Trade and Industry
Public Enterprises

SARi
SOUTH AFRICAN RENEWABLES INITIATIVE

Unlocking South Africa's Green Growth Potential

South African Renewables Initiative

Update briefing | December 2010

This update briefing has been prepared by a team supporting the development of the South African Renewables initiative (SARi), working with the Department for Trade and Industry, the Department for Public Enterprises and WWF South Africa. Dr Edwin Ritchkin, Special Project Advisor to the Ministers of Public Enterprise provides oversight and guidance on behalf of the Minister of Trade and Industry (edwin.ritchken@dpe.gov.za). The team is led by Dr Simon Zadek, Associate Senior Fellow, International Institute for Sustainable Development, and non-resident Senior Fellow, Center for Business and Government, JF Kennedy School of Government Harvard University, (simon@zadek.net).

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Policies considered in this update are developed for future assessment, and all associated data and analysis are indicative and provisional.

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Contents

FOREWORD

By the Minister of Trade and Industry, Republic of South Africa

In Copenhagen, President Zuma announced South Africa's commitment to play its part in addressing climate change and reducing emissions. For this reduction to be sustainable, the climate change agenda needs to be effectively integrated into a broader industrial and economic strategy that secures the benefits of a green growth pathway into the future. Such a pathway would require, centrally, the development of renewables.

Over the next twenty years South Africa will need to develop an additional approximately 52GW of new energy generation capacity to 2030. South Africa has world-class wind and solar resources by any measure that can contribute a significant element of this capacity. In so doing, it can simultaneously enable the development of the industrial capabilities to design and manufacture renewable generation systems, provide jobs, protect and enhance the competitiveness of exports in increasingly carbon-sensitive international markets and contribute to the country's energy security and so the basis for a robust and growing economy.

Renewables are more costly than traditional energy sources, and will remain so for some time to come. The *South African Renewables Initiative*, established in early 2010 under the South African Government's Industrial Policy Action Plan, is tasked to design and establish a viable financing mechanism that would catalyse the critical mass of renewables needed to deliver economic and broader social benefits. Such a mechanism, in its current stage of development, would blend domestic commitments with concessionary resources and risk guarantee instruments channelled through inter-governmental co-operation. Provided within an appropriate institutional framework, such public resources would in turn leverage the far larger sums required from private finance at an affordable cost to South Africa.

The *South African Renewables Initiative* is a work-in-progress, and this briefing provides an update on its development to date. Its success would enable South Africa to take a major step forward in advancing its green growth plans and practices. Furthermore, it would exemplify how nationally led initiatives with international co-operation could effectively realize ambitious economic and climate imperatives.

Dr Rob Davies (MP)

Minister for Trade and Industry

Government of the Republic of South Africa

SUMMARY

The South African Renewables Initiative has been established to catalyse industrial and economic benefits through an ambitious scaling up of renewables. Its task is to define an industrial strategy for securing the economic gains from an ambitious program of renewables development, including financing and associated institutional arrangements, that would not impose an unacceptable burden on South Africa's economy, public finances or citizens.

A critical mass of renewables is needed to achieve the green growth opportunities of domestic job creation, improved export competitiveness and energy security. A continual ramp up of renewables capacity at the ambitious level of around 1–3 GW per year, would build up towards the generally-acknowledged potential of at least 15% of the electricity grid, by 2020-2025, which would support South Africa's industrial and broader economic development objectives. Alongside an ambitious target, a technology strategy that optimizes the balance between economic localization opportunities and energy costs is needed, supported by adequate and secure pricing and institutional arrangements.

Catalysing this critical mass of renewables development is the key to progressing South Africa's green growth transition. Success in the large-scale development of renewables could realize direct economic benefits of up to 50,000 jobs and US$55 billion in green investment over the next 15 years, a modest but significant addition to South Africa's energy reserve with associated economic benefits, and protection to up to US$11.2 billion in annual exports facing increasingly carbon sensitive international markets. The localization of major elements of the global value chain for wind and possible solar could also establish South Africa as a regional renewables manufacture and servicing hub, delivering both domestic economic benefits and accelerating renewables development across the region. Less directly, but crucially, it would nurture the political and economic conditions for green growth opportunities to be more broadly pursued.

Achieving significant renewables development would contribute towards South Africa's international carbon mitigation commitments. South Africa's emissions reduction commitments under the Copenhagen Accord will be easier and more likely to be realized if embedded in a green growth strategy. At its most ambitious, such a renewables program could deliver 20GW of renewables capacity by 2020, which would contribute nearly a quarter of the emission reductions needed for the country to transition towards a pathway of 'peak, plateau and decline' of emissions by 2020-25. The implied cost per ton of carbon mitigated compares very favourably to international benchmarks, especially for on-shore wind.

Appropriate financing of incremental costs of renewables is the key to unlocking renewables' green growth potential. The estimated incremental costs of an ambitious renewables program would have a net present value of about US$21 billion at current REFIT rates, or US$9 billion if they were reduced to a more cost competitive level. Such an additional domestic burden to South Africa would not be appropriate and so currently prevents the more ambitious renewables targets being adopted and pursued.

An innovative solution to financing the incremental costs of renewables is needed, to achieve critical mass with minimal burden on South Africa's economy and its domestic energy consumers. Detailed analysis and extensive consultation, both domestically and internationally, highlight the opportunity to secure a lower REFIT price, leverage relatively small amounts of public finance to catalyse privately led investment in an

ambitious renewables program. Proposed is to bring down the cost of capital, through domestic institutional derisking and the provision of a blend of concessionary debt and risk guarantee instruments from international sources. This could be combined with modest amounts of domestic private and public funds channelled through the feed-in tariff at a level offset by domestic economic benefits. International public grants also channelled through the feed-in tariff would complete the financing of estimated incremental costs.

