October 2021

CLIMATE, ENERGY AND INFRASTRUCTURE SERIES POLICY BRIEF #2

SAREM POLICY BRIEF

CHALLENGING PRIVATISATION, CENTRING PUBLIC OWNERSHIP AND DECENT WORK

EXECUTIVE SUMMARY

The South African Renewable Energy Masterplan (SAREM) is one of 14 industry-specific Masterplans which form part of a national process led by the Department of Trade, Industry and Competition (DTIC) to inform an industrial strategy.

The ongoing process to establish the SAREM is an opportunity to transform existing industrial policy to ensure maximum benefit in the process of realising a just energy transition. This Policy Brief challenges the emerging proposals and identifies key gaps in the initial SAREM background research study in an attempt to provide proposals that advance employment creation and decent work, supporting the labour movement with the negotiations process. This analysis has been conducted with the support of COSATU and developed through workshop consultations. The key recommendations are as follows:

- **Leverage public investment in infrastructure and manufacturing**: Advocating for the role of public ownership, the provision of cheap debt, and mechanisms for controlling the economic rents on private projects in developing RE manufacturing capacity.
- **Market structuring**: Asserting the importance of protecting nascent industry through the use of import tariffs.
- **Technology transfer**: Asserting the importance of establishing a coherent technology transfer strategy to ensure potential learning from increased technology diffusion is captured and institutionalised.
- **Enable diversification of demand for the PV industry**: Reduce dependence of renewable energy component demand on utility-scale procurement. Supporting research and development of Green Hydrogen and providing incentives for energy efficiency and Green construction initiatives.
- **Establish a municipally-based recycling industry**: Ensuring end-of-life management of renewable energy systems (particularly solar PV) is considered. Given the high levels of subsidisation required, advocating for public ownership realised through municipal depots for solar PV module recycling.
- **Establish a framework for monitoring and evaluating the employment opportunities in line with "Decent Work" criteria**: Ensuring the bulk of the employment opportunities generated from increased RE component demand and associated localisation are decent work opportunities. Appropriate accompanying monitoring and evaluation mechanisms must be implemented by the Government to ensure compliance.

CONTENTS

1. BACKGROUND CONTEXT

The urgency and importance of decisive action to shift and divest from fossil fuel based industrialisation has been sharply captured by the 6th International Panel on Climate Change (IPCC) report published in August 2021. In Southern Africa, the IPCC forecasts a higher frequency of extreme weather events coupled with trends of increased dryness, agricultural drought, higher susceptibility to flooding, heat and cold waves. These shifts are already widening existing inequalities and are threatening to worsen what is already a desperate situation.

In recognition of South Africa's role in global climate change mitigation efforts, the draft Nationally Determined Contributions (NDC) plan identifies a 10-year priority focus for the nation's energy transition. The energy transition towards a low carbon economy has been proposed in electrical energy generation through the increased use of wind and solar energy, coupled with a divestment from ESKOM's coal-based generation fleet.

South Africa's high reliance on coal has also resulted in localised environmental degradation and severely impacted air quality, harming workers and communities in mining-affected areas. The historical development of the coal value chain in the region has benefited from cheap labour and land dispossession endemic to the Apartheid and colonial periods and has engendered dependency on income from harmful industries for many Black working class South Africans. High levels of elite profiteering in the coal sector, in spite of declining global demand as a result of public pressure, along with the increase in use of alternative energy sources, in a context of stagnating electrical demand, has led to a decline in demand for coal. The impacts of the decline of the coal industry are widely acknowledged to be severe and are estimated to threaten the livelihoods of as many as 120 000 people in mining, beneficiation, and power generation. Many more livelihoods are tied to these industries and without careful planning and support to ensure the appropriate social protections are put in place, tied to plans for regional economic diversification in targeted areas, including ensuring the benefits of emerging sustainable industries are captured by working class communities.

South Africa has committed to transitioning away from fossil fuel-based energy sources for electrical generation. This will be achieved through the planned and staggered increase of the use of renewable energy (RE) resources in the national energy mix, as confirmed in the National Development Plan (2030). The national energy mix is defined by the Integrated Resource Plan (IRP) and is based on a set of social, economic, and technical factors. These include:

i. cost of energy production (translating into electricity Tariffs);
ii. suitability of technical characteristics of the energy technology; and
iii. direct and indirect employment benefits.

The primary mechanism for renewable energy deployment, to date, is the Renewable Energy Independent Power Producer Programme (REIPPPP; REI4P).

The Independent Power Producers' (IPP) office reported the creation of 57 236 direct job years (64 950 full time equivalent jobs[1]), with over 80% of employment deriving from construction and typically temporary and casual in nature. This trend has raised transition concerns from the labour movement who advocate for the importance of ensuring decent work opportunities are guaranteed and realised. Internationally it is recognised that the majority of the decent work opportunities in the RE sector will be derived from the extent to which the associated value chains can be localised where an appropriate manufacturing base can be established.

Internationally it is recognised that the majority of the decent work opportunities in the RE sector will be derived from the extent to which the associated value chains can be localised where an appropriate manufacturing base can be established.

1. Jobs are recorded using job years by REIPPP developers – a job year is equivalent to one year of work for one person, but the full-time equivalent is slightly different because it includes leave, and so uses a different measure of hours worked per year. The definition of job years has changed between the REIPPP bidding windows which makes these numbers difficult to understand.

The South African Renewable Energy Master Plan (SAREM) aims to expand South Africa's manufacturing industry to realise the substantial benefits and multiplier effects of manufacturing in the economy across key identified RE value chains. These include contribution to gross domestic product (GDP), direct and indirect job creation, and skills development. This Policy Brief responds to the initial research inputs published by the SAREM project committee. It provides key arguments and recommendations for high-impact proposals for trade unions to advance in the formulation of the Masterplan.

