Green Manufacturing Sector Report

March 2026

Wind Turbines, Cape Overberg

Western Cape Government
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Contents

1 Executive Summary

The Western Cape has firmly established itself as South Africa's leading green manufacturing hub, underpinned by strong institutional capacity, advanced infrastructure, abundant renewable resources and a mature ecosystem of investors, developers and innovators. As global momentum toward decarbonisation accelerates, the province is uniquely positioned to capture a growing share of investment across renewable energy, battery storage, green hydrogen and water infrastructure, while serving as a strategic gateway into African markets.

Globally, the green economy is expanding rapidly and is projected to exceed USD7 trillion annually by 2030, driven by large-scale investment in clean energy, electrification and sustainable industrial processes. Key sectors such as solar photovoltaic (PV), wind energy and battery storage have experienced dramatic cost reductions and deployment growth, reinforcing their central role in the energy transition (International Renewable Energy Agency, 2025). However, scaling these technologies requires coordinated policy frameworks, infrastructure investment and supply chain development. Within this context, Africa has emerged as a high-growth but undercapitalised market, where rising energy demand, urbanisation and climate pressures are translating into significant long-term investment opportunities.

South Africa's energy transition is gaining traction, supported by policy frameworks such as the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) and the South African Renewable Energy Masterplan (SAREM). These initiatives have mobilised over ZAR200 billion in private investment and established a foundation for localisation and industrial development (Department of Energy and Electricity, 2025). Despite this progress, substantial gaps remain across key manufacturing value chains, particularly in high-value components such as solar cells, wind turbine systems and battery cell production. This presents a dual challenge and opportunity: to deepen localisation while integrating into global supply chains through targeted investment, policy support and technology transfer.

Battery storage and green hydrogen represent critical next frontiers. South Africa's mineral endowment, particularly in platinum group metals, provides a structural advantage in emerging hydrogen technologies, while growing demand for energy storage is driving new opportunities in battery module assembly, system integration and recycling (Localisation Support Fund, 2022). However, large-scale industrialisation in these sectors remains constrained by limited domestic demand, infrastructure bottlenecks and concentrated global intellectual property. Unlocking these industries will require coordinated efforts to build market scale, strengthen skills and attract international partnerships.

Water security is an increasingly important dimension of the green economy, with desalination emerging as a strategic solution to climate-induced water stress. While global desalination markets are expanding steadily, adoption in sub-Saharan Africa remains limited due to high capital costs and energy requirements. In the Western Cape, significant investment is being directed toward diversified water supply systems, including large-scale desalination projects, positioning the province to enhance resilience while creating new infrastructure and technology opportunities (Western Cape Government, 2023).

At a provincial level, the Western Cape is translating these global and national dynamics into a compelling investment case. The province has already secured substantial renewable energy investment and is expected to significantly expand generation capacity, potentially becoming a net exporter of clean electricity. Key opportunity areas include embedded solar for commercial and industrial users, large-scale renewable energy projects and behind-the-meter battery storage. In parallel, green hydrogen development anchored around export corridors such as Saldanha Bay presents a transformative long-term growth pathway, with significant potential for GDP contribution, job creation and export revenues.

Strategic infrastructure assets such as the Atlantis Special Economic Zone (SEZ) and major port facilities further strengthen the province's competitiveness by enabling localisation, export-led manufacturing and integration into global value chains. However, critical constraints remain, particularly grid capacity limitations, regulatory complexity and the need for enhanced project preparation capabilities. Addressing these challenges will be essential to unlocking the full potential of the green economy in the region.

In conclusion, the transition to a low-carbon economy represents a defining structural shift in global markets, and the Western Cape is well positioned to lead this transformation within South Africa and across the African continent. With a strong pipeline of opportunities, a supportive policy environment and a growing base of capabilities, the province offers a credible and scalable platform for investment. The opportunity now lies in accelerating implementation, deepening localisation and building resilient, future-focused industries that can anchor long-term economic growth.

Saldanha Special Economic Zone, Cape West Coast

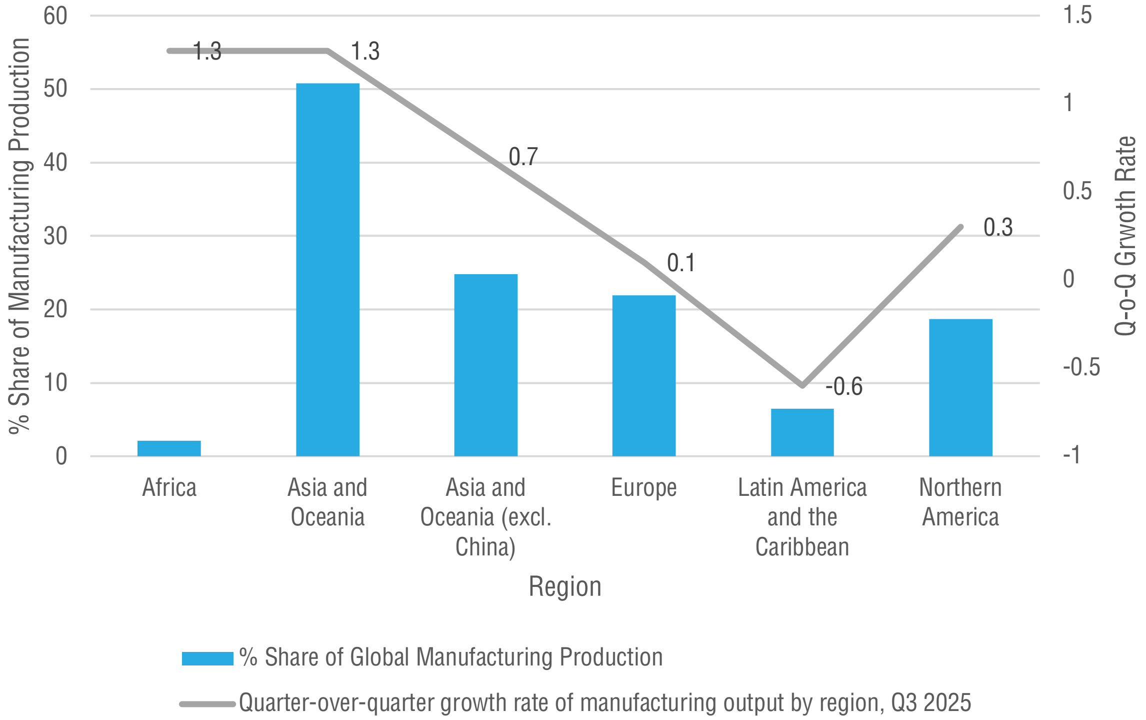
2 Outlook

This section of the report focuses on manufacturing opportunities in the global green economy. The document positions the Western Cape within this fast-growing sector and the province's response to the need for sustainability and reductions in emissions. The focus is on global trends and African trends, as well as the South African and Western Cape context, in key thematic segments: renewable energy generation, water desalination and battery storage. The report highlights the current and projected scale of each segment and the predisposition for future investment. This macro-framing underlines the more detailed, sector-specific analysis that follows in the report.

2.1 Global Trends

Global manufacturing continued its steady recovery in Q3 2025, with production rising by 0.7% quarter-on-quarter and exports climbing 1.7%, according to the United Nations Industrial Development Organisation (UNIDO) World Manufacturing Production and Trade report. High-technology goods led this expansion, recording a 1.4% increase in production and a 2.5% rise in exports. This highlighted the growing importance of advanced manufacturing sectors in driving global trade. Regionally, Africa demonstrated the strongest manufacturing growth, followed by Asia and Oceania, while Latin America and the Caribbean experienced declines in production and exports. This is shown in Figure 1 (United Nations Industrial Development Organisation, 2025). The growth in manufacturing can be attributed to the rate of industrialisation in emerging markets and the need for increased investments in infrastructure and a consumer base.

Figure 1: Q3 2025 global manufacturing production



Source: United Nations Industrial Development Organisation, 2025

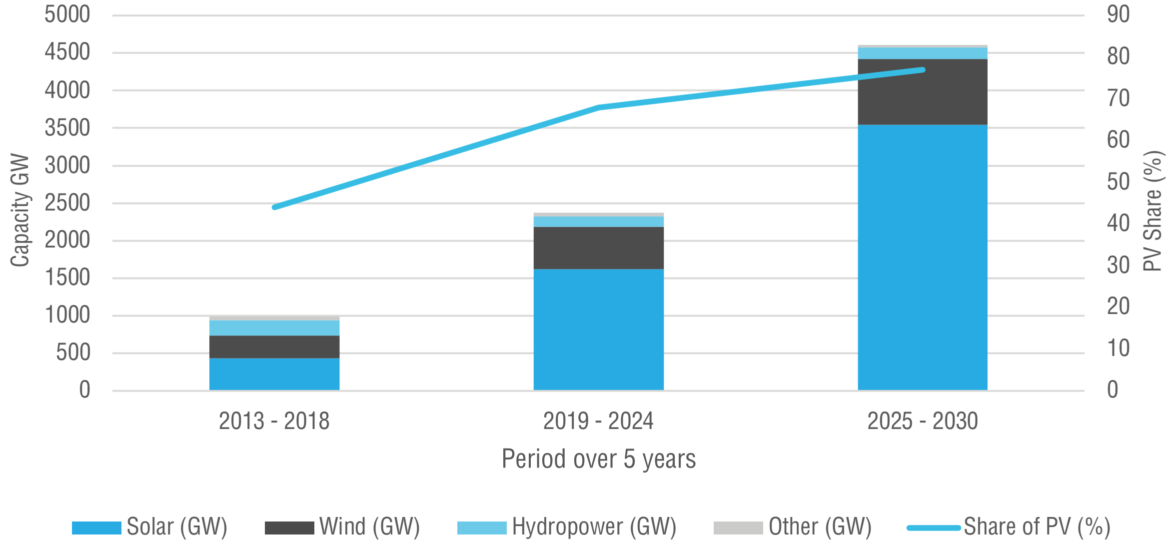
Reading this data in conjunction with the current global growth of investments in the green economy, it is evident that manufacturing output, in adjusting to the green transition, will increase. The global green economy is on a rapid expansion path, with recent analyses projecting that its value will surpass USD7 trillion annually by 2030. This growth is driven by accelerated investments in renewable energy, electric mobility, energy efficiency and sustainable industrial processes. Nonetheless, in order for scale to be achieved, there is an implicit need for policy clarity and coordinated investment frameworks which will accelerate the adoption of sustainable technologies and drive systemic change in industrial and service sectors (Boston Consulting Group, 2025).

Locally, the South African Renewable Energy Masterplan (SAREM) provides a structured blueprint for leveraging localisation opportunities. SAREM identifies pathways for scaling renewable energy deployment, optimising investment and creating jobs while addressing policy and infrastructural barriers. By aligning with the national Integrated Resource Plan, SAREM aims to maximise the industrialisation potential of renewables, promote sector inclusivity and provide certainty for emerging energy entrepreneurs, positioning South Africa to benefit from the projected global green economy growth (GreenCape, 2020).