International co-operation is key to advancing the proposed financing solution. National funding sources alone are insufficient to achieve a critical mass of renewable investment. Consequently, international cooperation is required to secure the necessary concessionary finance and risk guarantee instruments in a manner that delivers the required, longer-term enabling environment that in turn would stimulate private investment.

The South African Renewables Initiative will continue to act as a vehicle to deliver an integrated industrial, l and financing strategy that could unlock South Africa's green growth potential. Much design work remains to be done, in particular on the institutional as well as the financing and localization aspects. Crucially, any viable strategy will have to be embedded into the South African Government's broader, national Integrated Resource Plan. Moving forward will require key actors, public and private, domestically and internationally, to be aligned in their ambition, interests and contributing capabilities and resources. Most of all, as for any innovative, large-scale plan, it will requires the will of these actors to collaborate in realizing the potential. The South African Renewables Initiative provides a vehicle for bringing together these key actors, including critical decision-makers, in a collaborative process to complete this work during 2011, and beyond that hopefully taking the resulting strategy into the implementation phase.

1. THE OPPORTUNITY AND CHALLENGE

UNLOCKING SOUTH AFRICA'S GREEN GROWTH POTENTIAL

South Africa has a high potential to grow its renewable energy supply. Energy is critical to every part of South Africa's economy. Energy-intensive mineral extraction industries make a significant contribution to the economy, and the country has historically relied almost exclusively on coal for electricity generation, based on its considerable domestic coal resources. However, South Africa does have at least two other world-class energy resources, with some of the highest irradiance rates in the world, and strong onshore wind.[1]

The country faces significant energy security challenges over the coming decades resulting from economic growth and associated increases in energy demands, alongside a prolonged period of under-investment in generating capacity. The need to make major investments in new energy capacity over the next twenty years provides South Africa with an opportunity to tap its natural potential by ramping up its use of renewables.

Industrial and broader economic benefits underpin South Africa's interest in an ambitious program of renewables. While renewables would deliver climate and environmental advantages, they can also offer significant industrial and economic benefits as part of green growth strategy. This potential is already being demonstrated in other developed and developing economies (see box 1) and has been recognised in South Africa's Industrial Development Action Plan.[2]

Box 1: Renewable growth for industrial development

- **Morocco** plans to double its energy capacity and increase its renewable power generation from 1.5 to 6 GW by 2020. This would make renewables 42 percent of all power generation.
- **Denmark** implemented a feed-in-tariff programme in 1993, which helped the country to become the world leader in wind energy production. Denmark now obtains 21 percent of its electricity from wind turbines, most of which are owned by individuals and local electricity cooperatives. This also helped create 21,000 jobs in the wind industry.
- **Germany**'s Ecological Industrial Policy developed since 1991 provides a feed in tariff, and capital subsidy for wind power in 1991. With the help of this policy, Germany created the world's largest solar market and is able to meet its 2010 target of 12.5 percent renewables electricity. It also created about 250,000 jobs in the country with 400,000 expected by 2020.
- **China** plans to develop 500GW renewables (mainly hydro and wind) by 2020. Local content rules which enabled build up of wind industry over past 10 years have recently been removed as the domestic industry has become competitive.
- **Ontario** is seeking to become the 'silicon valley of renewables' with a feed-in tariff, localisation criteria, and strategic industrial partnership which aims to create 50,000 jobs in three years.
- **India**'s solar mission aims to generate 20GW from solar by 2022, to enable energy security and to create favourable conditions for solar thermal manufacturing.

In late 2009, the South African Government initiated an economic exploration of the relevance of renewables through its Industrial Policy Action Plan led by the Department of Trade and Industry. The preliminary work highlighted key economic benefits from a sufficiently ambitious renewables development program:

- **Industrial development:** South Africa's significant and growing energy demand, and its existing industrial infrastructure have the potential for attracting investment not only in renewables generation, but also in the industrial value chain supplying the industry. Technical studies, and the experience of other countries, indicate there is significant potential for creating and sustaining employment.[3] The level of job creation depends in particular on the scale of the renewables development, which not only impacts on the total workforce needed, but also on the ability to localise a greater proportion of the value chain.
- **Export competitiveness:** Tomorrows markets are likely to be increasingly carbon-sensitive. South Africa's could face restrictions and price discounting, either through contentious border tariffs imposed by importing nations or through private standards imposed by major buyers exports unless they can demonstrate they are on a pathway towards green growth. Greening South Africa's energy supplies would be a sound move to help secure the on-going competitiveness of energy-intensive exports.
- **Regional renewables development:** With its comparatively strong technical, scientific and manufacturing base South Africa has the potential to be a regional hub and catalyst for the development of renewables in sub-Saharan Africa. Whilst the potential for this regional role has yet to be estimated, it would both deliver domestic economic benefits and accelerate renewables development across the region, the latter by virtue for example of reduced capital and maintenance costs.
- **Medium-term energy security:** Renewables, if developed in the next ten years could add several percentage points to energy reserves, addressing medium term shortfalls which create significant risk of economic and social dislocation as a result of reduced availability.

