Briefing Note 2: The renewable energy value chain in South Africa

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Renewable energy technologies, principally solar photovoltaic (PV) and wind energy along with battery storage, have had exponential growth over the last two decades. From virtually no solar and wind energy generation capacity worldwide in the 1990s, a total of 375GW of solar energy and 108GW of wind energy were installed in 2023, accounting for the vast majority of new generation capacity. As the cost of renewable energy further declines (and climate policy tightens), this trend is expected to continue for the foreseeable future. While more haphazard, South Africa has also witnessed the rise of renewable energy and battery storage technologies. The share of renewable energy technologies rose from less than 1% in 2000 to 7% in 2022. The market is set to increase further with massive investment in utility-scale renewable energy generation capacity and the drive by the private sector as well as households to install and/or procure renewable energy for their own use and, increasingly, export to the grid.

Growing demand comes with growing supply, and a set of challenges, risks and opportunities. The renewable energy and battery storage industrial value chain has already gone through some restructuring. Initially dominated by Global North manufacturers, the renewable energy industry is now much more diversified and competitive. The entry of Chinese (and to some extent Indian) manufacturers into the market has reshuffled the cards. The scramble for access to the raw materials needed to manufacture solar panels, wind turbines, batteries and many other green products is also shifting power in the value chain. With virtually every major country witnessing a (rapid) increase in the demand for renewable energy, many have also attempted to capture a share of manufacturing production, at least for their domestic market, notably through extensive green industrial policy packages in support of local manufacturing in the United States, the European Union and China.

In South Africa, the rise of renewable energy has created opportunities to drive industrial development in the value chain.

The renewable energy and battery storage value chain is made up of a wide range of inputs, parts and services. It is structured around key systems and components, such as panels and mounting structures, wind towers, nacelles and rotors, battery cells and packs, transformers, inverters, cables and fasteners. In turn, manufacturing such key elements requires a vast array of inputs (such as silver paste, copper wiring, glass, polysilicon, steel, aluminium, magnets, polymers, concrete, carbon fibre, manganese metal, nickel sulphate, and vanadium pentoxide), themselves dependent on a range of raw materials and fuels. Manufacturing-related services, such as testing and certification, research and development and skills development, but also end-of-life management, support the growth of the value chain.

Combined with South Africa's broad industrial capabilities in connected or related value chains (such as mining, steel, aluminium, automotive, shipbuilding, capital equipment and electro-

technical equipment), the historical rollout of renewable energy has displayed wide-ranging domestic capacity in supplying the solar energy, wind energy and battery storage sectors.

In the solar PV value chain, local industries have capabilities in the assembly of mounting structures and trackers as well as 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 exploratory stages. The production of green polysilicon, leveraging South Africa's silica deposits, should 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. As with the solar PV value chain, much of these capabilities have been idle due to lack of demand, but can be supplied by local steel manufacturers. 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.

Apart from battery cells (mainly imported from China), the lithium-ion battery value chain is well developed, with capabilities in mineral beneficiation, casing and assembly and electrical systems, including battery and energy management systems. The vanadium-based battery value chain, although nascent domestically, also boasts material local capabilities, including vanadium mining and refining, electrolyte production and vanadium-redox flow battery assembly.

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. Transformers, combiner boxes and switchgears are additional components that can be procured locally.

Considering market dynamics and existing capabilities, select industrialisation opportunities can be identified for short-term prioritisation. To be viable, the majority of component manufacturing investments require a minimum annual demand ranging from 500MW to 1GW, for a period for five years.

A TIPS Policy Brief by Gaylor Montmasson-Clair on South Africa's capacity in the renewable energy value chain can be found here: Bridging the gap between aspiration and reality: What would it take to localise the renewable energy value chain in South Africa

A TIPS Development Dialogue on the Renewable Energy Value Chain took place on 30 May 2024, a link to the seminar and presentations can be found here: Development Dialogue