Trade union affiliates under COSATU and SAFTU, as well as several civil society organisations, have been critical of the REI4P role in deepening the levels of privatisation in the energy sector. The debate of the impact of REI4P has, thus far, focussed on ownership and the purported impacts on employment levels across the sector, often framed as "coal jobs vs green jobs".[2] The broader contentions around ownership, and further liberalisation of the energy sector impact participation in the SAREM process by labour. This policy brief is an attempt to link these concerns with the potential downstream implications for RE value chain localisation.

Campaigns led by the trade union movement and civil society have put forward the importance of ensuring the unfolding energy transition is a "Just Transition". The importance of ensuring workers and communities historically impacted by fossil fuel-based generation are not left behind has gained traction. However, the mechanisms for realising this remain contested across the sector. State policy structuring the REI4P currently prescribes requirements in three key areas which have a bearing for RE industrial policy namely financing, local content requirements, and economic development allocations.

The project committee empowered to draft SAREM was constituted by the Department of Trade, Industry and Competition (DTIC) in July 2019. GreenCape, a not for profit company established to promote growth in the green economy, was appointed to manage the SAREM drafting process which consists of three phases: research, consultation, and validation.[3] The research process conducted by GreenCape included SAREM inputs circulated to the stakeholders. The process is currently in the consultation phase. GreenCape, DTIC, and the Department of Minerals Resources and Energy (DMRE) are in the process of engaging industry associations, trade unions, and civil society organisations to identify gaps and aid in the Masterplan drafting process. SAREM is due to have its executive oversight committee appointed in the coming months.

The methodology undertaken in the SAREM background study includes an assessment of three scenarios:

- In scenario 1, the 2019 IRP forms the baseline for the energy mix, meaning electricity and energy policy remains at the status quo with optimal implementation.
- In scenario 2, electricity policy has evolved based on a set of probable policy shifts, thereby increasing the RE market size with optimal implementation.
- In scenario 3, energy policy has evolved to "full policy flexibility" where significant restructuring has taken place, increasing the RE market size. This may see the effects of sector coupling increasing renewable electricity demand from the implementation of new technologies in linked sectors (such as power-to-fuels, hydrogen, and electrical vehicles) through the requisite policy support mechanisms.

The scenarios informing the SAREM background study's forecasts appear to be linked to an expectation of further liberalisation of the electricity sector. The downstream implications of some of these shifts require engagement as they may constrain the potential for developing an industrial base for renewable energy technologies.

This Brief proposes ways in which the SAREM process can be engaged in order to secure job-rich decent work opportunities in the RE sector.

2. Tshwane, T. (2018, May 18). Jobs issue plagues green energy. The Mail & Guardian. https://mg.co.za/article/2018-05-18-00-jobs-issue-plagues-green-energy/
3. Green Cape NPC. (2020, August). SAREM Background Information. Green Cape. https://www.green-cape.co.za/assets/SAREM_Background-Information_20200812.pdf

2. GLOBAL TRENDS

Out of an internationally-recognised need to curb the harmful impacts of the fossil fuel-based industrialisation of the 20th century, resulting in Climate Change, renewable energy has been prioritised as a key sector for the future.

The purpose of this section is to contrast and compare the drivers and constraints in RE technology deployment in South Africa with global market leaders. Key lessons from these trends and industrial policy interventions are reflected on to help inform the proposed recommendations which conclude the Policy Brief.

2.1. SOUTH AFRICA IN GLOBAL CONTEXT

Advancements in RE utilisation technology have created opportunities for the electrification of contexts with low grid access, and, in specific contexts, created potential for cost saving for residential and commercial users when deployed in combination with electrical supply from large-scale utilities. Rural electrification schemes, where extending national grid infrastructure may prove prohibitively expensive, are increasingly investing in RE through small stand-alone systems (rooftop solar PV in community centers or clinics) and microgrid technologies (powering small villages).

Utility-scale RE has been historically constrained by trends in the cost of renewable energy based generation, the rate of the levelized cost of electricity[4] (LCOE), - and capacity utilisation of a RE plant - the capacity factor[5] of RE plants. While increasingly competitive, these are highly dependent on the quality and characteristics of the energy resources available, for example, the wind or solar. South Africa has large areas with high levels of solar irradiation and high wind energy availability making it well suited to capitalise on the technological advancements in solar photovoltaic and wind turbine based power plants.

Global rise in solar and wind penetration

The increased economic viability of wind and solar generation technologies has led to widespread adoption by electricity utilities worldwide. In context, South Africa, by 2020, had a total installed electrical generation capacity of 47MW with a solar and wind component accounting for roughly 10%. Solar and wind technology market leaders in installed capacity include China (536GW), United States of America (193GW) with Australia at 10th (27GW)[6]. High penetration of wind generation capacity has been popular across a number of European states particularly Denmark, Ireland, Portugal and Germany running from 25-45% of total installed capacity. These trends are supported by the interconnection of the electricity grid across Europe allowing for the quick deployment of complementary energy resources notably including nuclear energy and gas based generators.

In 2019, solar energy generation contributed 4.9% of Europe's total energy production and 3.9% of China's. The efforts to significantly expand the contribution of solar and wind energy systems into the energy mix are constrained by the need for complementary energy resources, to compensate for intermittency, and the cost of energy storage systems. In alignment with the the IRP2019 South Africa

Solar and wind technology market leaders in installed capacity include China (536GW), United States of America (193GW) with Australia at 10th (27GW). High penetration of wind generation capacity has been popular across a number of European states particularly Denmark, Ireland, Portugal and Germany running from 25-45% of total installed capacity.

4. The LCOE is a measure of the average net present cost of electricity generation for a generating plant over its commissioned lifetime.
5. The Capacity factor is the ratio of the actual energy output divided by the maximum possible energy output for a given generator over a defined period of time. The capacity factor is a common measure used to assess and characterise the performance of a generator technology.
6. IRENA. (n.d.). Country Rankings. Retrieved September 1, 2021, from https://www.irena.org/Statistics/View-Data-by-Topic/Capacity-and-Generation/Country-Rankings

aim's to increase the penetration of solar and wind to 34% of the energy mix which necessary implies complementary investments across various layers of the grid.