Going beyond these individual benefits, an ambitious renewables program has the potential to catalyse wider change and create a business environment for green growth. South Africa will need other changes beyond renewable electricity to transform itself into a low-carbon economy. Off-grid renewables, including solar water heaters, as well as energy efficiency are two key opportunities. Large-scale renewables need not take away from these priorities, but could offer synergies. An ambitious renewables programme that stimulated economic benefits would empower communities of businesses, citizens and policy makers with interests in green growth. It would engage the trade union movement and political leadership in that potential and it would stimulate the right price signals for energy efficiency programs and other investments. Indeed, the secondary potential to kick start South Africa's green growth pathway through such political economy impacts may be as important over then long term than the discrete volume of renewables procured.[4]

Box 2: The Carbon Competitiveness Threat

"Ten or 15 years from now, those that produce in dirty ways are likely to face trade barriers"

Nicholas Stern, Chair of the Grantham Research Institute for Climate Change at the LSE[5]

"Life cycle assessments will be increasingly important as environmental decision making reaches a new level of rigor and integration into business processes."

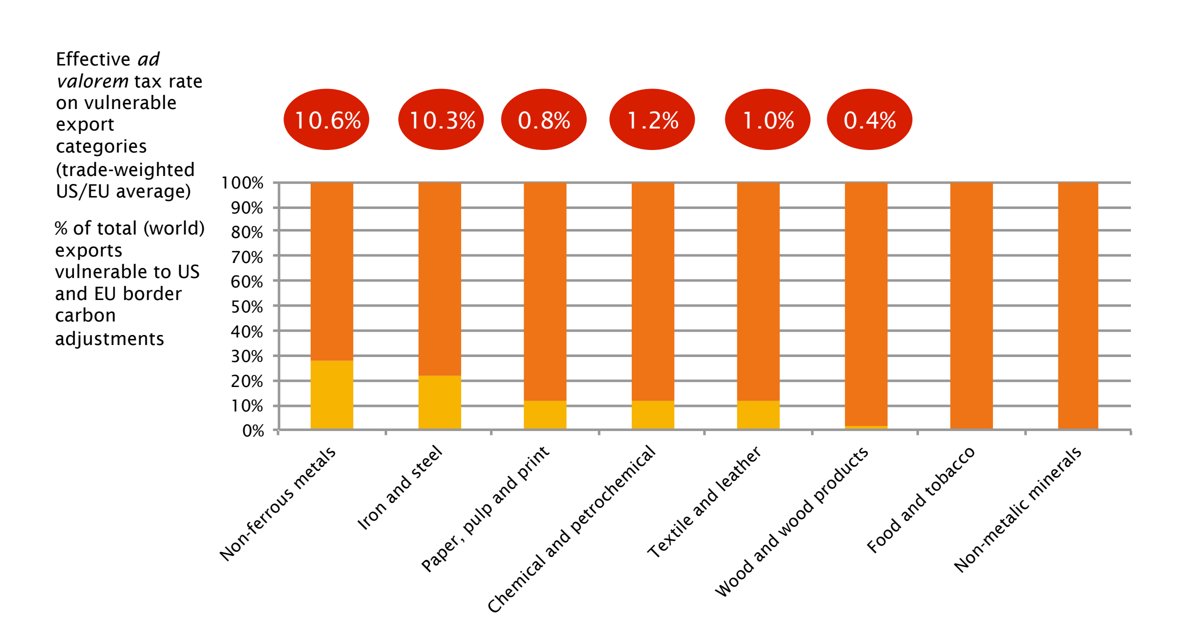
General Electric[6]

South Africa's energy intensive exports are likely to face growing carbon based challenges to competiveness. Private standards are already present in South Africa's export markets, especially in the consumer-focused food and beverage sectors.[7] Relevant carbon label standards already being imposed by importers include:

- Major retailers such as Tesco and Carrefour have introduced their own labels.
- British Standards Institute's PAS 2050 offers the first carbon label standard.
- The World Business Council for Sustainable Development is piloting a product-based version of its GHG Protocol.
- France has introduced mandatory carbon of a range of products as of 2011.

Furthermore, there is the threat of highly contentious Border Carbon Adjustments (BCAS) such as those included in the US Waxman-Markey bill. The sectors likely to be affected if any such measures were brought in include metals and minerals, chemical and petrochemicals, and agriculture and forestry products. Assuming a US$20/tonne charge and a partial equilibrium model, the potential cost to South African exporters if the EU and US implemented BCAs would be around US$720million.[8]

Exhibit 1: Key exports are vulnerable to US$720 million carbon border tariff threat



[Source: based on Cosbey, A and Wooders, P (2010) Vulnerability of South African Exports to Climate Change Related Trade Measures: Quantifying the Impacts of BCAs and Product Standards, IISD – Consultancy Report to SARi]

A critical mass of key renewables technologies can deliver industrial and economic benefits. Existing research by the South African Government, as well as technological and trade research commissioned as part of this work highlight the need for a critical mass of renewables to be developed in order to achieve economic benefits.[9] This is reflected in the current deliberations to develop South Africa's long-term energy plan, for 2013-2030 which seeks to find the best balance between least-investment cost, climate change mitigation, diversity of supply, localisation and regional development. [10] The size of the critical mass needed to achieve economic benefits, is a dynamic calculation and a function of technological, economic and public policy factors, many of them still uncertain. Nevertheless the key principles and parameters for optimising a renewables program to reach a viable critical mass can be ascertained.