2.1.1 Solar PV Market

Global solar PV capacity exceeded 2.2 terawatt (TW) by the end of 2024, up from 1.6 TW in 2023, as shown in Figure 2. This reflects a more than doubling of renewable energy installations, which totalled over 600 gigawatt (GW) in new installations. Falling module prices, driven by persistent oversupply, created financial pressures for manufacturers but simultaneously stimulated market growth. China dominated the market, installing 357.3 GW and reaching over 1 TW cumulative capacity, representing nearly half of global PV capacity. Outside China, global installations totalled 244.6 GW, with strong growth in Europe (led by Germany and Spain), the Americas (USA and Brazil), India and Pakistan, while markets like Australia and Japan slowed (International Energy Agency, 2025).

Figure 2: Renewable energy: installed capacity (GW), 2013 - 2030



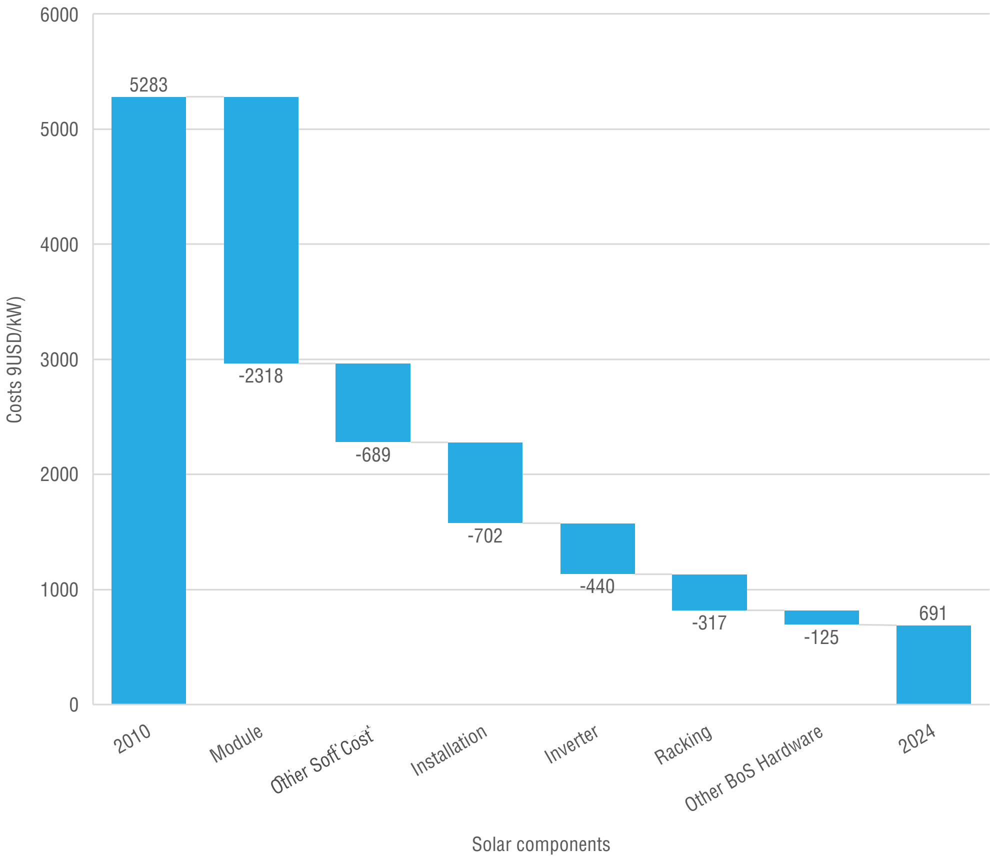
Source: International Energy Agency, 2025

PV generation reached over 10% of global electricity consumption for the first time in 2024, with more than 25 countries now generating at least 10% of their electricity from solar. High penetration rates are driving curtailment in some regions, increasing the need for grid flexibility, storage, interconnections, and hybrid system solutions to maintain profitability and optimise peak capacity utilisation. Market growth continues to depend on regulatory support, electricity prices and grid access costs.

PV accounted for over 75% of new renewable capacity in 2024, contributing nearly 60% of new renewable generation and playing a major role in reducing emissions. Oversupply issues, largely driven by Chinese manufacturing, kept module prices at record lows and highlighted challenges in aligning production with demand. Some countries responded with import tariffs to protect local manufacturing, but uneven policy support and persistent global overcapacity constrained the growth of domestic PV production in several markets (International Energy Agency, 2025).

Between 2010 and 2024, the global weighted average levelized cost of electricity (LCOE) for utility-scale solar PV fell dramatically by 90%, though 2024 saw a slight 0.6% year-on-year increase reflecting changing financial conditions. Over the same period, the total installed cost of new utility-scale PV projects dropped by 87%, while the capacity factor rose from 15% to 17.4%, driven by improved inverter load ratios, over-panelling, higher market irradiance, and wider adoption of trackers and bifacial technologies.

Figure 3: Total installed costs for utility-scale solar PV systems (USD/kW)



Source: International Renewable Energy Agency, 2025

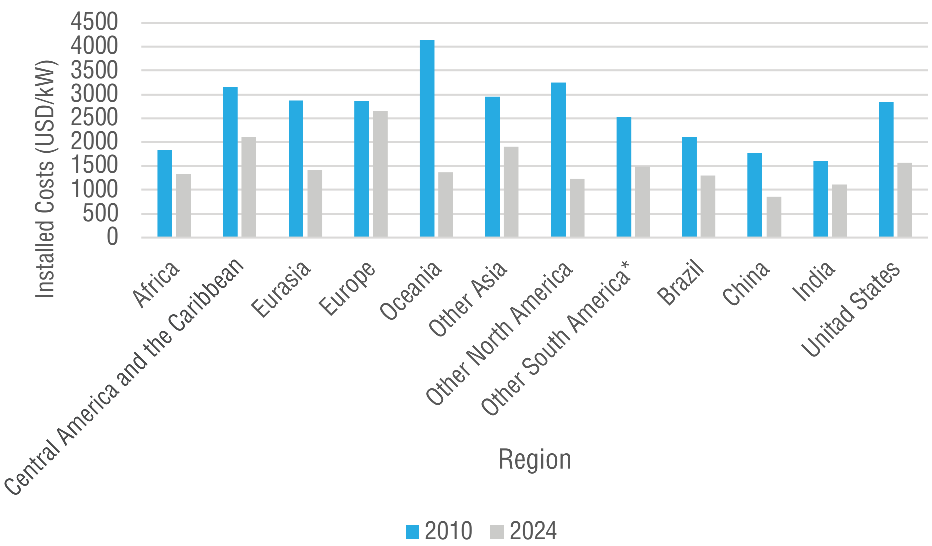
Crystalline silicon module costs have declined by 97% since 2010, while balance-of-system (BoS) costs now account for roughly 65% of total installed costs. A growing trend is the integration of battery storage with utility-scale PV, creating hybrid systems that enhance grid reliability and flexibility. Together, these trends underscore the ongoing cost competitiveness of solar PV and its increasing role in global decarbonisation strategies. Figure 3 denotes the cost composition of crystalline silicon modules and their respective changes to date (International Renewable Energy Agency, 2025). As the demand for renewable energy increases, BoS costs should decrease in markets with increased knowledge transfer systems and innovation development ecosystems that can assure competitiveness. A comparison relating to the composition of the various types of solar modules is tabulated in Annexure A, Table 4.

2.1.2 Onshore Wind Energy Market

Similar to solar PV, and during the same period of 2010 to 2024, the global weighted average LCOE for onshore wind fell by 70%, though 2024 also saw a 3% year-on-year increase due to rising financing costs and lower capacity factors in some key markets. During this period, cumulative onshore wind capacity grew by more than fivefold, reaching 1,049 GW, while the average total installed cost declined by 55% across various markets (see Figure 4), with China maintaining costs below USD1,000/kW. Technological improvements raised the capacity factors for new projects from 27% in 2010 to 34% in 2024, reflecting enhanced turbine design, higher hub heights and improved site selection (International Renewable Energy Agency, 2025).

Wind turbine pricing remained relatively stable in 2024 amid supply chain bottlenecks and geopolitical uncertainties. Chinese original equipment manufacturers (OEMs) dominated the market, accounting for 82% of all orders and nearly 100% of domestic demand while European manufacturers retained strong positions internationally. The integration of hybrid systems and green hydrogen production is expanding the value proposition of onshore wind by enabling more flexible and dispatchable energy solutions. However, grid constraints remain a key challenge for scaling deployment, highlighting the need for infrastructure and policy support to fully realise onshore wind's potential in global decarbonisation strategies (International Renewable Energy Agency, 2025).

Figure 4: Total installed costs (USD/kW)



Source: International Renewable Energy Agency, 2025
* excluding Central America and the Caribbean

Looking at Figure 2, it is evident that growth in wind energy is expected to increase. Despite ongoing supply chain constraints, cost pressures and permitting delays, global wind capacity is projected to nearly double to over 2,000 GW by 2030, driven by continued expansion across both advanced and emerging economies. Approximately 85% of new capacity additions are expected to come from onshore wind, increasing capacity by more than 730 GW through 2030, while offshore wind is projected to add a further 140 GW. Accelerating offshore wind deployment will depend on improved auction design, cost reductions and supportive policy frameworks, given the heightened sensitivity to macroeconomic and supply chain conditions (International Energy Agency, 2025).

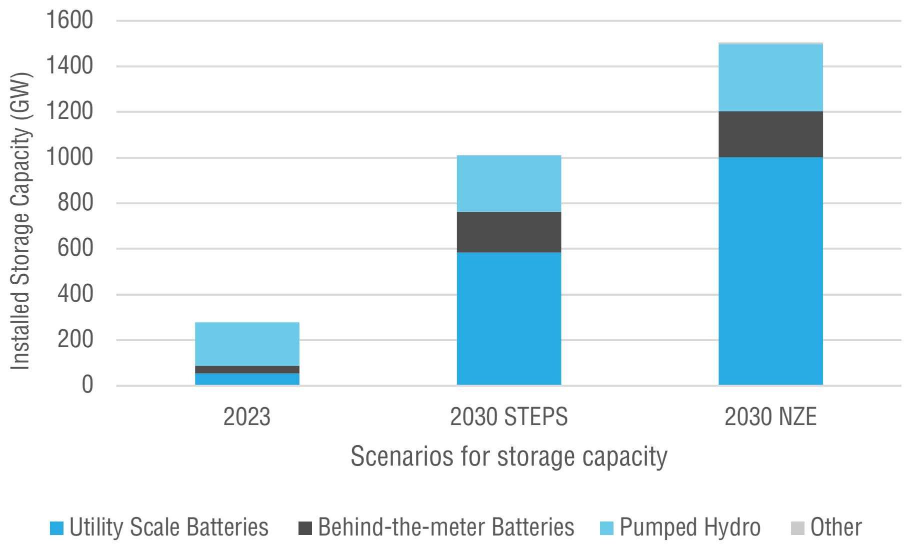
Wind generation rose by 10% in 2023 to more than 2,330 TWh, marking the second-highest growth among renewables after solar PV. However, achieving net-zero emissions by 2050 will require generation to reach roughly 7,100 TWh by 2030, necessitating a significant acceleration in annual capacity additions from 115 GW in 2023 to approximately 340 GW by 2030. While manufacturing capacity and investment are expanding, with USD180 billion invested in 2023 and production capabilities increasing across major components, current trajectories remain insufficient to meet projected demand under net-zero pathways. Coordinated government action, streamlined permitting and scaled private-sector investment will be critical to closing this gap and sustaining long-term growth (International Energy Agency, 2025).