Globally, the solar PV industry stands out as a key beneficiary of industrialisation and state support. The levelized cost of electricity (LCOE) of solar PV has dropped dramatically by approximately 360% from 2010 to 2019,[7] falling to USD 0.03/kWh. This development is largely due to China's RE industrialisation process which will be discussed further below.

In South Africa, efforts to localise components of the solar and wind value chains has achieved limited success. Industrial policy requirements for the REI4P requiring local content requirements for commissioned projects have helped drive the local manufacturing of wind turbine towers and solar module assembly to a minimal extent. Battery systems, which are experiencing an increase in demand due to the uptake in variable energy resources (mostly solar PV in residential and commercial environments) are largely imported wholesale from several Asian nations into South Africa. Local development of a number of components and ancillary services already exist and can be leveraged, in combination with available primary materials through the mining sector, to incorporate larger portions of strategic battery technologies.[8]

South Africa accounts for almost half of the installed RE components in the African continent for solar PV, concentrated solar PV, and onshore wind plants. North Africa, particularly Morocco and Egypt, have the next largest domestic demand for RE at utility scale, with solar PV the most widely deployed technology across the continent. The development of a manufacturing base for renewable energy technologies in South Africa could offer downstream benefits to energy transition efforts across the continent. A substantive assessment of the trade dynamics surrounding the procurement of renewable energy systems in major demand centres in Africa is required to make concrete assessments of the export potential for South African products. Such a study is beyond the scope of this Brief but it is important to note that such an analysis is also absent from the SAREM background study.

Renewable Energy Procurement Trends

Globally, utility-scale RE has largely developed through private sector investment backed by state de-risking policies, such as, power purchase agreements (PPAs) that lock-in a public utility to purchasing electricity from a private supplier at a particular rate. Part of the reason for this is due to the historically high costs of RE generation from variable energy resources in relation to the domination of cheaper base load plants[9] typically using coal and nuclear energy. South Africa's power system is shaped by the state utility, ESKOM, which operates as a vertically integrated utility holding a monopoly over generation, transmission, and distribution services in electricity provision in the country.

As with the trend globally, South Africa's private renewable energy procurement was initiated through the Renewable Energy Feed-In Tariff scheme (REFIT) which offered PPAs with generous tariffs, guaranteeing a rate of returns on investment pegged to inflation. In 2011, REFIT was phased out by the then Department of Energy as it was found to be inconsistent with public finance management and procurement mechanisms. REFIT was succeeded by the REIPPP programme which allows private developers to participate in a competitive bidding process to meet prescribed generation capacity requirements. Successful REIPPP projects are then offered PPAs at mutually agreed tariffs, typically over a 20-year period.

More-recent key emerging developments should be noted:

- ESKOM CEO Andre De Ruyter has advanced a "Just Energy Transition" (JET) which formalises the position of linking an energy transition with the unbundling of the utility (into seperate generation, transmission, and distribution companies) to allow the expansion of private power producers. An accelerated transition to increased utility RE (solar and wind) penetration in the grid is being tied to the unbundling process directly implying the central thrust of new RE generation will derive from increased private participation in generation.
- Auction bidding mechanisms may become a significant feature of the system operation activities managing the South African energy system. Auction bidding in energy markets can be organized to trade short, mid and long-term electricity contracts for targeted energy supply procured from public and private generators. The energy is delivered to consumers over different time frames, typically regulated by an Independent System Operator. The emergency risk mitigation round of IPP (RMIPP) procurement - which includes batches of wind, solar, and gas plants - is set to operate using an auction process where projects bid to dispatch emergency power to the grid with a 24-hour notice period at a competitive price.
- Across a spread of international examples of electricity sector liberalisation, auction bidding in energy markets

7. IRENA. (n.d.-b). Global Trends. Retrieved September 1, 2021, from https://www.irena.org/Statistics/View-Data-by-Topic/Costs/Global-Trends
8. Montmasson-Clair, G., Moshikaro, L., & Monaisa, L. (2021, January). Opportunities to develop the lithium-ion battery value chain in South Africa. Trade & Industrial Policy Strategies (TIPS). https://www.tips.org.za/policy-briefs/item/4013-opportunities-to-development-the-lithium-ion-battery-value-chain-in-south-africa
9. Baseload plants refer to a group of generators which cumulatively provide the minimum level of electrical demand over time. These plants are typically inflexible and are used in combination with other plants which use variable energy resources (Solar, Wind, etc) and dispatchable generations (Gas turbines, Hydro/Pumped Hydro,ect) to meet the balance of demand

The proposed ESKOM JET, which appears tied to the unbundling of the utility, has been accompanied by the overhaul of ESKOM price determinations, marking a shift towards cost-reflective tariffs.

introduces new cost drivers in the cost of electricity, including through speculation from private generators when grid assets are constrained, leading to inflated cost of electricity prices. The possible successful implementation of the RMIPP scheme may result in the greater prevalence of auction bidding as a mechanism for purchasing power from a growing array of private generators which will lead to high electricity prices, particularly in crisis periods, and negatively impact the demand for electrical generation capacity.

Impact of Local Trends on Electricity prices

The transition from a vertically integrated utility towards a regime of energy markets through "unbundling," expands the potential for financialisation of the sector. This will deepen existing trends in which existing market reforms enabling private power procedures allow profiteering through debt on-selling and the collection of secure revenue from state-backed PPAs. These financial instruments, in turn, service high interest bearing loans.

The proposed ESKOM JET, which appears tied to the unbundling of the utility, has been accompanied by the overhaul of ESKOM price determinations, marking a shift towards cost-reflective tariffs. This will allow the future reformed utility to pass through costs of new private infrastructure investments directly onto users, increasing the cost of electricity.

This trend has already been observed in Zambia[10] where the nest of market reforms contribute to rising electricity prices and deepening energy poverty. Rises in electricity prices will constrain the speed through which new generation capacity (particularly for variable energy resources) can be procured.