Exhibit 2:Key factors determining the critical mass of renewables for economic benefit

Economic benefit	Requirements	Factors underlying critical mass
Industrial development	**Localisation of a significant proportion of the renewables technology value chain**	**Early development and stable rollout programme** to support the development of skills to meet domestic need. **Sufficient, regular volumes and price in relation to risk,** to attract developers to meet localization criteria.[11]
Export competitiveness	**Ability to provide a basis for exemptions** from border carbon adjustments or private penalties.	**Demonstrates a national commitment** to an ambitious green growth pathway **Comparability of financial impact on key sectors to actions taken by importing nations** (combined with the principle of common but differentiated responsibilities).[12]
Regional renewables development	**Development of cost competitive local renewables technology supplies.**	**Transition towards grid parity and pure commercial financing** through optimized technology mix and risk reduction.
Medium-term energy security	**Timely contribution** to energy reserves.	**Early development** to contribute to energy reserves in critical period up to 2020. **Alignment of peak demand with peak renewables generation** and/or development of storage capacity.
Environment for green growth	**Net contribution to economic growth** - green growth strategy is a boon not a burden.	**Minimal incremental financial impact** on consumers and business. **Minimal domestic tax burden**

[Source: SARi team analysis]

THE CORE CHALLENGE IS INCREMENTAL COST

Developing and financing a coherent renewables strategy is akin in some ways to developing a public procurement strategy, where ambitious, coordinated, long-term planning can secure products and services at improved terms, and in the process deliver a range of local economic benefits. This has been identified as key lever for industrial policy in South Africa where large portions public infrastructure spending goes to imports, representing a lost opportunity to resuscitate key sectors of the economy, raise their competitiveness and reposition them as exporting sectors of the future.[13] In the case of renewables the key challenge to a strategic procurement program is financing the medium term incremental costs of renewables, compared to coal.

Exhibit 3:Why is an ambitious target needed, and what is stopping it?

Approach to renewables development	**Ad hoc development** - Late start - Gradual ramp up - Low overall target - Turn-key developments	**Ambitious target** -Early start -Long commitment -Regular ramp up -Development of domestic capacity
Industrial development	◔	◕
Export competitiveness	○	◕
Regional renewables development	○	◕
Energy security	○	◑
Potential to mobilise broader green growth synergies	◔	●
Medium term incremental cost	$	$$$

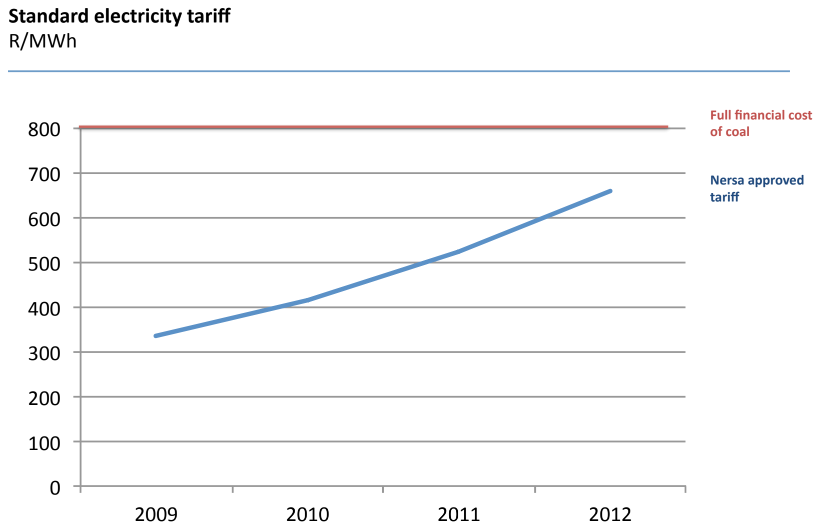
Key
Benefits: Low ○ ⟷ ● High   Costs: Low $ ⟷ $$$ High

[Source: SARi team analysis]

The key challenge is that renewables are more costly than traditional energy sources. South Africa's excellent solar and wind resources allow for the productive deployment of renewables generating capacity. However, the costs of generating renewable energy are significantly more than the cost of coal-power. South Africa has put in place a generous feed-in tariff (REFIT) to cover the cost differential between the general electricity tariff and the cost of renewables. However, its budget is limited and it is therefore currently only designed to finance procurement of a limited volume of renewables.

South Africa's basic electricity tariff is rising to cover the full financial cost of coal-fired generation. South Africa's has historically had low electricity prices, with electricity below its full cost for many decades.[14] These prices reflect Eskom's low depreciated asset base, valued at historical net book values, and it is recognised that they are unsustainable for funding new power generation and distribution capacity. The cost of new capacity will therefore have to be reflected in the future pricing of electricity. To achieve this South Africa's National Energy Regulator has approved a steep rise in the average electricity tariff of around 25% per year in 2010, 2011 and 2012. Bringing the electricity tariff up to reflect costs has been achieved despite significant domestic concern about affordability and competitiveness, and goes a significant way to reducing the incremental costs of renewables.

Exhibit 4:South Africa's electricity tariff is rising to meet the full financial cost of coal



[Source: based on NERSA (2010) Decision on Eskom's Required Revenue Application – Multi-year price determination 2010 to 2013]

It is clear is that a renewables strategy focused on 'least-cost mitigation' will not in itself deliver an ambitious, rapid-scale approach. While renewables costs are falling through technological learning curves, there remains a REFIT premium. The earlier a technology construction programme is triggered, and the more steadily such technology capacity is added, the higher the potential to localise value creation. A large and sustained procurement commitment makes it viable for developers and manufacturers to make greater use of local capacity, as well as for local manufacturers, universities and training institutions to develop the specialist skills needed beyond the basic construction of towers and civil engineering contracting. A least-cost driven approach, limited by available domestic financing for the REFIT, would result in a slow, technologically fragmented, project-by-project build up, which would not provide the conditions for reaping the potential economic rewards from the local manufacture of solar and wind infrastructure, and from development of a regional export and service hub. Furthermore, with international markets growing more carbon sensitive, small-scale renewables development would not provide the basis for greening South Africa's exports. Finally, and perhaps most importantly slow growth, without associated economic benefits would not mobilise the business and civil communities needed to champion broader green growth opportunities.