2.1.3 Battery Storage

During the same period 2010–2024, the cost of battery storage projects fell by 93%, driven by advances in battery chemistry, improved material efficiency, manufacturing scale and stronger market competition. During this time, annual global capacity additions surged from just 0.1 GWh to 169 GWh, reflecting the rapid mainstreaming of battery energy storage systems (BESS) for the net-zero emissions scenarios. This can be seen in Figure 5. China led global deployment in 2024 with 84 GWh of new installations, which accounted for half of total additions, followed by the United States with 41 GWh, representing nearly a quarter of new capacity (International Renewable Energy Agency, 2025).

Energy shifting remains the dominant application, comprising 68% of newly added capacity in 2024, as storage systems absorb excess renewable generation during periods of low demand or low prices and release it when needed. The integration of storage with renewable energy projects has accelerated, enhancing grid flexibility and reliability. In hybrid wind and solar projects, increasing the storage-to-generation ratio can improve capacity factors, although these performance gains must be weighed against higher upfront investment costs (International Renewable Energy Agency, 2025)

Figure 5: Global installed energy storage capacity by scenario, 2023 and 2030



Source: International Energy Agency, 2024

By storing excess renewable generation during periods of low demand or low prices and dispatching it during peak periods, energy shifting improves system efficiency and reduces curtailment. Falling BESS costs have strengthened the economic case for time-shifting, particularly in markets with high solar PV penetration. In 2024 alone, nearly 47 GW of BESS capacity was added for energy shifting, representing almost 70% of new storage deployments, with China and the United States leading growth through large-scale renewable projects paired with storage (International Renewable Energy Agency, 2025).

Hybrid power plants, which combine multiple renewable technologies and/or integrate storage systems, are playing an increasingly important role in enhancing grid reliability and performance. By leveraging complementary generation profiles and embedding battery storage, hybrid systems better align supply with demand, mitigate intermittency and oversupply, and optimise limited grid connection capacity. While residential and ancillary service applications continue to contribute to overall deployment, utility-scale hybrid configurations are becoming central to grid stability and the efficient integration of renewable energy sources (International Renewable Energy Agency, 2025).

In net-zero aligned scenarios, demand for critical minerals used in electric vehicles (EVs) and battery storage increases dramatically. On the net-zero emission pathway, total mineral demand for clean energy technologies grows by roughly six times by 2040, with EVs and battery storage accounting for the largest share of this increase. For battery-related minerals specifically, demand growth is far more pronounced: lithium demand rises by more than 40 times by 2040 in the Sustainable Development Scenario, while graphite, cobalt and nickel increase by approximately 20 to 25 times, reflecting their central role in lithium-ion battery chemistries (International Energy Agency, 2021).

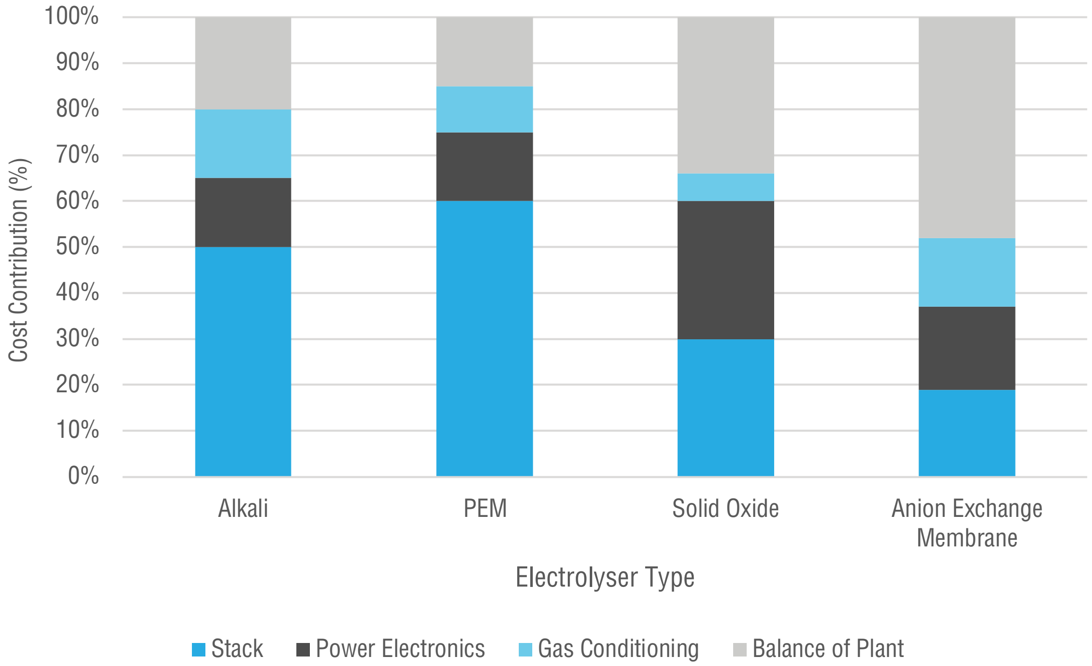
Graphite demand is projected to rise from around 2.7 million tonnes in 2025 to 6.7 million tonnes by 2050 under long-term transition scenarios, driven by its use as the primary anode material in lithium-ion batteries. BloombergNEF (2025) projects a potential technical deficit emerging in the early 2030s as secondary supply from recycled batteries struggles to keep pace with demand growth. Lithium supply, by contrast, is expanding significantly, with total capacity potentially reaching 4.4 million tonnes of lithium carbonate equivalent by 2035 – up from roughly 1.5 million tonnes in 2025 – and supported by new extraction technologies, expanded output in South America and Africa, and growing recycling volumes after 2035.

For manganese and cobalt, supply dynamics differ. Manganese remains predominantly tied to steel production, which accounts for about 97% of demand, and global supply is expected to broadly align with demand through 2050. However, logistics constraints in key producers like South Africa and export policy shifts in Gabon may introduce near-term volatility. Cobalt markets, meanwhile, have experienced price instability due to oversupply and subsequent policy intervention. Export restrictions and quotas introduced by the Democratic Republic of Congo, the world's largest cobalt producer, have tightened the market and supported price recovery following a sharp decline from 2022 highs. Together, these trends underscore both the scale of mineral demand growth under energy transition pathways and the importance of diversified supply chains, recycling and policy stability in managing future market risks.

2.1.4 Green Hydrogen – Electrolysis

As with BESS, proton-exchange membrane (PEM) electrolysers are highly material-intensive technologies, with component costs largely driven by critical raw minerals. While capital costs remain substantial, the greatest opportunities for cost reduction lie in operational efficiency, system optimisation and manufacturing innovation (The Oxford Institute for Energy Studies, 2022). Competitiveness in electrolyser production will therefore depend on consolidating raw material supply chains and improving efficiency and hydrogen output per kilowatt. Key cost components include stacks, power electronics, gas conditioning and balance of plant (BoP). In both PEM and alkaline electrolysers, stacks are the dominant cost driver, accounting for roughly 82% of total system costs in PEM and 72% in alkaline systems due to their reliance on platinum group metals (PGMs), as illustrated in Figure 6. Power electronics and gas conditioning contribute a smaller share and benefit from economies of scale, while BoP costs are typically higher for emerging technologies such as solid oxide and anion exchange membrane systems due to their research-intensive nature (The Oxford Institute for Energy Studies, 2022).

Figure 6: Cost determinants for types electrolysers for a 1MW facility

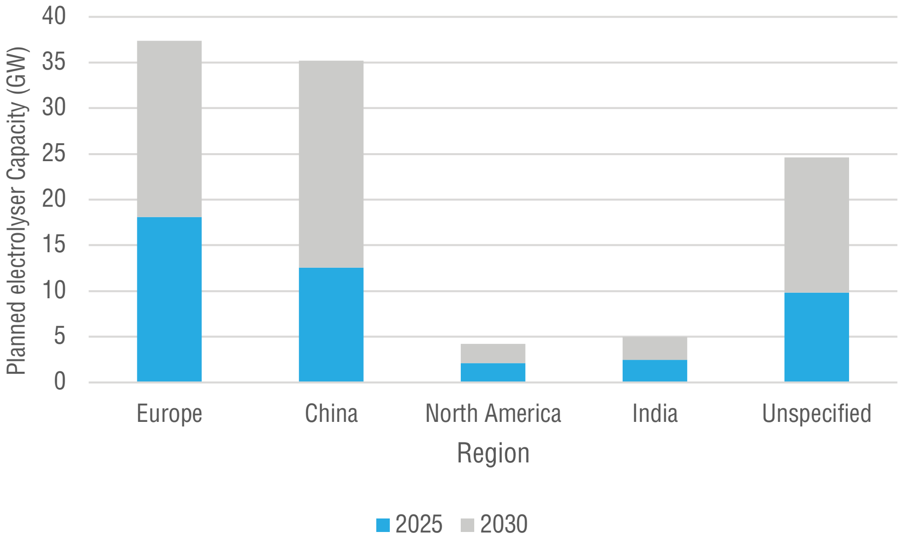


Source: The Oxford Institute for Energy Studies, 2022

South Africa holds a structural advantage in the electrolyser value chain given its global leadership in PGM exports and established precious-metal trade networks. Proximity to raw materials and mature supply chains can materially reduce input costs, particularly as PGMs remain central to PEM fuel cells. Industrial upgrading through greater beneficiation and product complexity could further strengthen competitiveness (Harvard Growth Lab, 2024). SAREM estimates that renewable energy localisation could contribute approximately ZAR420 billion to GDP, with green hydrogen commercialisation adding a further ZAR74 billion annually (GreenCape, 2020). Annexure A, Table 5 shows the types of electrolysers and the various advantages.

However, realising this potential requires addressing key constraints in the power-hydrogen nexus. Electrolysers require stable, high-load electricity supply and coupling them with intermittent renewable energy introduces design trade-offs that affect utilisation rates and costs. Reducing energy consumption per kilogram of hydrogen, improving load management, shortening start-up times, extending stack lifetimes and scaling production will be critical as cost-reduction levers.

Figure 7: Planned installed electrolyser capacity (GW/y)



Source: International Energy Agency, 2024

Globally, the EU and China currently lead electrolyser manufacturing, which is illustrated in Figure 7. Such growth is supported by intellectual property advantages and cumulative learning effects. Continued cost declines are driven by "learning-by-doing," whereby costs fall as production scales and firms innovate through market competition (RENAC, 2024). Although South Africa represents less than 1% of global electrolyser manufacturing capacity, it has a competitive foundation in its mineral endowment. Advancing up the value chain will require accelerated research and development (R&D), technology transfer partnerships, licensing arrangements and strengthened human capital development (The Oxford Institute for Energy Studies, 2022). Leveraging PGMs to attract foreign direct investment and nearshore established manufacturers could position South Africa as a competitive player in electrolyser component manufacturing and, ultimately, the broader green hydrogen value chain.

2.1.5 Green Hydrogen – Desalination

Desalination has become an increasingly important solution to global freshwater scarcity, which is driven by rising water demand, population growth and climate-induced droughts. Modern desalination technologies such as reverse osmosis (RO), multi-effect distillation (MED) and solar desalination are being deployed to convert seawater and brackish water into potable and industrial-grade water, with membrane-based systems now representing over half of global capacity due to their relative energy efficiency and scalability (Sharifi, et al., 2025). This trend reflects growing investment in water infrastructure globally, particularly in arid and water-stressed regions where conventional freshwater sources are insufficient. Advanced projects are also experimenting with hybrid and renewable-powered configurations, reducing energy costs and environmental impact.

