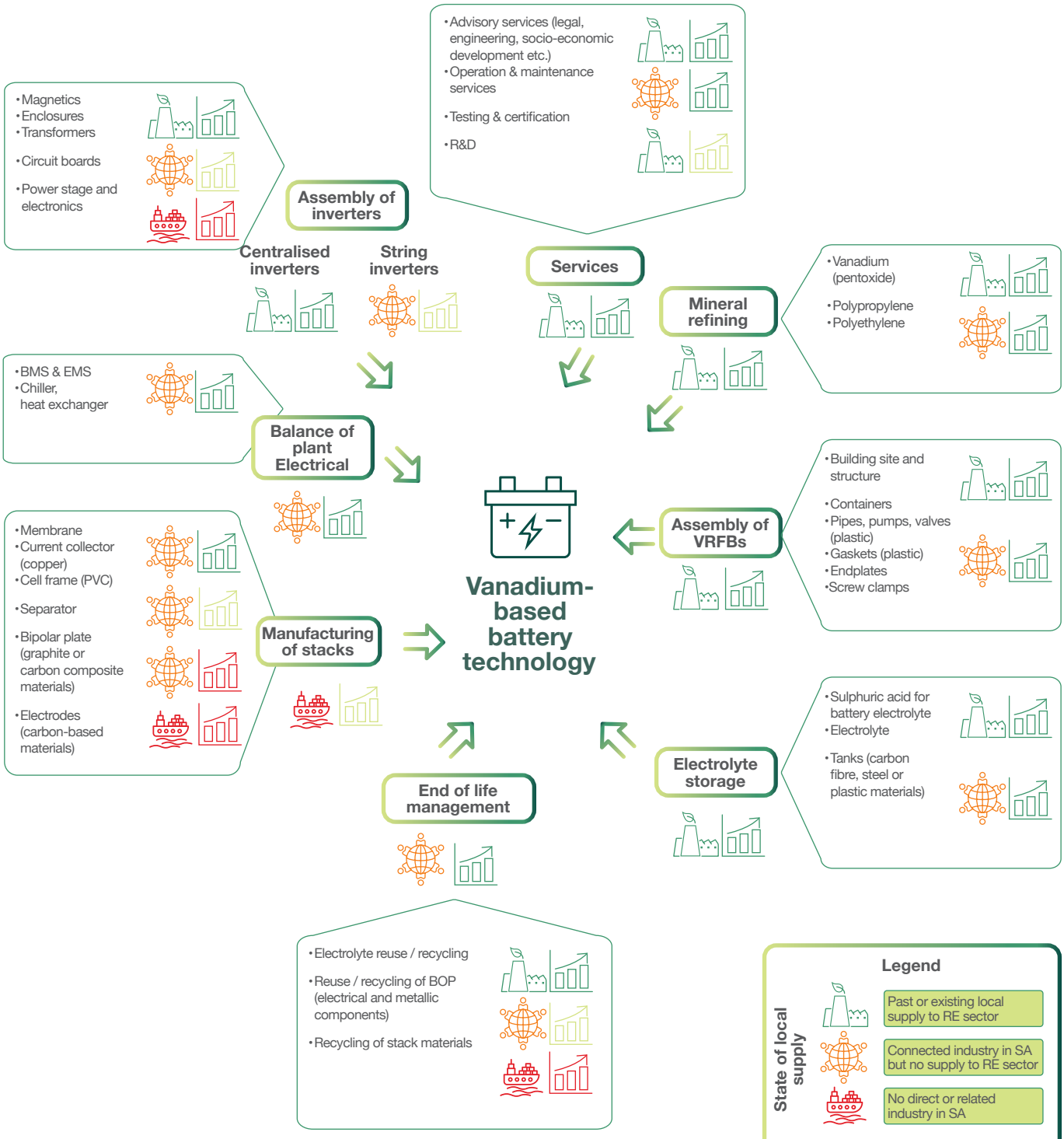

Source: Montmasson-Clair, based on various inputs, including the Draft SAREM document of March 2022, Urban-Econ et al. 2023, Rivett-Carnac, 2022a & 2022b, Montmasson-Clair et al., 2021, Moshikaro, 2023, Barnes et al. 2023 and key informant interviews

mineral resources & energy
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