The core challenge is therefore to fund the incremental costs of procuring renewables at scale, in a manner that secures the longer-term enabling environment for on-going private investment. Domestic policy reforms are crucial to de-risking renewables investment by providing an enabling framework of procurement, contracting, and grid access arrangements for independent power producers. Seeing through the process of reform depends on effectively integrating it into a broader industrial and economic strategy that secures the benefits of a green growth. The lack of medium term funding is therefore the critical obstacle, which currently prevents more ambitious renewables targets being adopted and pursued with the required urgency and action.

The South African Renewables Initiative was therefore developed to help unlock the potential economic benefits of renewables by designing an approach to ambitious scale-up that would align an industrial and associated technology strategy with an acceptable means to finance the associated incremental costs and enabling institutional arrangements.

Box 3: What is the South African Renewables Initiative?

The South African Renewables Initiative (SARi) is a South African Government initiative developed by the Ministers of Trade and Industry and Public Enterprises and integrated as part of the work program of the *Renewables Working Group of the Inter-Ministerial Committee on Energy* and the *Industrial Policy Action Plan Task Team*.

The initiative was started in early 2010 to determine whether, and how South Africa's renewables ambitions could be substantially increased as part of its broader industrial and economic strategy. Its aim is to define an industrial strategy for securing the economic gains from an ambitious program of renewables development, and to design and secure the financing and associated institutional arrangements.

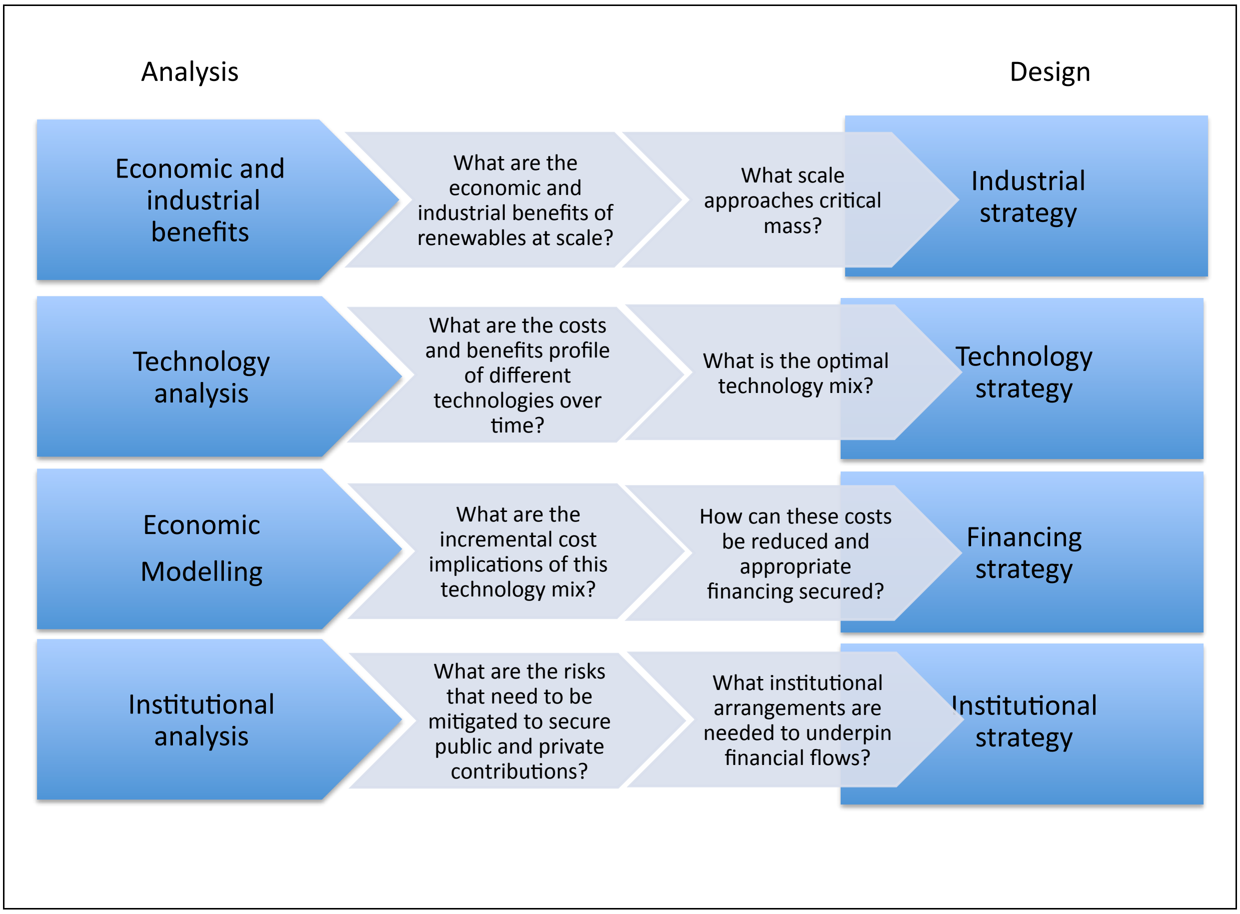
Over the past year, the core design proposal and economic model, outlined in this briefing, has been developed and road tested through commissioned research and through extensive consultation with experts and key stakeholders in the public and private sector. This has included workshops with government officials, industry and technology experts, and public and private finance providers, both in South Africa and internationally. It has also benefited from international support and knowledge networks such as those coordinated by Project Catalyst, Deutsche Bank 'Get FiT' Initiative, and the World Economic 'Critical Mass' project.[15]

2. DEVELOPING A SOLUTION

The South African Renewables Initiative was developed to provide the broad-based analysis to develop an implementable design solution for the *industrial* and underpinning *technology* strategy needed to reach critical mass, and for the *financing*, and associated *institutional* arrangements needed to make it viable.