The global desalination technologies market was valued at roughly USD18 billion to USD25 billion in 2024 and is expected to grow at a compound annual growth rate of roughly 6–8% through the next decade, potentially reaching between USD34 billion to USD41 billion by the early 2030s (Fortune Business Insights, 2026). Growth is strongest in the Middle East, North Africa and Asia Pacific, while technological innovation and smart automation, such as AI-enabled plant monitoring and modular designs, are emerging as differentiating factors for cost and performance.

Desalination infrastructure is capital-intensive and complex, requiring large-scale facilities with high-capacity water intake systems, high-pressure pumps, membrane arrays and associated pre- and post-treatment processes. High capital expenditure (CAPEX) and operational expenditure (OPEX), exacerbated by energy consumption, membrane replacement and skilled labour requirements, remain major economic challenges, particularly for developing regions with constrained budgets (Fortune Business Insights, 2026). Furthermore, site-specific factors such as feedwater transportation, regulatory compliance and environmental permitting can significantly influence total project costs and timelines.

Energy requirements are central to desalination cost and environmental impact. Even energy-efficient technologies like RO consume between 2.5 and 3.5 kWh per cubic metre of freshwater, and globally desalination operations are estimated to consume tens of terawatt-hours of electricity annually, contributing to significant greenhouse gas emissions where power is fossil fuel-based (Sharifi, et al., 2025). This has underscored the need for renewable energy integration, including solar-powered desalination and offshore innovations that leverage natural pressure, to reduce the carbon footprint of freshwater production.

Environmental considerations extend beyond energy use. Brine discharge, elevated salinity plumes and chemical by-products from membrane cleaning pose threats to marine ecosystems and receive increasing regulatory scrutiny. These factors influence permitting and plant design choices, and necessitate investment in brine management solutions and environmental monitoring to mitigate ecological harm. Stakeholders must balance water security needs with commitments to environmental protection and sustainable development (Sharifi, et al., 2025).

Technological trends are pushing desalination toward more sustainable configurations. Continued innovation in membrane materials, energy recovery devices, smart system optimisation, brine reuse and hybrid energy systems are making desalination more efficient and cost-effective over time. There is also ongoing research into solar thermal, wave-powered and other renewable-enabled desalination approaches that could further reduce energy intensity and environmental impact, although these remain at earlier stages relative to traditional RO (Sharifi, et al., 2025).

Finally, as freshwater scarcity intensifies globally, desalination is expected to play a crucial role in national water security strategies, particularly in coastal and water-stressed regions. While it cannot alone address all water challenges, its market growth and technology evolution reflect its strategic importance. Investments in desalination infrastructure must be paired with water-use efficiency, recycling and integrated resource planning to create sustainable, resilient water systems that align economic, environmental and social goals.

View of Table Mountain from the V&A Waterfront

2.2 African Trends in Industrialising Green Manufacturing

Africa's green economy is at an early but accelerating stage of growth. Rising energy demand, water stress, urbanisation and food-security pressures are creating strong structural demand for climate-aligned infrastructure and technologies across the power and water sectors. The continent's opportunity lies in turning these pressures into investable pipelines, supported by policy reform, de-risking instruments and regional value-chain development.

Key Insights

Africa's transition is accelerating and under-capitalised

Africa's opportunity lies in turning structural pressures into investable markets, which include these factors:

- Electricity demand is expected to more than double to 2,291 TWh by 2050
- Renewable investment (2000–2020): this amounts to USD60 billion, with Southern Africa receiving nearly two-thirds
- Green hydrogen production costs could fall to ~USD1.80/kg by 2030

2.2.1 Solar PV Market

Africa's energy investment remains highly uneven. Southern Africa and North Africa account for less than 20% of the population but attract over 45% of total energy investment and hold roughly 65% of installed capacity. In contrast, sub-Saharan Africa continues to face significant access gaps, with around 600 million people lacking electricity and more than 1 billion without clean cooking, despite gradual progress in new connections (International Energy Agency, 2025).

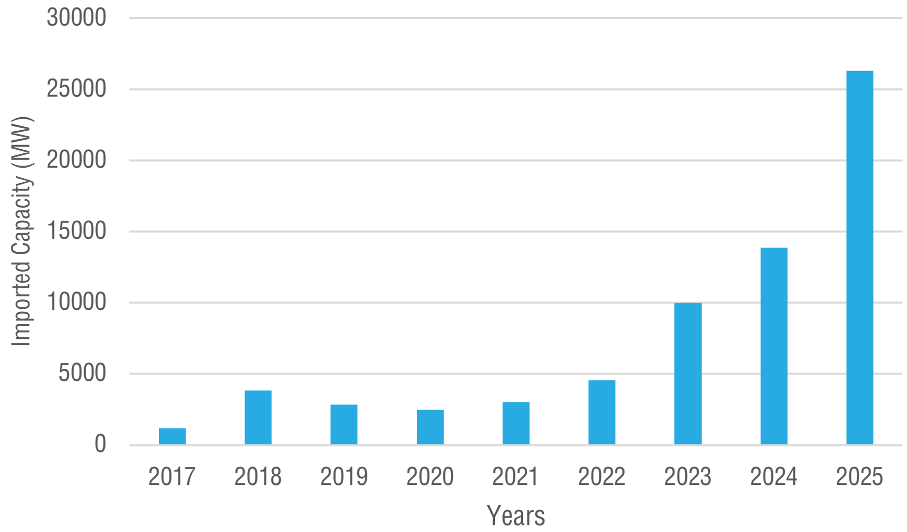
Historically, approximately half of Africa's energy investment has flowed to oil and gas projects, which are primarily export oriented and financed by private companies. Spending on clean energy remained below USD30 billion annually until 2021, reflecting limited investment in low-emissions power (International Energy Agency, 2025). Since then, clean energy investment has accelerated, as falling technology costs – particularly for solar PV – resulted in improved competitiveness across the continent.

Private clean energy investment has surged, rising from roughly USD17 billion in 2019 to nearly USD40 billion in 2024. This reflects broader confidence in renewables as cost-effective solutions, alongside growing market participation outside traditional hubs such as South Africa (Ember Energy, 2025). The expansion of private investment is complemented by targeted public and development finance which, although reduced in recent years, remains critical for high-risk, early-stage and innovative projects.

Africa's solar panel imports illustrate this shift in energy deployment. Imports reached a record 25,032 MW in the 12 months to June 2025, a 60% increase in relation to the previous year. This is shown in Figure 8. Unlike the 2023 surge which was driven largely by South Africa during its peak power crisis, much of the recent growth has occurred outside South Africa, highlighting a more structural, continent-wide adoption of solar technology (Ember Energy, 2025).

Over the past two years, solar panel imports outside South Africa have tripled, from 3,734 MW in the 12 months to June 2023 to 11,248 MW in the 12 months to June 2025. While monthly imports peaked in December 2024, volumes have remained consistently elevated, confirming that the increase is not a short-term spike but part of a broader structural trend supporting accelerated solar deployment across multiple markets.

Figure 8: Chinese solar PV exports to Africa 2017–2025 (MW)



Source: Ember Energy, 2025

Venture capital and private equity have also played an increasingly important role, particularly for energy access ventures. Since 2015, venture capital has contributed around 40% of funding for energy access start-ups, supporting smaller, higher-growth businesses that complement large-scale private and public investment. Together, these trends signal a gradual but sustained transition toward cleaner, distributed energy solutions across Africa.

Such investments support the requirement to expand electrification on the continent. Furthermore, this also highlights the need for large-scale industrial investments and localisation of supply chains to meet electrification requirements. In light of mineral beneficiation, the continent can fulfil a large part of the solar PV supply chain with co-investments in human capacity and technology transfer.

2.2.2 Onshore Wind Market

Wind energy remains in its infancy in Africa, despite rapid growth in Europe and other developed regions. As a renewable resource, wind energy offers significant potential to help Africa meet rising energy demand driven by population growth and urbanisation, while contributing to global climate goals, including the Paris Agreement target of limiting temperature rise to 1.5°C above pre-industrial levels. Expanding wind capacity can provide cleaner, cheaper and environmentally friendly energy, enhance energy security, foster a local energy economy and reduce energy poverty. Most African countries face challenges including rising energy demand, oil price volatility, high CO_2 emissions, and national security risks due to heavy reliance on fossil fuels. Despite these drivers, Africa's installed wind capacity was only 5,464 MW in 2018, representing roughly 1% of global capacity (Abbas, et al., 2020).

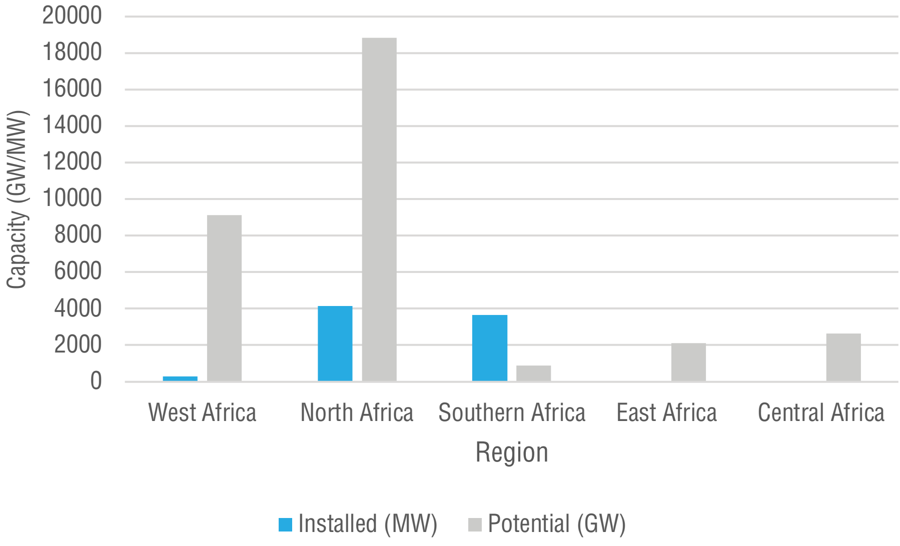
Political commitment to renewable energy growth has emerged through initiatives such as the Africa Renewable Energy Initiative (AREI) which aims to scale up renewable energy capacity and support sustainable development. AREI targets 10 GW of installed renewable energy by 2020 and 300 GW by 2030, which will help Africa leapfrog to a low-carbon economy while driving economic growth (Abbas, et al., 2020). Additional programmes supporting wind and renewable energy include the Africa–EU Partnership, the African Union's Programme for Infrastructure Development in Africa (PIDA), Power Africa, and the Africa Clean Energy Corridor, alongside multilateral, bilateral and civil society commitments.

By the end of 2020, the International Renewable Energy Agency (IRENA) estimated Africa's installed wind capacity at 6.5 GW, with primary markets in South Africa, Morocco and Egypt; and secondary markets in Kenya, Ethiopia, and Tunisia. Considering projects under construction and scheduled for commissioning by 2023, total installed capacity rises to approximately 9 GW (Get-Invest, 2023). North Africa leads in capacity due to early renewable energy programs in Egypt and Morocco, with initial utility-scale wind projects commissioned in 1988 and 2000. Southern Africa, largely driven by South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), holds the second-highest capacity, followed by eastern Africa with operational wind farms in Ethiopia and Kenya (Get-Invest, 2023).