In order to compensate for the variability of solar and wind in particular, energy storage technologies, hybrid plant systems and the use of complementary energy resources (increasingly natural gas turbines) have been implemented. Under an unbundled ESKOM scenario, with cost-reflective tariffs, the net investment costs of additional transmission lines to remote areas, energy storage capacity, peaking gas plants, and other intermittency, protection and stability enhancing components will be passed through onto consumer tariffs. These measures increase the total cost of reliably providing electricity which severely impacts the medium- to long-term prospects of high wind and solar adoption domestically.

2.2. LESSONS FROM COMPETITOR ECONOMIES

The SAREM background desktop research includes a country comparison across Brazil, Russia, India, Argentina, Morocco and India. The comparison countries were chosen to draw lessons where renewable energy deployment and industrialisation has yielded positive results in comparably-sized economies (using GDP as a benchmark). Consistent with the notion that the proposed foundational principle for SAREM is "market certainty" the background research identifies the proliferation of procurement measures (feed-In tariffs and auction bidding) and strategic industrial measures, such as, local content requirements. These are credited as key determinants of success for the development of local industry. What is not adequately appreciated is the role of public subsidies in manufacturing (and in some key cases increased public ownership), and the role control of economic rents collected on largely private renewable energy projects has played in the major industrial developments in the sector globally. This section will briefly discuss the macro trends in renewable energy in the US, EU, Australia, and Chinese markets, which hold the vast majority of the value chain of wind and solar technologies, to help structure the proposed industrial policy recommendations.

China, the EU and the USA dominate the levels of installed capacity solar and wind energy. Solar energy is heavily dominated by China (205GW) which accounts for larger than the combined share of the EU and USA (143GW and 61GW respectively) by 2021. The EU and China firmly lead domestic wind energy (196GW and 210GW respectively) with the USA lagging behind (104GW).

Globally, rapid expansion of renewable energy has been tied closely to the availability of state backed incentives which ensure market certainty and profitability of private generation projects. Private RE has largely materialised where state guarantees through legislated capacity commitments and feed-in tariff schemes with favourable subsidies were available.

In partial response to high electricity costs of subsidised RE tariffs, shifts in EU energy policy in 2018 saw feed-in tariffs phased out in favour of competitive auctions which resulted in a decline in profitability for utility-scale renewables. This trend followed a steady decline in investments,

10. Bayliss, K., & Pollen, G. (2021). The power paradigm in practice: A critical review of developments in the Zambian electricity sector. World Development, 140, 105358.

a decline in community energy cooperatives,[11] and a move towards complex capital-intensive projects (such as large-scale offshore wind) favouring large private utilities (leveraging economies of scale and advanced European wind manufacturing value chain to compete with the low cost of other sources).

Trends in Solar Manufacturing

China's dramatic rise to monopoly control of global solar PV value chains from the early 2000s offers key lessons for economies aiming to yield higher benefit from solar value chain localisation. Total investment in Chinese manufacturing has exceeded $47 billion, covering virtually every link of the solar PV supply chain. Efforts are currently underway to expand production capacities of wafers, cell manufacturing, and module assembly, as well as a range of module components and accessories (notably including aluminium frames). The top 12 manufacturers have continued to ramp up production from 168GW in 2019 to an estimated 392GW per year. Analysis of this achievement clearly illustrates the significance of targeted industrial policy, a supportive ecosystem for technology transfer, and crucially the cheap cost of capital.

The USA benefited from early involvement in the research and development of modern solar cells (silicone) in the 1950s and have historically hosted a high number of early-stage solar companies at the cutting edge of innovative research, attempting to increase panel efficiency, reduce cost, and experiment with the use of different substrates. By the year 2000, the USA accounted for nearly half of the world's solar installations (600MW) with a significant proportion sourced from local manufacturers. In 2008, the global financial crisis, initiated by collapse in the US economy, led to a lack in the availability of domestic private equity to develop the local manufacturing sector to reach significant scale. The public subsidies that did exist focussed on a spread of cutting edge solar pv technologies.

In contrast, China adopted a strategic focus on wafer-based silicon solar cell technology offering significant state support for manufacturers. Most significantly this included offering cheap debt to manufacturers at state bond rates in exchange for ownership requirements. Additional benefits to manufacturers include tax holidays and preferential loan agreements.

China's tremendous expansion in the solar PV manufacturing share benefitted from the maturity of the technology and the nature of the production process of the silicon wafer which enables rapid scalability. While wafer silicon production is more labour intensive than (slightly higher efficiency) thin film modules the most decisive factor allowing Chinese manufacturers to undercut local manufacturing closer to the demand centres in the West has been the availability of cheap debt and more recent maturity of localisation efforts across the value chain in China since the initial period of expansion.

Further developments in the Chinese domestic market encouraging the deployment of solar PV for small-scale use (principally rooftop PV installations) came in 2009 with an extensive solar roof programme offering yearly subsidy support for the integration of solar PV in residential users. This was also accompanied by the "Golden Sun" project where the state subsidised 50% of the transmission and distribution costs of selected projects and offered special incentives for rural electrification schemes. Take up of residential solar rooftop installations in China cannot be understood outside trends of rapid urbanisation, increased access to housing, and a rise in average household income.

The Australian economy offers important cautions to approaches which privilege an emphasis on market certainty, through offering financial incentives and enabling legislation, over a consideration of the necessary complimentary industrial policy measures. In 2019/20 Australia produced a higher proportion of its power from RE than China, and yet it has remained largely dependent on the import of key RE technologies. China also yields over 8 times as many jobs per GW installed from its solar PV industry compared to Australia, with statistics skewed by the tremendous levels of production geared for export. Renewable energy entered the Australian energy market through IPPs in 2000 meeting state-imposed targets differentiating utility and small scale (rooftop) allocations. The rollout policy allocated specific subsidies tailored to avoid competition between self generation and feed in

In 2019/20 Australia produced a higher proportion of its power from RE than China, and yet it has remained largely dependent on the import of key RE technologies. China yields over 8 times as many jobs per GW installed from its solar PV industry compared to Australia, with statistics skewed by the tremendous levels of production geared for export.