Critically the SARi approach recognises that a viable low-carbon development strategy must start from nationally-owned economic development priorities, and work down to establish the supporting industrial, technology, financing and institutional strategies needed. These Industrial, technology, financing and institutional strategies need to be coordinated, since the economic dividends generated through ambitious green growth are crucial to enabling the mobilisation of public and private players which support the necessary electricity system reform and development of green economic clusters.

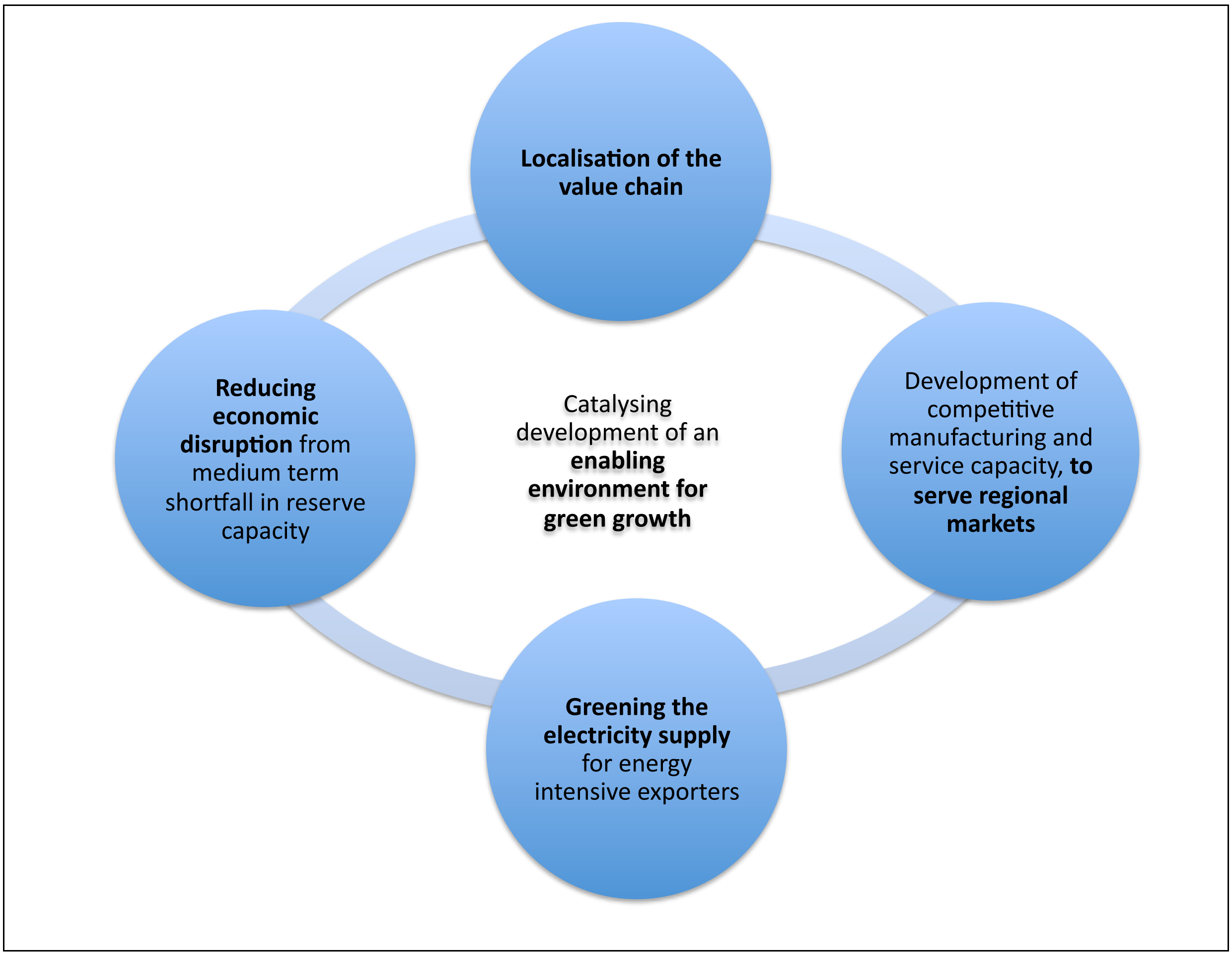
Exhibit 5:The SARi analysis and design framework



INDUSTRIAL STRATEGY FOR CRITICAL MASS

The proceeding analysis indicates that a sound industrial strategy in renewables should be aligned to key industrial and competitiveness opportunities. This strategy should focus on enabling the generation of new jobs in the renewables industry, sustained through expanding regional markets, while also providing broader economic competitiveness impacts of greening the electricity supply chain, and addressing reserve capacity shortfalls in the medium term.