Across Africa, 140 planned projects represent 86 GW of new wind capacity, including initiatives in countries new to wind such as Angola, Chad, Mali, Ghana, Sudan, Niger, Madagascar, Uganda, Zambia and Malawi. Angola alone has 13 planned projects totalling 700 MW, highlighting untapped technical potential even in Central Africa (Get-Invest, 2023). Established markets in northern, southern, and eastern Africa also anticipate further capacity expansions, reflecting ongoing regional investment in renewable energy infrastructure.

Regional market integration is expected to enhance the development and utilisation of wind resources, allowing countries with high wind potential to trade electricity with high-demand countries. Africa currently operates five active power pools, though some are more active than others, and several countries are members of multiple pools. This integration will improve efficiency and support cross-border electricity trade, helping to maximise the continent's renewable energy potential. Figure 9 illustrates the existing wind capacity as of 2023, and the potential wind capacity.

Figure 9: Current installed wind capacity by region (2023) and potential wind capacity



Source: Get-Invest, 2023

In summary, Africa's wind sector shows strong promise but remains underdeveloped relative to global markets. Strategic investments, political commitment, regional integration and expansion into new markets are essential for unlocking the continent's wind potential; increasing installed capacity; and providing clean, affordable and reliable energy to meet growing demand.

2.2.3 Battery Energy Storage Systems

The Africa Solar Industry Association (AFSIA) released its Africa Solar Outlook for 2025 which highlighted extraordinary growth in energy storage across the continent. Installed capacity in 2024 surged by an estimated 1,045% compared to 2023, signalling a rapid acceleration in adoption (Africa Solar Industry Association, 2026).

Prior to 2023, annual energy storage additions remained relatively low, averaging around 50 MWh. This figure tripled in 2023 to more than 150 MWh and then jumped dramatically to approximately 1,500 MWh in 2024. AFSIA attributes this surge to sharply falling prices for lithium-ion battery storage, with BloombergNEF reporting a 20% decline in costs in 2024 following a 13% decrease in 2023 (BloombergNEF, 2025).

Residential, commercial and industrial storage solutions have been key drivers of this growth, particularly in South Africa, where ongoing load shedding has created strong demand. The launch of the Battery Energy Storage Independent Power Producer Procurement Programme (BESIPPPP) in 2023 has been critical with projects from the first bid window currently under construction, totalling 513 MW / 2,052 MWh of BESS (BloombergNEF, 2025).

Large-scale storage projects are also contributing to the expansion. Notable examples include the second phase of the Soma Project in The Gambia (100 MW / 130 MWh) and a 900 MW PV / 720 MWh storage project in Egypt developed by Masdar and Infinity Power (Africa Solar Industry Association, 2026). Additional projects are underway across Senegal, Malawi, Botswana, Tanzania, Namibia and Mauritius, totalling more than 500 MW, which reflect a continent-wide push toward large-scale storage deployment.

Overall, AFSIA reports that around 18 GWh of battery storage projects are currently under development in Africa, underscoring a significant step toward enhancing grid flexibility, supporting renewable integration and addressing energy security challenges across the region (Africa Solar Industry Association, 2026).

2.2.4 Green Hydrogen – Electrolysis

Africa presents immense potential for green hydrogen. However, there are deep institutional challenges in developing a green hydrogen industry. Although the continent is recognised globally for its abundant renewable resources, which underpin competitive green hydrogen production, large-scale deployment by 2030 remains unlikely without substantial progress in infrastructure, financing and policy frameworks. Africa has a strong natural resource base that could support up to a quarter of global low-emissions hydrogen production if all proposed projects proceed, but in reality fewer than 0.5 % of projects in emerging regions (including Africa) have secured financing to date, slowing near-term rollout (Africa Green Hydrogen Alliance, 2025).

The International Energy Agency (IEA) emphasises that low-emissions hydrogen still makes up less than 1% of global production, with most demand met by fossil-based hydrogen without carbon capture. While low-emissions hydrogen production is forecast to grow strongly by 2030, potentially reaching around 4 Mtpa from projects that are operational or have reached final investment decision, this is far below earlier ambitions and depends on supportive policies and infrastructure build-out (International Energy Agency, 2024).

For Africa specifically, there is limited access to affordable capital and export infrastructure presents barriers. Only a small share of announced export projects have reached investment decisions, pointing to the need for greater infrastructure development, clearer regulatory frameworks, and reliable offtake commitments to attract investment and move projects toward commercial reality. The region's projected electrolysis capacity, as shown in Table 1, highlights the need for renewed focus in industrial capacity to meet demand and offtake of green hydrogen.

While Africa's green hydrogen aspirations are widely discussed in broader contexts, such as industry and trade dialogues, actual progress remains in the early stages with substantial policy and financing gaps needing to be addressed to unlock the continent's renewable resource potential and integrate hydrogen into energy systems at scale.

Table 1: Projected electrolysis capacity for select countries

Country	Electrolyser Capacity (GW) 2030	Production Volumes (TWh) 2030
Algeria	N/A	30
Egypt	13	N/A
Morocco	N/A	14
Namibia	15	N/A
South Africa	10	N/A

Source: Africa Green Hydrogen Alliance, 2025

Technology costs have not seen much improvement with electrolyser costs increasing against inflation and supply chains for required critical minerals still not consolidated. The comparative advantage for the African market is still not fully realised as China leads the pack in electrolyser manufacturing and installed capacity, accounting for 65% of total installed global capacity. Innovation thus is lagging for electrolyser manufacturing on the continent and there is a need for co-investments in human capacity and technology transfer to ensure there is full competitive advantage (International Energy Agency, 2024).

2.2.5 Green Hydrogen – Desalination

Desalination in sub-Saharan Africa occupies a curious position in the global water economy: technically proven, increasingly necessary, yet still financially constrained. Globally, desalination capacity now exceeds 100 million cubic metres per day, with the Middle East, North Africa, Spain and Australia leading deployment at scale. By contrast, sub-Saharan Africa accounts for only a small fraction of installed global capacity, despite facing some of the world's fastest rates of urbanisation and intensifying climate variability. Most large plants on the continent are concentrated in North Africa, while sub-Saharan deployment remains limited to select coastal cities and industrial hubs. This imbalance reflects not only water scarcity patterns but also financing capacity, creditworthiness of utilities and energy cost structures.

Cost remains the defining constraint. RO, now the dominant global technology, typically requires between 2.5 and 3.5 kWh of electricity per cubic metre of water produced, with total production costs commonly ranging from roughly USD0.50 to USD1.50 per cubic metre depending on energy prices, plant size and financing terms (Sharifi, et al., 2025). In higher-risk or smaller markets, costs can exceed this range due to elevated borrowing rates and limited economies of scale. For sub-Saharan utilities already facing low tariff recovery and infrastructure backlogs, such capital-intensive systems require concessional finance, guarantees or blended finance structures to become viable. Public–private partnerships are increasingly used, but project bankability remains uneven across the region.

Technologically, the shift from older thermal processes toward RO has reduced both capital intensity and energy consumption, improving feasibility for emerging markets. Advances in membrane efficiency, energy recovery devices and modular plant design are further driving incremental cost reductions. There is also growing interest in renewable-powered desalination, particularly solar-coupled systems, to reduce exposure to volatile fuel prices and lower lifecycle emissions (Fortune Business Insights, 2026). While grid-connected large plants remain the backbone of urban supply strategies, smaller containerised and decentralised systems are emerging as practical solutions for remote coastal communities and island states where extending water infrastructure is prohibitively expensive.

Environmental considerations are increasingly central to project design. Brine discharge management, marine ecosystem protection, and carbon intensity of power supply all influence regulatory approval and long-term sustainability. Globally, the desalination market is projected to grow steadily over the next decade, driven by climate stress and water security concerns, with annual growth rates commonly estimated in the mid-single digits. If sub-Saharan Africa can address financing constraints, strengthen regulatory frameworks and integrate desalination with renewable energy systems, it stands to capture a greater share of this expanding global market. The trajectory suggests that while desalination will not replace conventional water sources, it is likely to become a strategic supplement in coastal urban planning and industrial development across the region.

2.3 South African Context

South Africa's energy transition is being driven in part by the REIPPPP, a competitive procurement programme launched in 2011 to attract private investment into renewable electricity generation. Through long-term power purchase agreements with Eskom, the programme has enabled independent power producers to develop large-scale wind and solar projects while promoting price competition, local content requirements, and community development commitments. To date, the programme has procured more than 6 GW of renewable capacity and mobilised over ZAR200 billion in private investment, establishing South Africa as one of the most active renewable energy markets in the global south.

Complementing this transition, the Green Hydrogen Commercialisation Strategy sets out South Africa's roadmap for developing a globally competitive green hydrogen industry. The strategy aims to leverage the country's abundant renewable energy resources and PGMs to support the production and export of green hydrogen and derivatives such as ammonia. By prioritising hydrogen hubs, export infrastructure and domestic industrial applications, the strategy seeks to stimulate new manufacturing capabilities, strengthen technology transfer and position South Africa as a major supplier of clean energy products to international markets.

Key Insights

South Africa's energy investment case is strengthening

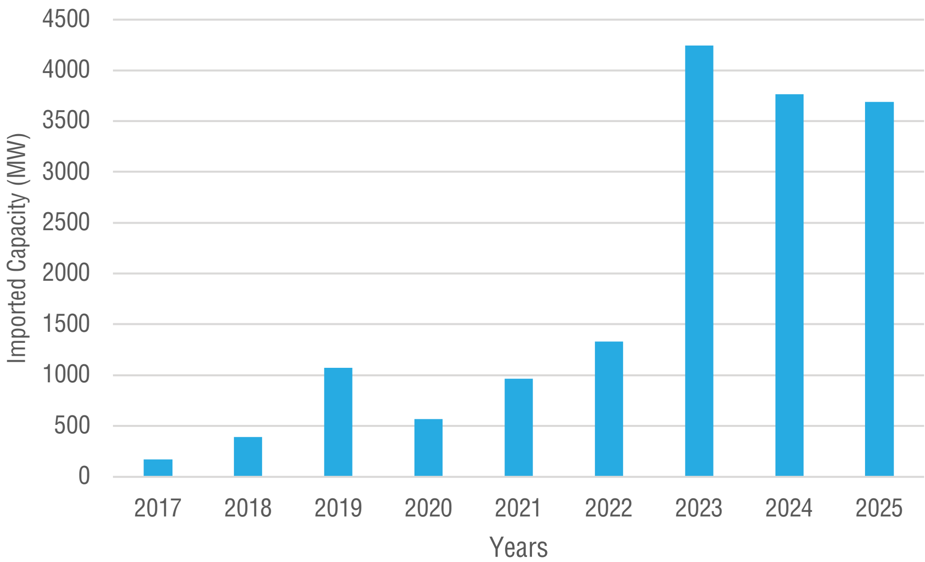
Priorities:

- Over ZAR200 billion in private investments mobilised
- 6 GW of renewable capacity added to the grid
- Clearly defined targets for green hydrogen development
- 14,000 km of high voltage power lines to be added to the grid

2.3.1 Solar PV Localisation

Two policy frameworks set out the required installed solar capacity in South Africa. The Transmission Development Plan (TDP) of 2024 anticipates that by 2034, solar would have increased from 9.6 GW (inclusive of embedded generation) to 27.8 GW. The other framework, the Integrated Resource Plan (IRP) 2025, forecasts 25 GW of solar PV capacity (Eskom, 2025). These figures show a significant increase in installed capacity and demand growth for renewable energy (Department of Electricity and Energy, 2025). The REIPPPP has been a leading driver for increased solar PV uptake to 3,940 MW across 18 projects (EnerData, 2025). This has seen significant imports of solar panels, as illustrated in Figure 10, but also of solar cells, wafers and modules for domestic assembly.