11. Sweeney, S., Treat, J., & HongPing Shen, I. (2021, March). Transition in Trouble: The Rise and Fall of "Community Energy" in Europe. Trade Unions for Energy Democracy (TUED). http://unionsforenergydemocracy.org/resources/tued-publications/tued-working-paper-13/

Wind value chains are highly concentrated and controlled by monopoly Original Equipment Manufacturers (OEMs) and other major electrical industry companies which conduct the design, development services, and long-term maintenance for commissioned projects.

tariffs for home users and utility projects connected into the grid network. By 2012, Australia implemented carbon prices to increase the competitiveness of RE by arguing the true costs of coal are externalised. Carbon pricing came accompanied by public investment in research and development, as well as incentives for local manufacturers. In the absence of trade protections private RE developers in Australia favoured the import of key portions of the solar PV value chains to reduce project cost and risk.

Trends in Wind Manufacturing

Wind value chains are highly concentrated and controlled by monopoly Original Equipment Manufacturers (OEMs) and other major electrical industry companies which conduct the design, development services, and long-term maintenance for commissioned projects. Wind OEMs are globally dominated by Vestas (Denmark), Siemens Gamesa (Spain), Goldwind (China), and General Electric (USA), which cumulatively accounted for 55% of all installed wind capacity by 2019.[12]

The EU and the USA have significant local manufacturing capacity for wind turbines. In spite of having a combined domestic wind capacity of half of China they each benefit by 4 to 5 times in the levels of employment for each gigawatt of installed wind capacity. This can be attributed to the large global market share of EU based OEMs, in conjunction with comparatively higher levels of localisation in relation to their Chinese competitors. China responded to these trends by implementing import tariffs on wind turbine components and requiring local content requirements as high as 70% to support local industry, notably including their own competitor wind turbines.

Wind Developers have experienced significant increases in turbine efficiency due to technological advancements and reductions in cost due to higher volumes of demand which have resulted in lower electricity tariffs for generation projects. OEMs typically secure long-term maintenance contracts with utilities for wind farms which help compensate for lower profit margins brought through competition in energy markets.

Wind OEMs are highly protective of the intellectual property of key components, and are able to exercise greater control over machines installed in the field through maintenance contracts. This can limit the potential benefits for increased diffusion for highly technologically-advanced sections of the value chain.

The prevalence of supply chain bottlenecks for international projects has led to large wind companies purchasing suppliers of critical components which include generators, blades, and gearboxes. These trends of vertical integration in the wind value chain can be seen across major OEMs as a means to reduce risk and manage timely product delivery, enabling them to produce their own generators and controllers.[13]

Wind blades, turbine construction, and component assembly are typically seen as low hanging fruit for value chain localisation. There are precedents for localisation of generator manufacturing,[14] which is then supplied to the contracted wind OEM, but this is highly dependent on the risk appetite of the OEM selected, and only viable where design capacity and high local quality controls are in place. Generator localisation, where possible, is more likely when smaller OEMs are selected for implementation in a wind plant.

12. Ingram, E. (2020, February 20). Vestas tops BloombergNEF's list of top wind turbine manufacturers by installations. Renewable Energy World. https://www.renewableenergyworld.com/wind-power/vestas-tops-bloombergnefs-list-of-top-wind-turbine-manufacturers-by-installations/#gref
13. Energy Alternatives India, 2010. Analysis of Wind Value Chains. The Renewable Energy Chennai 2010 Conference. [online] Chennai: Energy Alternatives India. Available at: <https://eai.in/ref/eve/wind_power_value_chain.pdf>
14. T. (2006, March 17). Suzlon buys Belgian co Hansen for $565m. The Economic Times. https://economictimes.indiatimes.com/suzlon-buys-belgian-co-hansen-for-565m/articleshow/1454361.cms?from=mdr

3. THE LOCALISATION CHALLENGE

The market for RE technologies is highly competitive and capital intensive. Key technologies are protected by intellectual property patents and global demand is dominated by industries based in China, Europe, and North America. A key measure of success of the SAREM initiative will be the extent to which industrial policy measures can increase the levels of localisation of RE technologies. The purpose of increasing localisation is to deepen levels of industrialisation across the value chain of RE technologies.

The International Labour Organisations (ILO) decent work campaign reflects global efforts to ensure employment is created that is productive and delivers a fair income, security in the workplace, and social protection for families among other key benefits.

The current ability for the RE sector to yield significant decent work opportunities has come under question. RE value chain industrialisation remains low and most of the direct employment in RE is based on periodic construction activities of utility-scale REIPPP projects with low levels of collective bargaining.[15]

Current reporting on jobs, and much of the existing research estimating growth of green jobs with the increase in the RE market size (including SAREM inputs) fail to adequately discuss the prospects for decent work. Globally, higher levels of industrialisation, combined with targeted national policy resulting in an increase in manufacturing of RE components, are related with an increase in higher-quality employment.

The recommendations in the next section create pathways to maximise the potential for creating decent work and advancing a "Just Transition" which challenges the status quo of ownership in the emerging sector. Before that, we review difficulties facing current localisation efforts and the proposals currently discussed by SAREM fail to address these.

3.1. FAILURE OF CURRENT INDUSTRIAL POLICY

The section below summarises some of the key industrial policy failures in the existing RE sector:

Lack of Market Certainty

South Africa has experienced significant market uncertainty in the renewable energy sector since the implementation of the 2011 REFIT programme. Since the implementation of the REI4P, shifting DoE/DMRE attitudes to REI4P by state leadership have led to infrequent wait periods between bidding windows limiting the ability of local industry to emerge. A key example of this has been the collapse of prospective efforts to establish a wind blade manufacturing facility in 2013[16] (whose inclusion would significantly increase the local content quotient of prospective wind farms).

Inadequate Design, Monitoring and Enforcement of Local Content Requirements

The local content requirements for the REI4P are defined by proportion of the total project finance and the financial spend (Rand value) of local materials. The current local content rules leave room for interpretation for developers through their lack of specificity. This has resulted in projects exploiting loopholes to bypass requirements.