Exhibit 6:Industrial strategy goals from a critical mass of renewables



Initial estimate are that the critical mass needed for such a strategy could be built up through a steady and ambitious ramp up of between 1–3 GW installed each year. This is based on a reasonable consensus supported by existing Government technology analysis, together with additional studies commissioned as part of this work. This equates to a ramp up of renewables to provide 15% of the grid generating capacity by 2020-2025 (20GW by 2020 or 23GW by 2025).[16]

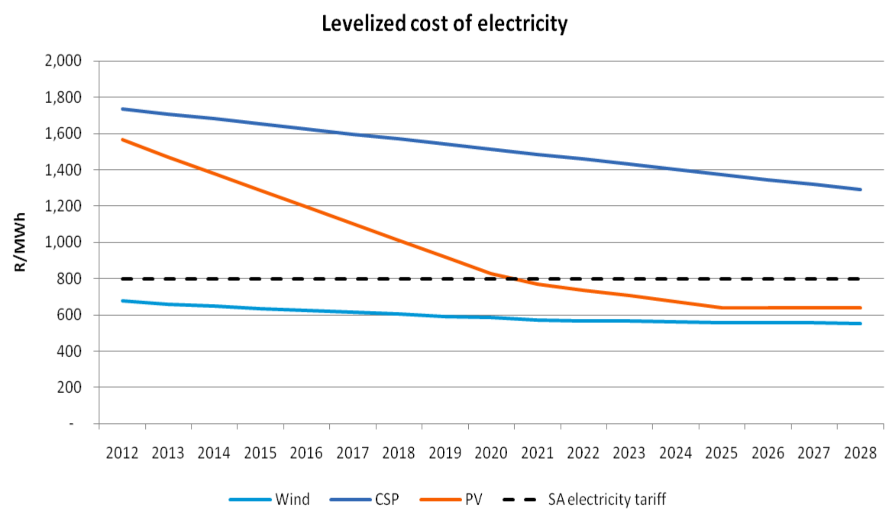
Such a target, would provide the critical mass needed to:

- **Advance industrial development** of the renewables supply chain in South Africa by providing 'long, loud and legal' signals to private investors (provided that the price was right and the commitment credible).
- **Provide a basis for export expansion** to meet regional renewable energy component manufacture, commercial management and servicing needs.
- **Contribute to energy security** by adding several percentage points to South Africa's energy reserve, an important addition during a period of critical generating shortages.
- **Address any export competitiveness threat**. Embarking on this ambitious pathway would also crucially demonstrate a national commitment to a green growth, contributing almost a quarter of the emission reductions needed for the country to get onto the trajectory needed to peak, plateau and decline emissions, by 2020-2025.[17]

TECHNOLOGY STRATEGY TO OPTIMISE COSTS AND BENEFITS

The technology mix selected is of course critical in order to optimise the balance between electricity costs and economic benefits. There is no doubt that on-shore wind delivers the lowest cost of electricity of any available renewables technology at this stage. It is already close to grid parity, and with an adequate adoption targets and secure pricing can be largely localised for manufacturing. Utility scale solar, in the form of both PV and CSP will generate more costly electricity for some time to come, but provide a different profile of economic upsides, in terms both of energy security and potential for development of technological leadership. Reflecting this opportunity, development of a solar park in Upington is currently in feasibility stage, with the aim of serving as and industrial development cluster for solar PV, CSP and other green technology.

Exhibit 7:Levelised costs of wind, solar and PV compared to current full financial cost of coal



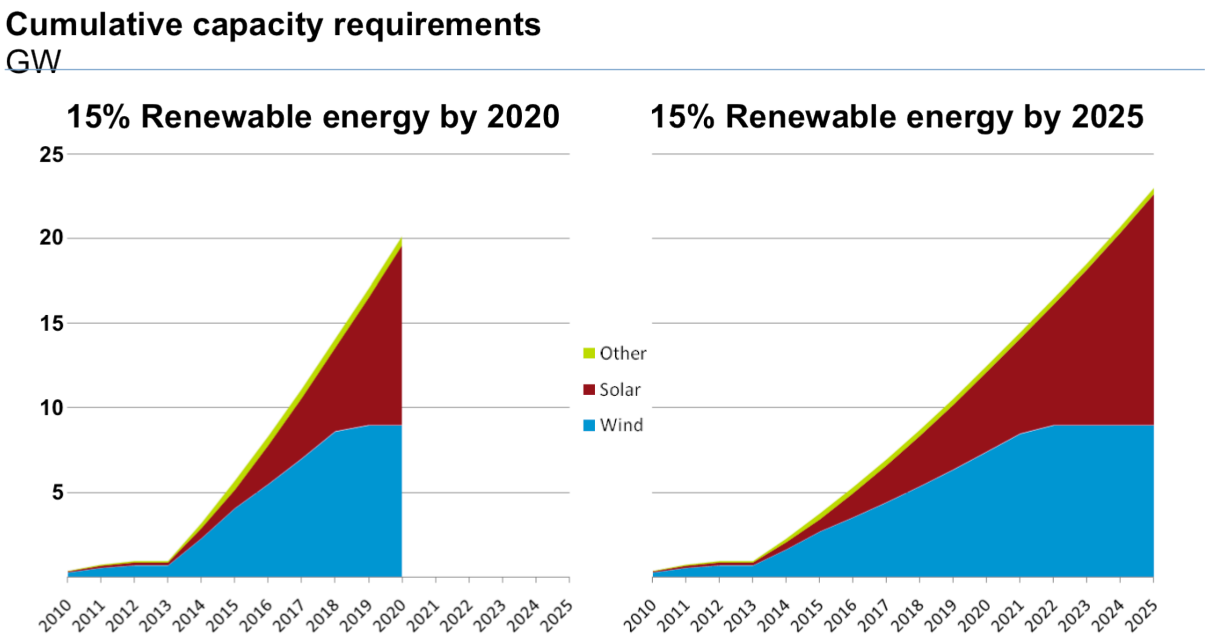
[Source: Marquard et al (2008); LTMS 1 (2007); EIA (2007); E-on UK; EIA Annual Energy Outlook (2010) Lazard (2010); NREL (2009); US DOE (2009); expert interviews; SARI model v13.0; team analysis]

In order to model the basis for a technology strategy which delivers key economic development objectives, whilst controlling energy costs, two core scenarios have been developed for ramping up renewables in South Africa. Both scenarios involve an early build up of wind power capacity, and a slowly, but accelerating ramp up of solar, in combination amounting to a combined contribution of 15% of grid capacity.