Figure 10: Imports of solar panels into South Africa from China (MW, 2017 – 2025)



Source: Ember Energy, 2025

An opportunity therefore exists for localisation to meet the current solar PV energy generation demand and the anticipated growth. Meeting South Africa's projected electricity demand of 35,715 MW by 2030 would require approximately 71 million 500W solar PV modules, representing an estimated market value of ZAR250 billion to ZAR300 billion. At current production levels, local manufacturers are positioned to supply roughly 12% to 15% of this demand. Expanding local market share to 25% could generate an estimated ZAR62 billion in sales value, with significant secondary economic benefits, including the creation of approximately 200 to 300 direct jobs (Localisation Support Fund, 2023).

South Africa already possesses established, high-quality local assembly capability. However, intellectual property for solar-cell manufacturing remains largely with international technology partners, meaning domestic producers import critical components for final assembly. While locally assembled modules are slightly more expensive than comparable high-quality imports, the domestic market is heavily saturated with lower-cost, lower-quality alternatives. Revising the tariff structure across the PV value chain could help to create a more balanced competitive environment. When combined with targeted investment to expand existing facilities or develop new manufacturing capacity, such reforms could meaningfully strengthen localisation and deepen South Africa's participation in the solar manufacturing value chain (Localisation Support Fund, 2023).

2.3.2 Wind Localisation

The TDP 2024 and IRP 2025 have also set targets for demand and installed wind capacity. The TDP 2024 anticipates an increase from 3.5 GW in 2024 to 20.8 GW in 2034, while the IRP expects to add 34 GW by 2029. The two have far greater variation in capacity. This could be attributed to the TDP's factoring in build or procurement which is largely driven by Eskom, while the REIPPPP had procured 3.3 GW of onshore wind energy across 34 projects by 2022 (Department of Mineral Resources and Energy, 2020).

Local content expenditure for operational and completed independent wind power producer projects totals approximately ZAR24.5 billion out of an overall project spend of ZAR52.1 billion, representing 47% of the total project value to date. However, most of this local procurement is concentrated in the BoP, particularly in transport, civil works, erection, foundations and tower manufacturing (Trade and Industry Policy Strategies, 2022). Although SAREM notes that the country has a strong industrial base, including steel, cement and electrotechnical capabilities, the number of local manufacturers producing wind-specific components and subcomponents remains limited.

Data from bid window 4 indicates that the BoP accounts for roughly 34% of total construction costs, while nacelle sub-assemblies represent around 40% of plant CAPEX. OEMs typically centralise procurement of key turbine components according to proprietary technical specifications. The global wind turbine market is highly concentrated, with a small group of manufacturers dominating supply. In 2019, four companies accounted for 55% of turbines deployed globally (Trade and Industry Policy Strategies, 2022). Procurement decisions are largely driven by programme scale, pricing, warranty terms and long-standing supplier relationships.

In terms of component breakdown, generators and gearboxes represent the largest cost shares, accounting for approximately 22% and 9% of total CAPEX respectively. Wind turbine generators are not currently manufactured domestically, although some repair capability exists locally (Trade and Industry Policy Strategies, 2022). Blades are imported, and while South Africa has the technical capacity to manufacture nacelle covers and machine main frames, this capability is not currently integrated into the wind energy value chain. Tower bases, anchor cages and fasteners are locally sourced, and towers themselves are manufactured domestically using imported steel or locally produced cement. However, most tower internals such as ladders, platforms and internal cabling are not produced locally, partly due to specification constraints.

Elements of the electrical BoP are manufactured within South Africa, though medium-voltage cables, low- and medium-voltage transformers and switchgear are largely imported. Local firms such as Aberdare Cables and CBI-electric African Cables produce alternating current cables, and transformer manufacturing capacity does exist domestically to supply wind energy projects. Overall, while meaningful local participation has developed in civil works and certain structural components, higher-value turbine components remain concentrated in global supply chains dominated by established manufacturers.

2.3.3 Battery Energy Storage Systems Localisation

The IRP 2025 has planned for 8.5 GW of additional battery energy storage on the grid by 2039, while the TDP expects a growth from 0.2 GW in 2024 to 4.1 GW in 2034. The BESIPPPP has since its inception procured 1.7 GW of storage capacity across 18 projects (IPP Office, 2025).

Battery energy storage is a critical enabler of renewable energy expansion in South Africa, helping to stabilise the grid and ensure a reliable electricity supply during the country's energy transition (Localisation Support Fund, 2022). As the share of variable renewable energy increases, storage systems play an essential role in balancing supply and demand, thereby supporting overall system resilience.

In parallel, vanadium redox flow batteries are emerging as an important complementary technology in South Africa, particularly given the country's significant vanadium resources and the technology's suitability for long-duration storage. While other battery technologies, such as lead-acid batteries, continue to coexist and additional chemistries remain in early development stages, lithium-ion and vanadium redox flow batteries are expected to dominate the market (Localisation Support Fund, 2022).

Table 2: Comparitive advantage for manufacturing in the components of the South African battery energy market

Value Chain Stage	Current Status in South Africa	Key Constraints	Localisation Potential / Strategic Insight
Mineral Mining	South Africa mines several minerals used in lithium-ion batteries (e.g., manganese and nickel). These are predominantly exported in raw or semi-processed form.	Limited domestic processing capacity and absence of local cell manufacturing reduce incentives for downstream beneficiation.	Strong upstream resource base creates long-term opportunity if domestic battery manufacturing develops or beneficiation policies incentivise local processing.
Purification & Refining of Precursor Materials	With the exception of manganese (and potentially nickel), South Africa lacks facilities to refine minerals into battery-grade precursor materials.	High capital investment requirements and intellectual property are largely concentrated in Asian markets.	Localisation may only become viable if large-scale domestic battery demand emerges or if industrial policy actively supports mineral beneficiation and refining capacity.
Cell Components & Cell Production (Cathode, Anode, Electrolyte, Separators)	No commercial-scale manufacturing of core lithium-ion battery components currently exists in South Africa.	Manufacturing becomes economically viable only at scale (≈5 GWh or more). Technology and IP are dominated by global OEMs located mainly in Asia.	This is the largest localisation gap. Battery cells account for 50–80% of the total value of battery energy storage systems, making domestic production difficult without major investment and scale.
Cell Modules	Capabilities for module manufacturing exist locally, particularly through machining processes using metals such as aluminium, steel, copper or plastic housings.	Demand volumes remain relatively small compared to global manufacturing hubs.	This represents a practical near-term localisation opportunity, leveraging existing CNC machining and fabrication capabilities in the local manufacturing sector.
Cooling Components	Cooling components, typically produced from extruded aluminium, can be sourced from local component suppliers.	These are limited by the scale of domestic battery pack production.	Local suppliers could expand production as battery pack assembly grows, making this a feasible area for supply chain localisation.
Battery Pack Casings	Design and manufacturing of casings already occurs partially in South Africa, using materials such as steel, aluminium, and plastics.	These are dependent on battery pack assembly volumes and integration with system manufacturers.	This is a significant localisation opportunity, as domestic manufacturers can supply base materials and fabrication capabilities to support battery assembly firms.
Battery Management Systems (BMS) & Battery Information Systems (BIS)	These systems control battery performance, monitoring, and safety, and are typically designed and managed internally by battery manufacturers.	There is a high reliance on proprietary software and electronics design capabilities controlled by manufacturers.	Potential exists for localisation through software development, electronics engineering and system integration, particularly if local battery pack assembly scales.
Recycling & Reuse	Battery manufacturers are responsible for end-of-life management. Currently, recycling activity is limited and largely focused on early-stage processes.	Advanced recycling technologies and material regeneration processes are concentrated in Asia, Europe, and North America.	Initial domestic capabilities are expected to emerge in disassembly and material separation by 2030, with deeper recycling processes likely remaining globalised. However, this segment will grow rapidly over the next decade.

Source: Localisation Support Fund, 2022

Currently, lithium-ion batteries are the dominant technology in the energy storage market due to their technological maturity, declining costs and well-established global supply chains. These advantages have positioned lithium-ion systems as the primary solution for both utility-scale and distributed energy storage, and they are expected to remain the leading technology in the near to medium term.

Insights regarding South Africa's battery energy storage system are presented in Table 2. South Africa's strongest opportunities in the lithium-ion battery value chain lie in midstream and downstream activities such as module production, pack assembly components, cooling systems, casings, control systems and early-stage recycling. Upstream mineral resources provide a strategic advantage, but cell manufacturing and precursor material processing remain constrained by scale, capital intensity, and global intellectual property concentration.

2.3.4 Green Hydrogen – Electrolysis

Localisation opportunities exist in the manufacturing of catalysts, electrolysers, fuel cells and energy storage components. South Africa already hosts a number of firms that either manufacture or are establishing facilities to produce these technologies. Beyond renewable energy component manufacturing, additional green hydrogen value-chain segments are expected to support local industrial development as both domestic and export markets expand. These include electricity grid infrastructure, hydrogen compression and storage equipment, beneficiated products, and logistics systems. Unlocking these localisation opportunities will require coordinated planning, sustained policy support, and targeted investment to build competitive domestic capabilities.

Within the value chain, electrolyser systems represent one of the most significant areas for localisation. In the short term, high-priority opportunities include the mining and beneficiation of PGMs, for which South Africa accounts for approximately 72% of global supply (Industrial Development Coorperation, 2023). PGMs are critical to the hydrogen economy, contributing roughly 8% of the cost of a PEM electrolyser. Demand for certain PGMs, particularly iridium, is expected to increase substantially as electrolyser deployment expands globally. Another priority lies in the production of catalyst-coated membrane (CCM) components, which convert locally mined PGMs into higher-value inputs for electrolysers. CCMs represent about 7.5% of the total cost of a PEM electrolyser system and growing global electrolysis capacity is expected to generate significant demand for these components (Industrial Development Coorperation, 2023). As shown in Table 2, there are capabilities of the domestic market to localise electrolysers in South Africa and developing value of adding activities in the primary and secondary sectors of our extractive industries.

Further short-term opportunities include system integration installation and operations and maintenance. As a domestic market for green hydrogen develops, demand for local engineering, installation and servicing capabilities is expected to rise. South Africa possesses a skilled technical workforce that can be further trained to support these activities. Installation alone can account for approximately 33% of total installed system costs, making this a meaningful area for domestic value capture (Industrial Development Coorperation, 2023).

In the medium term, opportunities may also emerge for local manufacturing of electrolyser stacks, systems and associated components. Access to competitively priced PGMs provides South Africa with a potential advantage in developing globally competitive manufacturing facilities for such equipment. However, these opportunities remain dependent on partnerships with international OEMs, as well as the development of a reliable domestic or export offtake market. For this reason, localisation of full electrolyser systems is considered a medium-term prospect, contingent on supportive policy frameworks, investment incentives and sufficient market scale.