Current reporting on jobs, and much of the existing research estimating growth of green jobs with the increase in the RE market size (including SAREM inputs) fail to adequately discuss the concrete prospects for decent work.

15. International Labour Organisation. (2012). Are "green" jobs decent? International Journal of Labour Research, 4(2), 133–251. https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---actrav/documents/publication/wcms_207887.pdf
16. Baker, L., & Sovacool, B. K. (2017). The political economy of technological capabilities and global production networks in South Africa's wind and solar photovoltaic (PV) industries. Political Geography, 60, 1-12.

There is an evident lack of engagement on mechanisms to enhance technology absorption capabilities in the SAREM background study. The costs involved with building technical capacity and capabilities through "learning by doing" can be a significant barrier for SMEs and small manufacturers.

There has been a lack of clarity observed on the rules and definitions of local content for REI4P bid windows 1-4. This has been coupled with inadequate measures, institutional capabilities, and financial resources to monitor and enforce compliance. The latest RFP for bid window 5 has a local content threshold of 40%, including requirements for specific components to curb manipulation.

REI4P developers face high levels of competition to offer comparatively low electricity tariff prices while bound to maintain profitability during the bidding process by financiers. This in turn incentivises projects to compete to reduce project costs and identify state of art technologies (to benefit from efficacy improvements). The results of this reduce the levels of technology diffusion for specific components.

Recent industry trends in solar PV, where successful REI4P projects opt for bifacial PV panels (rated at Tier 1), exclude lower-efficacy panels designed and manufactured locally. This demand has led to solar manufacturer ArtSolar entering into a partnership with a Chinese company, LONGi, to create local manufacturing capacity for Tier 1 bifacial panels, with the latter retaining IP over the new technology available.

Absence of a coherent Technology Transfer Strategy

There has been a lack of coordination between the Department of Science and Technology, Department of Trade, Industry and Competition, and OEMs. This has constrained the emergence of a coherent technology transfer strategy which could unlock opportunities to deepen value chain localisation.

There is little coordination and support for research and development which target the latest RE technologies and develop skills pertinent to manufacturing sectors. Existing green skills capacity initiatives, consist of courses geared towards wind and solar installations and a range of maintenance activities.

No explicit mention is made of RE technology transfer in the 2019 White Paper of Science, Technology and Innovation. This points to a misalignment between the incentives to increase RE technology market size, and capacity building initiatives within the National System of Innovation (NSI) to foster and support deep localisation opportunities.

There is an evident lack of engagement on mechanisms to enhance technology absorption capabilities in the SAREM background study. The costs involved with building technical capacity and capabilities through "learning by doing" can be a significant barrier for SMEs and small manufacturers.

Inadequate Trade Policy

Solar module manufacturers in South Africa (at present ArtSolar & Seraphim) have had very limited success in meeting the available production capacity. The overwhelming majority of solar modules used in REIPPP projects remain imported. Most recently, increased investment in solar module production capacity by Chinese manufacturers in South Africa has sought to urge DTIC to compel projects in the Risk Mitigation round to procure locally manufactured panels.

Low levels of transparency in employment reporting in the sector

Several metrics are used to assess direct employment ("number of jobs", "job years", and "person years"). Job years and person years have been used in reports by the DMRE but offer little insight into the employment capacity of different technologies in proportion to their scale. The lack of transparency constrains the ability to concretely assess trade offs associated with the energy transition.

3.2. WHY CURRENT SAREM INPUTS WILL NOT ATTEND TO INDUSTRIAL POLICY FAILURES

The section below summarises the gaps in the approach presented in the SAREM input research documents which demonstrate misalignment with the existing industrial policy failures in the sector.

Lack of critical reflection on existing trade dynamics

The SAREM background study places emphasis on "market certainty" as a key underlying principle but this is not accompanied by an analysis of how the trends in global trade have impacted local attempts to build manufacturing capacity and what industrial policy mechanisms have been successful in doing so. A key early example is the reality of the under production in local solar manufacturing facilities. None of the proposed interventions by the initial SAREM input research account for challenges being contested between manufacturers and DTIC at present. For instance, the export of locally manufactured RE components to other African markets is identified as a key site to develop diversification in the local manufacturing sector. However, an analysis of the expected demand and an assessment of the trade dynamics is lacking from the SAREM inputs. Therefore, it is unclear what prospects and interests there are regionally to drive levels of consumption to a level that would see significant benefit to the nascent local industry.

Lack of appreciation for the role of Public subsidies and Ownership in RE Industrialisation

SAREM should reflect on possible strategies to curb financialisation of the sector in favour of redirecting capital towards productive industries given the demands from the labour movement to renegotiate the terms of the REI4P. This could constitute the inclusion of public subsidies in manufacturing accompanied by partial public ownership; and also a mechanism to control the economic rents collected by private renewable energy projects.

Lack of engagement on the role Technology Transfer

The SAREM input documents focus on task-based industrialisation, which focuses on activities such as component assembly and manufacturing processes for intermediate goods. This limits the prospects of yielding long-term benefits from the increased diffusion of imported RE technology. Tasked-based industrialisation provides less meaningful benefits than a product-based industrialisation strategy. A product based industrial strategy, would focus on building medium to long term capacity to design, manufacture and assemble key components (for example: wind turbine generators, PV module design and mass manufacture, etc). The SAREM process should guide a pathway towards creating opportunities for increased product-based industrialisation in wind and solar value chains in the medium to long term.

In order to achieve this a technology transfer system will be required. This is not adequately discussed in the SAREM input. In the absence of a clear strategy to build support mechanisms to develop a skills base, institutional capacity, and capabilities, it is unclear how deep industrial benefits will materialise simply from an increased market size of RE components.

4. RECOMMENDATIONS

Stemming from the gaps discussed in the previous section, five clusters of recommendations stand out.