Finally, recycling of PGMs represents an additional localisation opportunity as the hydrogen economy matures. Secondary supply from recycling is expected to increase over time and already contributes roughly 25% of global platinum supply (Industrial Development Coorperation, 2023). Expanding recycling capacity could therefore strengthen domestic resource security while supporting circular economy objectives within South Africa's emerging hydrogen industry.

However, while these inherent competences can unlock growth in electrolyser manufacturing it is important that structural and tacit barriers are addressed to retain the comparative advantage which the country has in its mineral resources and the competitive advantage in the global energy transition. Below are key steps for South Africa to unlock electrolyser manufacturing capacity:

A. Establish clear hydrogen targets:

South Africa should set clear national targets for low-emissions hydrogen and electrolysis deployment. Strong policy signals would provide investment certainty and align the country with global ambitions, where governments have collectively announced 185–360 GW of planned electrolysis capacity.

B. Create domestic hydrogen demand:

Developing local markets for hydrogen in sectors such as mining, heavy industry, freight and hydrogen derivatives will create the scale required to justify investment in local electrolyser manufacturing.

C. Strengthen national capabilities in technology development and transfer:

Building human skills, institutional capacity and research capabilities is critical. Evidence shows these forms of capital are strongly linked to the adoption, trade and innovation of low-carbon technologies.

D. Expand renewable energy and grid infrastructure:

Electrolyser deployment requires abundant renewable electricity. Grid expansion is therefore essential, particularly as over 80% of grid capacity in key renewable regions is already allocated, constraining new projects.

E. Leverage mineral advantages and partnerships:

South Africa's reserves or large PGMs provide a strategic advantage in hydrogen technologies. Combining this resource base with international partnerships could support the localisation of electrolyser manufacturing and related components.

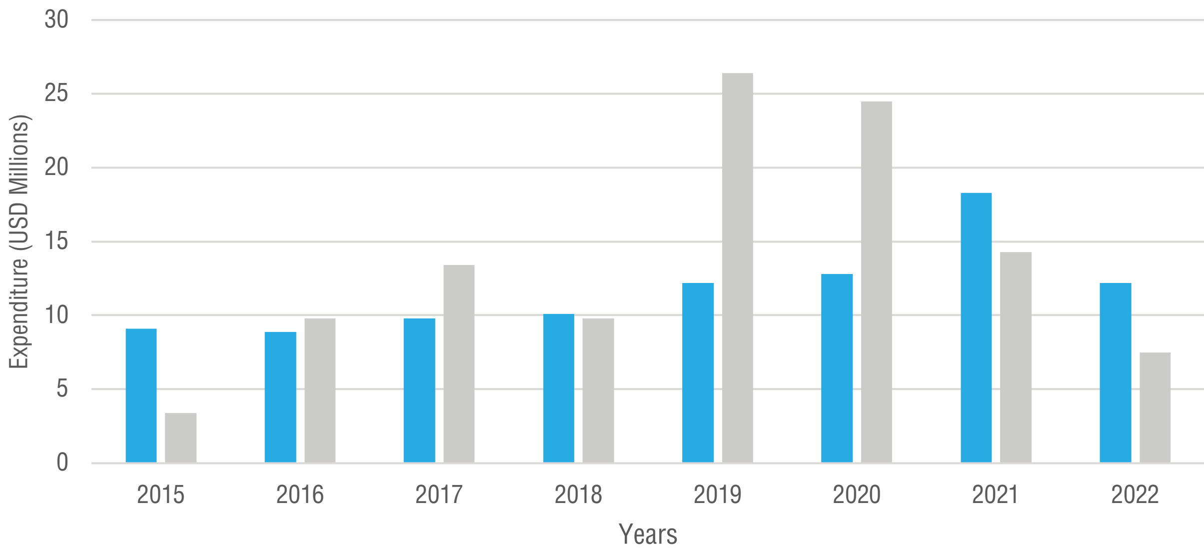
2.3.5 Green Hydrogen – Desalination

In South Africa, the deployment of seawater desalination has so far been relatively limited, consisting mainly of small-scale installations. RO has been the dominant technology used, while thermal desalination has largely been considered unsuitable due to its high energy consumption and capital costs in a country already facing electricity supply constraints and rising power prices (Trade & Industrial Policy Strategies, 2023). An exception is the Koeberg Nuclear Power Station, where thermal desalination has been explored due to the availability of discharged coolant water. In practice, desalination systems in South Africa typically operate either as mobile packaged plants or fixed infrastructure installations.

Desalination technologies are also widely used in industrial wastewater treatment, particularly in sectors such as coal, phosphate, steel and mining where acidic effluent must be treated. Several mining companies have implemented desalination to convert contaminated water into potable supply. For example, Anglo American operates a plant in Witbank that produces 30 million litres of drinking water per day, supplying roughly 12% of the municipality's needs. Similarly, Glencore runs a 15 million litre per day plant in Hendrina, supplying about 20% of local water demand, while Sasol treats acidic mine water at its Secunda Synfuels operations using a combination of electrodialysis reversal and RO technologies (Trade & Industrial Policy Strategies, 2023). Figure 11 breaks down capital and operational expenditure changes over the past years for desalination plants.

As water scarcity pressures intensify across South Africa, demand for desalination is expected to grow. In the short term, much of this demand is likely to focus on small-scale or emergency plants for drought response, while in the longer term it is expected to shift toward larger, permanent desalination infrastructure projects in regions facing sustained water stress.

Figure 11: Expenditure on desalination in South Africa 2012–2022 (USD Millions)



Source: Trade & Industrial Policy Strategies, 2023

Membrane technology is a key cost component in RO desalination, accounting for up to 7% of operating costs in desalination plants. Recent advances in membrane technology have improved efficiency, with newer membranes designed to last longer, increase water throughput, enhance salt removal and reduce overall costs. Some of these technological improvements have begun to filter into the South African desalination market, contributing to gradual improvements in operational efficiency.

Globally, rising water demand, increasing scarcity of conventional freshwater resources and the transition toward lower-carbon energy systems have driven growing interest in desalination powered by renewable energy sources. This combination is increasingly seen as a pathway to produce freshwater while reducing the carbon intensity traditionally associated with desalination processes.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2.4 Western Cape Context

The Western Cape is increasingly positioning itself as South Africa's leading green-economy hub and a strategic springboard into the wider African market, a role that is central to the province's Growth for Jobs (G4J) strategy. The green economy directly supports G4J's core objectives of unlocking private investment, driving export-led growth and creating sustainable, future-facing jobs.

Key Insights: The Western Cape's sub-sectors in the green economy

Renewable Energy

- An estimated 2,680 MW of additional capacity could be unlocked through curtailment mechanisms in the Western Cape.
- To date, approximately ZAR6 billion has been invested in embedded solar, with the potential to expand to ZAR20 billion.
- Large-scale renewable energy projects have seen around ZAR21 billion in investment, with a projected growth potential of up to ZAR63 billion.
- Battery energy storage is expected to grow from a current base of approximately 170 MWh to around 540 MWh by 2030.

Green Hydrogen

- Contribution to GDP is projected to grow from ZAR57 billion in 2030 to ZAR87 billion by 2050, supported by over 125,000 jobs.
- Total investment is expected to increase significantly, rising from approximately ZAR238 billion to ZAR464 billion over the same period.

Desalination

- City of Cape Town is investing ZAR120 billion which will add 70 million litres per day.

2.4.1 Renewable Energy

Guided by the G4J strategy, the Western Cape government aims to significantly expand the integration of renewable energy into the provincial electricity system. South Africa benefits from exceptional wind and solar resources, with solar generation primarily occurring during the day and wind generation typically peaking at night. International experience suggests that these resources overlap by only about 7%, allowing them to complement each other and support a more stable renewable energy mix. More than 80% of South Africa's land area, including much of the Western Cape, has sufficient wind resources to achieve average annual load factors of around 30% which compares favourably with global benchmarks (Western Cape Government, 2023).

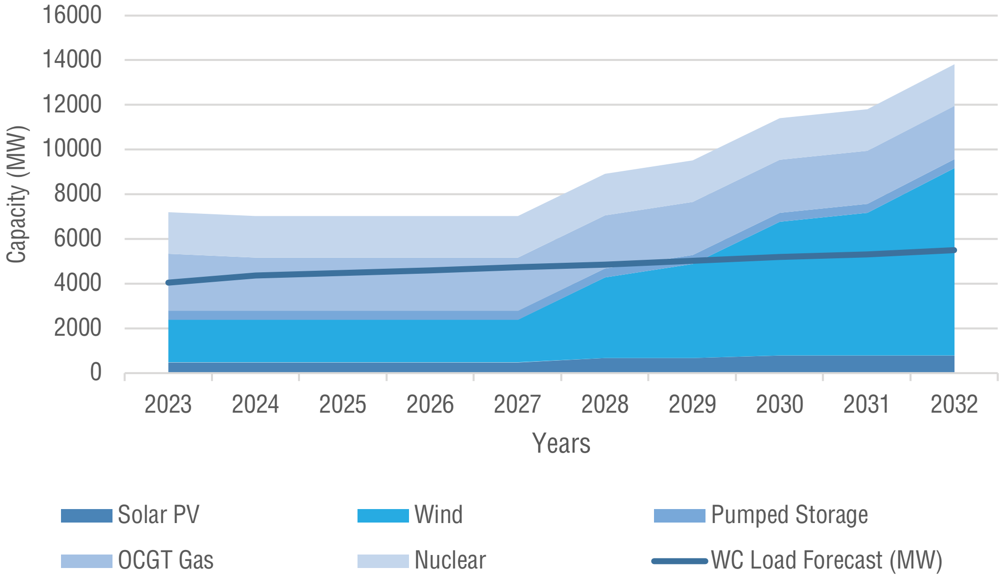
The Western Cape has been the largest provincial recipient of foreign direct investment in renewable energy projects and continues to attract new investment due to its strong infrastructure base and favourable climate conditions. However, sustaining this momentum will require enhanced institutional capacity to prepare and fast-track projects, develop robust project pipelines and strengthen the systems required to finance, construct and operate renewable energy facilities. Achieving long-term energy resilience will also depend on the expansion of decentralised and diversified energy systems. However, the provincial government's influence over energy markets remains limited as it does not control national fuel pricing or the legislative framework governing the electricity sector.

The province has secured approximately 1,008 MW of commissioned utility-scale renewable capacity out of 2,241 MW of Independent Power Producer (IPP) generation under procurement within the province. Notable projects include the Gouda Wind Farm (138 MW), one of the largest wind facilities in Southern Africa, alongside Perdekraal East Wind Farm (107 MW), Karusa Wind Farm (140 MW), Roggeveld Wind Farm (140 MW), and Soetwater Wind Farm (139 MW). As a result, the province hosts over 1 GW of grid-connected renewable capacity, making it a major hub within the national REIPPPP (Western Cape Government, 2023).

In parallel, the national utility Eskom is implementing its Battery Energy Storage System Programme, with several Western Cape sites such as Graafwater and Paleisheuwel forming part of the rollout to deliver 199 MW of storage under Phase 1 and 144 MW under Phase 2.

Hybrid renewable projects are also beginning to integrate storage directly with generation to improve dispatchability. The Oya Hybrid Project, located between the Western and Northern Cape, combines 86 MW of wind generation, 155 MW of solar PV and 92 MW / 242 MWh of battery storage, representing an important step toward firm renewable baseload power. At the municipal level, the City of Cape Town is also pursuing battery storage initiatives aimed at strengthening local grid resilience, improving demand management and capturing value from time-of-use electricity tariffs.