4.1. PUBLIC INCENTIVES AND FINANCING MECHANISMS

As identified in SAREM, and consistent with global trends, **there is importance in ensuring certainty in the local demand of renewable energy**. This is to allow stable conditions for investment which involve a network of state-backed policy incentives to encourage investment. To increase the viability of local manufacturing, further incentives to reduce the production costs of local content and targeted protections are required. This will ensure alignment between demand and the increased local-supply centres. An opportunity exists to link a proposed public incentives package to increased public ownership requirements through the following mechanisms:

Public Incentives Mechanisms

- SAREM should propose a schedule of import tariffs on key RE technology components targeted for protection for medium- to long-term localisation.
- Implement a phased increase in local content requirements allocation to 50-70% for utility-scale RE projects based on readiness of local manufacturing.
- Revise mechanisms and institutional capabilities and provision of financial resources for monitoring and enforcing compliance.
- State to publish a schedule of Green Special Tariffs for RE technology component manufacturers. The provision of low cost (subsidised) electricity to reduce the input costs for green manufacturing.

Financing Mechanism

- State prompted to offer a series of state-backed green financing opportunities for RE technology manufacturers, including grants and preferential loan agreements in exchange for public and local ownership requirements.
- State prompted to create a green fund to provide cheap debt (as close to bond rates as feasible possible) for utility-scale RE projects to offset the costs of increasing local content requirements and create pathways to influence procurement decisions at project level.
- Establish a greening municipal fund which increases the ability of underfunded municipalities to participate inRE procurement and deployment of the provision of basic services.
- Finance the greening municipal fund, cheap debt for manufacturers and utility RE projects through the the issuing of "Green bonds" through the reserve bank at very low interest rates

4.2. DEVELOPMENT OF A TECHNOLOGY TRANSFER SYSTEM FOR RENEWABLE ENERGY TECHNOLOGIES

As identified by SAREM, **funding and institutionalised support for skills training programmes is critical** for deepening localisation and improving the quality of employment benefits. In addition, developing a coherent Technology Transfer System will enhance the technical capabilities of the existing manufacturing base. Early coordination between the state and OEMs is likely to focus on improvements on the manufacturing process and cost reduction as opposed to product innovation. Key sections of RE value chains targeted by import tariffs will need to be supported with specific financial and institutional support from relevant state departments, research institutions, and industry associations, to improve the process of technology absorption.

These incentives will ensure research and development is conducted in a direction which enhances local knowledge bases in favor of a focus of scientific and engineering expertise beyond the application, integration, and optimisation of imported turnkey solutions in the South African operating environment.

- Establishment of a Technology Transfer System (TTS) to facilitate technology absorption targeting renewable energy technologies that capacitate local manufactures. The TTS is to be coordinated by the DST, DTIC and the Department of Higher Education and Training (DHET), OEMs, and local industry associations.
- Provision of state funding for research and development, skills training, and learning partnerships with target RE OEMs

4.3. FOCUS ON DIVERSIFYING DEMAND OF THE PV INDUSTRY

South Africa's high levels of solar irradiation form a key part of its competitive advantage for the deployment of renewable energy technologies. Beyond recommendations to energy policy and maximising the associated value chain of domestic installations, there is a clear gap in policy for **incentivising the use of the solar PV based systems beyond the use in utility scale systems**

- Provision incentives (tax rebates, rates reductions, etc) for "Greening" architecture and energy-efficiency plans for construction projects. Incentives to target the use of RE systems for water heating, back up generation, and building cooling systems.
- Develop policy framework to support the development of Green Hydrogen which will result in an expansion of RE deployment.
- Identify and support industry capability to target emerging export markets for hydrogen fuels, largely in the EU which is looking to source fuels from areas with high quality RE resource availability.
- Support research and development initiatives to identify opportunities for decarbonisation of long-distance freight transport vehicles and aluminium production.

4.4. BUILD RE RECYCLING INDUSTRY

Recycling and end of life management for wind turbines and solar pv panels presents **significant employment opportunities** in the future. Recycling does not feature in the background desktop analysis for SAREM but must be considered as a pillar of the overall industrialisation approach.

Targeted supporting initiatives focusing on solar module recycling due to the widespread use in small scale embedded generation (SSEG) and utility-scale installations.

Establish Municipal solar Module recycling depots. Solar Module Recycling processes are economically costly and require subsidies to be economically viable, making this activity well suited to public ownership and management. Fees for recycling of modules could be recouped through commitments for end-of-life management plans for REIPPP projects, future public renewables plants, and integrated into the municipal levies imposed on rooftop SSEG installations.

4.5. ESTABLISH A FRAMEWORK FOR ENSURING DECENT WORK

It is critical for the realisation of genuinely Just Transition that opportunities generated from increased RE component demand and associated localisation are decent work opportunities. SAREM must ensure **alignment between recommendations for trade policy, targeting associated value chains, and employment policies.**

- The SAREM strategy must clearly and explicitly center the creation of Decent Work[17] in its objectives. In order to Appropriate accompanying monitoring and evaluation mechanisms must be implemented by the Government to ensure compliance.
- Establishment of a well resourced monitoring and enforcement mechanism that ensures that recipients of incentives and other supports comply with job targets and decent work practices in exchange for state support.

17. ilo. "Guidelines for a just transition towards environmentally sustainable economies and societies for all." (2015).