Figure 12: Western Cape load forecast 2023–2032



Source: Eskom, 2022

Looking ahead, projections indicate that renewable generation capacity in the Western Cape could exceed 13,000 MW by 2032, as shown in Figure 12, and potentially surpass 17,000 MW by 2034 (Eskom, 2022), which will position the province as a net exporter of electricity to other parts of South Africa. Realising this potential will depend heavily on the expansion of transmission infrastructure to connect new generation to demand centres. Despite the region's strong resource base and continued investor interest, Eskom has confirmed that grid capacity in the Western Cape is already highly constrained, limiting the ability to connect additional large-scale renewable projects. Addressing these transmission bottlenecks will therefore be critical to unlocking the province's renewable energy potential and enabling its future role as a net exporter of clean electricity.

The investment case is underpinned by three main opportunity areas:

- **Embedded solar PV for agricultural, commercial and industrial users**: about ZAR6 billion invested to date (±420 MW installed), with upside to around ZAR20 billion (±1 500 MW). Demand is driven by cheaper, more stable power, attractive PPA and leasing options, supportive SSEG regulations and a strong push for energy security. Key constraints are municipal approval bottlenecks, limited technical skills and weak distribution networks in some areas.
- **Large-scale renewable energy**: currently about ZAR21 billion invested (±1.4 GW installed) with a further ±ZAR63 billion (±3.8 GW) growth potential over the next decade. Falling technology costs, emerging wheeling and trading frameworks, corporate decarbonisation commitments and planned grid expansion support the pipeline. Barriers include grid capacity constraints, policy uncertainty and uneven municipal wheeling capabilities.
- **Behind-the-metre battery storage (C&I)**: an estimated ZAR750 million (±170 MWh) market today, expected to grow to around ZAR2.3 billion (±540 MWh) by 2030. Improving economics, tariff optimisation, peak-lopping, and quality-of-supply requirements are driving uptake, although the market still relies heavily on imported components and operates in an evolving regulatory environment.

Source: GreenCape, 2025

2.4.2 Desalination

The City of Cape Town is investing heavily in long-term infrastructure to strengthen energy, water, and food security while supporting the transition to a carbon-neutral economy and generating employment. The City has outlined an ambitious ZAR120 billion capital investment pipeline over the next decade, with around 40% of these projects focused on climate resilience to help the city withstand future climate shocks (GreenCape, 2025).

A central focus of this investment is improving water security following the severe Western Cape drought, which exposed the vulnerability of Cape Town's water supply system. In response, the City developed the Cape Town Water Strategy and the New Water Programme, both aimed at diversifying water sources and strengthening long-term supply reliability.

Under this strategy, the City plans to increase water supply by 300 million litres per day through a mix of surface water, groundwater, water reuse, and desalination. A major component is the planned Paarden Eiland desalination plant, currently in the feasibility design phase and being assessed under a potential public-private partnership framework in line with the Municipal Systems Act (Act 32 of 2000).

The proposed facility will have a capacity of 70 million litres per day and will use a multi-stage seawater desalination process, including pre-screening, dissolved air flotation, sand filtration, RO, advanced oxidation, disinfection, and stabilisation. This project forms part of Cape Town's broader strategy to secure a more diversified and climate-resilient water supply system for the future.

Besides the City of Cape Town, several municipalities across the province have implemented desalination plants to supplement local water supply, although their utilisation varies depending on water availability and operational costs. In Mossel Bay, a medium-sized desalination facility is capable of producing 15 million litres of potable water per day. However, the plant is currently on standby because local dams are sufficiently full (WWF, 2018). Even while inactive, the plant requires ongoing maintenance to remain operational, resulting in municipal costs without producing water.

In Knysna, the municipal desalination plant has a capacity of 2 million litres per day, but it is presently undergoing maintenance and repairs. Under normal circumstances, the plant is operated at the municipality's discretion and is typically used during periods of water scarcity. As water availability is currently adequate, the plant's operation is limited due to the relatively high cost of desalination. The Plettenberg Bay area, under the Bitou Local Municipality, operates a desalination plant producing 2 million litres of water per day.

2.4.3 Green Hydrogen

Green hydrogen is a strategic pillar of the Western Cape's energy resilience and growth agenda. Its potential for the province is outlined in Table 3.

The Western Cape Green Hydrogen Strategy and Roadmap (approved May 2024) set two key objectives:

- Enable about 15 GW of new generation capacity for green hydrogen production in the province, including projects with their own dedicated renewable supply.
- Ensure that surplus capacity contributes to the 1,800 MW to 5,700 MW energy target under the G4J strategy, reducing reliance on Eskom.

Source: Wesgro, 2023

More broadly, the province is a national leader in manufacturing, accounting for approximately 70% of South Africa's renewable energy component manufacturing. The rooftop solar PV segment has more than doubled since 2020 and is projected to reach about ZAR14.7 billion in annual market value, while the large-scale pipeline is estimated at around ZAR468 billion. Coupled with labour costs, which are 40% to 50% lower than in the US and EU for similarly qualified professionals, and top-ranked engineering faculties at UCT and Stellenbosch, these factors position the Western Cape as a competitive base for both project development and localisation (Western Cape Government Energy Factsheet).

Table 3: Potential of green hydrogen in the Western Cape

Indicator	2030	2040	2050
GDP (billion)	ZAR57	ZAR79	ZAR87
Employment (number of jobs)	125 586	118 053	83 397
Fixed investment (billion)	ZAR238	ZAR388	ZAR464
Balance of payment effect (billion)	-ZAR2	ZAR9	ZAR16
Tax revenue (billion)	ZAR9	ZAR5	ZAR6
Accumulated CO_2 reduction (Mt)	6	43	103

Source: Western Cape Green Hydrogen Strategy and Roadmap, Cabinet Approved May 2024

Priority opportunity areas include:

- Large-scale renewable generation and green hydrogen production to serve export offtake, green steel and domestic hard-to-abate sectors.
- Development of the Western SADC Hydrogen Corridor as a globally recognised region, aligned with South Africa's Green Hydrogen Commercialisation Strategy.
- Logistics, manufacturing and innovation along the hydrogen value chain.
- Saldanha-based export of green ammonia and green DRI/steel, potentially underpinned by feedstock from the Northern Cape.
- Low-carbon bunker fuels and sustainable aviation fuel for maritime and aviation.
- Domestic offtake in transport, mobility and selected industrial processes.

The Atlantis SEZ, located just 40 km from Cape Town, offers a compelling competitive advantage for renewable energy localisation. With ready bulk infrastructure, proximity to major road networks and ports, and targeted fiscal incentives, Atlantis has attracted over ZAR2.25 billion in green infrastructure development investments. The SEZ is developing a specialised renewable manufacturing hub that combines local skills development with export orientation, creating a focal point for assembling, fabricating and testing renewable energy components.

Freeport Saldanha and the Port of Cape Town complement Atlantis by providing critical logistics and deep-water access for heavy and bulk renewable equipment. Freeport Saldanha is uniquely positioned within a deep-water port (23 m+ draught) with direct rail and road connectivity, enabling efficient import of large transformers, turbines, and wind tower components, while supporting emerging green hydrogen value chains. The Port of Cape Town serves as the region's primary gateway for containerised and break-bulk shipments, strengthening supply chains for both imported renewable components and domestically manufactured products, and ensuring integration of local production into national and international markets.

3 Conclusion

The transition to a low-carbon, resource-efficient economy is no longer a future aspiration, it is a defining economic shift that is underway. As global capital, policy frameworks and market demand converge around sustainability and resilience, regions that offer credible project pipelines, enabling regulation and execution capability are emerging as preferred investment destinations.

Cape Town and the Western Cape are uniquely positioned within this context. With a diversified and future-oriented economy, world-class infrastructure, strong institutions and a proven track record of public-private collaboration, the region offers a compelling platform for investment across renewable energy, green hydrogen, electric mobility, water infrastructure, the circular economy, and sustainable agriculture. These sectors are not only aligned with global decarbonisation imperatives but also present scalable opportunities for inclusive growth, job creation and long-term competitiveness.

Wesgro plays a central role in translating this potential into realised investment. Through targeted investor facilitation, market intelligence and end-to-end support across the investment lifecycle, Wesgro works with partners to reduce risk, unlock opportunities and accelerate project implementation. The focus is not only on attracting capital, but on building durable value chains that strengthen the regional economy and support South Africa's broader development objectives.

As the green economy continues to expand, the Western Cape stands ready to partner with investors, innovators and institutions seeking a stable, connected and forward-looking base from which to grow. The opportunity is clear, the pipeline is emerging and the moment to invest is now.

Cape Town Port

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5 Annexure A

Table 4: Comparison of Solar PV Types

	Key Descriptor	Components	Technology maturity	Efficiency
Monocrystalline Cells	Single uniform silicon crystal	Polysilicon	Commercial	Most trusted
Polycrystalline Cells	Multifaceted crystals	Polysilicon	Commercial	15% lower than monocrystalline
Cadmium Telluride Solar Cells	Films of photovoltaic material	Glass Cadmium Telluride	Commercial	Low production costs
Copper Indium Gallium Diselende (CGIS)	Films of photovoltaic material	Glass Copper Indium Gallium Diselende	R&D	High efficiency in lab
Amorphous Silicon Solar Cells	Non-crystalline silicon	Silicone	Commercial	7% lower than crystalline cells
Biohybrid Solar Cells	Photosystems	Photosynthetic Proteins and Semi-Conductors	R&D	Highest efficiency
Concentrated Photovoltaic Cells	Curved lenses and mirrors	Silicon	Commercial	40% more efficient than crystalline

Source: International Renewable Energy Agency, 2025

Table 5: Electrolyser types and efficiencies

	Alkaline	Alkaline Polymer		Acidic & Alkaline	Acid	Acid Polymer	Solid Oxide	Microbial	Acidic & Alkaline
Technological Maturity	Mature	R&D				Commercial	R&D		
Investment (USD/kW)	1,800-5,300	>100		300-2,800	>100	0,200-1,150	100-1,300	1.5-200	N/A
Type of Electrolyte	Microporous separator	Anion exchange membrane (AEM)	Molten carbonate electrolysis cell (MCEC)	Cation exchange membrane (CEM)	Li-ion exchange membrane	Proton exchange membrane (PEM)	Protonic ceramic electrochemic al cell	Microbial electrolysi s cell (MEC)	Photoelectrochemical cell (PEC)
Electrolyte Membrane	Na– or KOH	Anion exchange ionomer	Li, Na, K) retained in a matrix of $LiAlO_2$	H_2SO_4 & KOH	H_2SO_4 or H_2PO_4	Proton conductive polymer	Y_2O_3-stabilised ZrO_2	Phosphate species	Anion/ proton exchange polymer
Cathode	Ni & Ni-Mo alloys	Ni & Ni alloys	Porous Ni electrode	Ni & Pt (coating)	Ir & Pt	Pt & Pt-Pd	Perovskite electrodes	Stainless steel & Ni	Photoelectrodes
Catalyst	Pt and Ru,	Pt and Ru,	Non-precious metals	OH^-	Pt	Pt black, Ir, Ru, Rh	ZrO_2	Pt	Photocatalyst
System Lifetime (Years)	20–30	~20	<20	>20	>10	20–30	10-20	N/A	<10

Source: The Oxford Institute for Energy Studies, 2022

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