5. KEY RECOMMENDATIONS SWOT TABLE

Table 1 A table summarising the recommendations for labour participants in the SAREM process

DESCRIPTION	STRENGTHS	WEAKNESS	OPPORTUNITIES	THREATS
A. PUBLIC INCENTIVES PACKAGE ("GREEN NEW DEAL")				
REIPPP Industrial Policy changes: • "Reasonable Rate of Returns" policy • Phase increase of Local Content Requirements to 50-70% • Impose a schedule of targeted import tariffs on strategic RE components targeted for local manufacture based on industry readiness (Initiating with PV modules) • State backed green finance offering cheap debt and loan guarantees comparable to bond rates for utility scale RE & RE manufacturers • Increase local ownership of manufacturing as condition for cheap debt provision	• Responds to labour criticisms on ownership of the RE industry. • Proposes controls for the collection of economic rents and aims to use public finance to enable investment capital to be steered towards productive industry. • Mitigates against the global trends for slowing RE investment as tariff prices get increasingly competitive and auction bidding increases the complexity for new entrants.	• Potential to solicit a negative response from RE developers as high local content increases project risk. • Lack of trust in transparency in the allocations and awarding of new cheap debt mechanisms could lead to conflict.	• Recent action by solar Manufacturers advocating for DTIC intervention in RMIPPP process provides an opportunity to bring interventions such as targeted import tariffs into the SAREM debate. • Current attitude of DMRE appears reasonably proactive in rolling out RE allocations which has generated a lot of economic activity in the sector.	• Lack of sufficient interest from RE manufacturers to meet demand under increasingly stringent local requirements and economic development targets. • Requires significant political will from the Government. • Demand for electrical energy continues to decline in proportion to the slowing economy without a coherent overall recovery strategy; positive outcomes may be severely constrained. • Unbundling of transmission, distribution and generation may lead to "pass through" costs of new generation costs directly onto the consumer, shifting public attitudes on REI4P. • Emerging conflict over gas procurement allocations in RMIPPP could result in delays in future RE allocations resulting in market uncertainty.

DESCRIPTION	STRENGTHS	WEAKNESS	OPPORTUNITIES	THREATS
Green Special Tariffs Agreements	• Reduces the production costs of RE components targeted for domestic use (and export). • Increase competitive advantage of glass lamination processes for solar PV modules encouraging further investment in lamination and module assembly in South Africa. • Support the development of industries such as solar PV recycling which are energy intensive and not commercially viable without incentives.	• Increasing bureaucratic complexity of the tariff system. • Reliant on ESKOM buy-in and implementation.	• Encouraging green/clean technology innovation encourages industry to meet clear requirements in order to apply for Green Special Tariff Agreements.	• Pricing will need to be carefully set to balance production costs while also providing meaningful benefits to the green industry. • Poorly defined regulations could lead to misallocation of Green Special Tariffs to unintended recipients.
Greening Municipal Fund	• Addresses inequality in the ability for municipalities to raise finance for infrastructure projects.	• The state is unlikely to be able to provides financial support for all municipalities leading to this type of intervention having limited impact.	• Encouraging municipal generation increases the demand for RE technologies.	• High levels of municipal debt and an inability for some municipalities to recover their costs through electricity and water rates may lead to "Greening Municipal fund" projects becoming white elephants in communities. • Levels of corruption at municipal level are a risk to the success of this form of public financing initiative.
B. TECHNOLOGY TRANSFER SYSTEM FOR RE TECHNOLOGIES				
Establish a Technology Transfer System with DST, DTIC, DHET, Industry associations and RE OEMs. **Provide incentives for R&D & Skills training associated with Technology Transfer.**	• Institutionalised and incentivises the process through which absorption and local technical capacity is built.	• Raising public funds for R&D may prove unpopular under the present framework of fiscal austerity. • RE developers and OEMs may continue to prove resistant to sourcing key components from local manufacturers due to higher cost and risk implications. This may result in low market viability for products emerging from local technology transfer systems.	• Without a coherent Technology Transfer System, the prospects of developing localisation beyond task based industrialisation are slim • Higher education institutions and their associated resources are underutilised and not well coordinated with the needs of industry. Positive employment benefits exist in upskilling, R&D and spin off ventures from collaborations.	• Low levels of coordination between state departments undermine potential for implementation of a complex multi-stakeholder process • RE OEMs will move to protect their intellectual property and comparative advantage. If industrial policy mechanisms are not aligned well with the Technology Transfer System outcomes, large amounts of funding may be spent on low yield activities with limited product diversification potential.

DESCRIPTION	STRENGTHS	WEAKNESS	OPPORTUNITIES	THREATS
C. DIVERSIFYING DEMAND FOR THE PV INDUSTRY				
Develop municipal and national policy approaches to incentivise and enable "green" building and construction.	• Providing incentives for PV-based water heating, building cooling and backup power systems for key infrastructure (for example, hospitals) stands to increase the adoption of green technology in construction in South Africa which has positive employment benefits.	• Municipalities differ greatly in institutional capacity and in the type of economic activity occurring in their jurisdiction making appropriate police design for greening infrastructure challenging.	• Local experience exists for initiatives such as solar geyser systems tied to public housing developments which can be learned from and scaled appropriately.	• High capital costs of infrastructure may provide too prohibitive for wide scale adoption.
Provide incentives and enabling policies for Green hydrogen fuel production.	• Increases the demand for RE technologies by leveraging South Africa's high solar irradiation profile. • Responds to a growing demand (predominately in Europe, Japan, Australia, New Zealand) which creates opportunities to target export of green fuels.	• High capital costs associated with green hydrogen production require subsidies to enhance commercial viability.	• South Africa has an opportunity to be an early entrant in the industry providing opportunities for research and development under the conditions. • Opportunity to capitalise on early interest from Sasol and ArcelorMittal Green Hydrogen fuels. • Opportunity to develop local demand for green fuels which may find application in decarbonising long-distance freight transportation and aluminium production processes.	• Export demand is not realised and competitor nations with high RE profiles claim dominance in the emerging industry. • Regulatory framework for green hydrogen fuel pricing will face the challenge of managing the competition with fossil fuels.
D. DEVELOP RECYCLING INDUSTRY (SOLAR PV)				
Develop local solar pv recycling industry through local municipalities	• Recycling of solar PV modules is currently not performed in SA, however, the use of the technology is increasing. • Positive employment benefits.	• Solar PV module recycling processes are not economically viable without subsidies (often leading to end users preferring disposal).	• REIPPP plants are required to have decommissioning plans (as per the implementation agreement). • Municipal/locally-owned recycling depots could capitalise on the opportunity. • Municipal SSEG policy could extend to include recycling requirements for home solar system decommissioning.	