- **The 'base case' delivers renewables to meet 15% of grid capacity (20GW) by 2020**. It adds 9GW of wind up to 2018, complemented by a slower initial ramp up to 5GW of the more expensive solar option, in the same time. After 2018, when solar prices have come down significantly, due to both local and global learning curves, this scenario includes a further ramp of solar capacity by a further 6GW in two years. Other more minor sources including small hydro and landfill gas also provide a small amount to the grid.
- **The 'slower rise' case builds up to supply 15% of the grid (23GW) by 2025**. This means by 2020 it delivers 7GW of wind and 5GW of solar, building up to the additional capacity in the last five years.

These scenarios are aligned with the approach and the principles established in the on-going development of the Integrated Resource Plan, which has a vision for large scale renewables roll out, to drive industrialisation. However they both offer a more ambitious ramp up than could be viable through financing from the domestic electricity tariff alone. Both scenarios could accommodate the additional capacity offered by the Upington Solar Park initiative which plans to produce 5GW of solar power over a 10-year deployment horizon. Finally, they are consistent with the Long Term Mitigation Scenarios developed through extensive research and a multi-stakeholder process in 2008.[18]

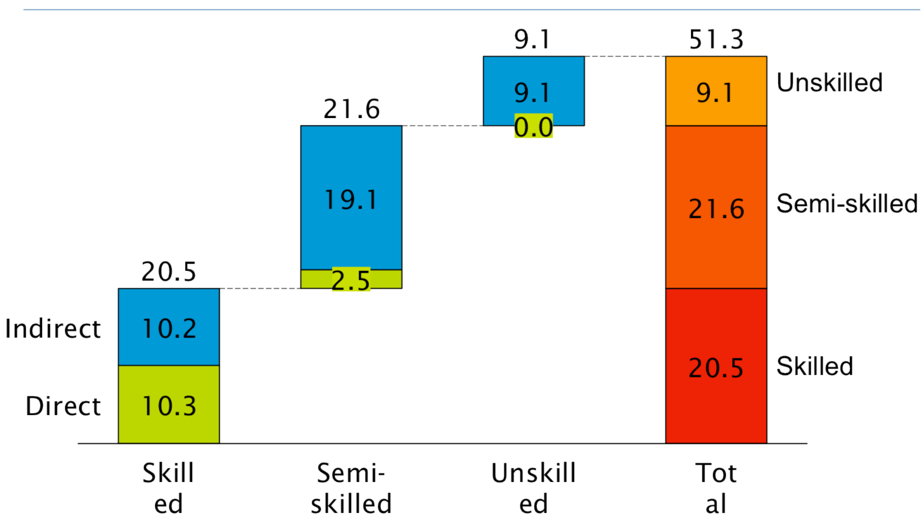
Exhibit 8: Cumulative capacity requirements for ramp up of renewables to 15% of the grid, GW



[Capacity factors source: Marquard et al (2008); LTMS 1 (2007); EIA (2007); E-on UK; EIA Annual Energy Outlook (2010); Lazard (2010); NREL (2009); US DOE (2009); expert interviews; SARI model v13.0; team analysis]

Our analysis indicates that developing this critical mass of renewables could create 35,000- 50,000 new jobs. Based on existing experience of job creation from renewables, and studies of the potential in South Africa we estimate that developing 20 GW by 2020 would result in the creation of over 50,000 new jobs, largely for skilled and semi-skilled workers. These include 13,000 direct jobs and 39,000 indirect jobs. In the case of the slower ramp up 35,000 jobs would be created. The vast majority of direct jobs created would be in skilled manufacturing and engineering (these include both upfront jobs in construction and on-going jobs in manufacturing, operations and service). This builds on South Africa's existing capacities, and supports the industrial development priority to develop labour-absorbing, internationally competitive manufacturing industries.

Exhibit 9:Job creation from a critical mass of renewable, thousands



[Source: Direct jobs: breakdown estimated from Agama (2003) "Employment potential of renewable energy in South Africa", 2003; Indirect jobs estimated through Department of Labour, "Job opportunities and employment in the South African Labour Market", 2010; team analysis; SARI model v13.0: Base Case Scenario]

A successful technology strategy for localisation is critical for creating new and sustained job growth. The majority of the job creation potential is linked to the upfront development of renewables capacity, and component manufacturing. It is estimated that 98% of the direct jobs created in CSP will be upfront rather than in operations and maintenance. For PV the comparable figure is 90% and for wind 79%.[19] While some elements of this such as construction work and manufacture of low-value heavy components such as wind towers are easy to localise, this alone will only provide a temporary uplift, and not the basis for the development of a long term sustainable industry. A successful localisation strategy would use the first critical mass of renewables procured as a springboard for creating the specialised capacities needed to deliver more advanced component manufacture. Initially this capacity would be sustained through the ambitious roll out of the build programme up to 2020-2025 of the grid. After this the goal should be to leave a commercially competitive and domestically fundable industry able to compete in expanding regional export markets.

Technology research and consultations with developers and manufacturers indicate that localisation up to the level of advanced manufacturing could be achieved with an ambitious and well-funded procurement programme for renewables. This would mean securing localisation up to the level of gearbox, blades and bearings for wind, and controls, valves and drives for CSP, which will require strategic technology partnerships, and strong localisation criteria for power purchase bidders. Examples such as the approach put in place by the state of Ontario show that Canadian model by the State of Ontario shows such high levels of localisation can be attained within a well-structured procurement strategy.

Exhibit 10: Critical mass localisation goal for renewables procurement

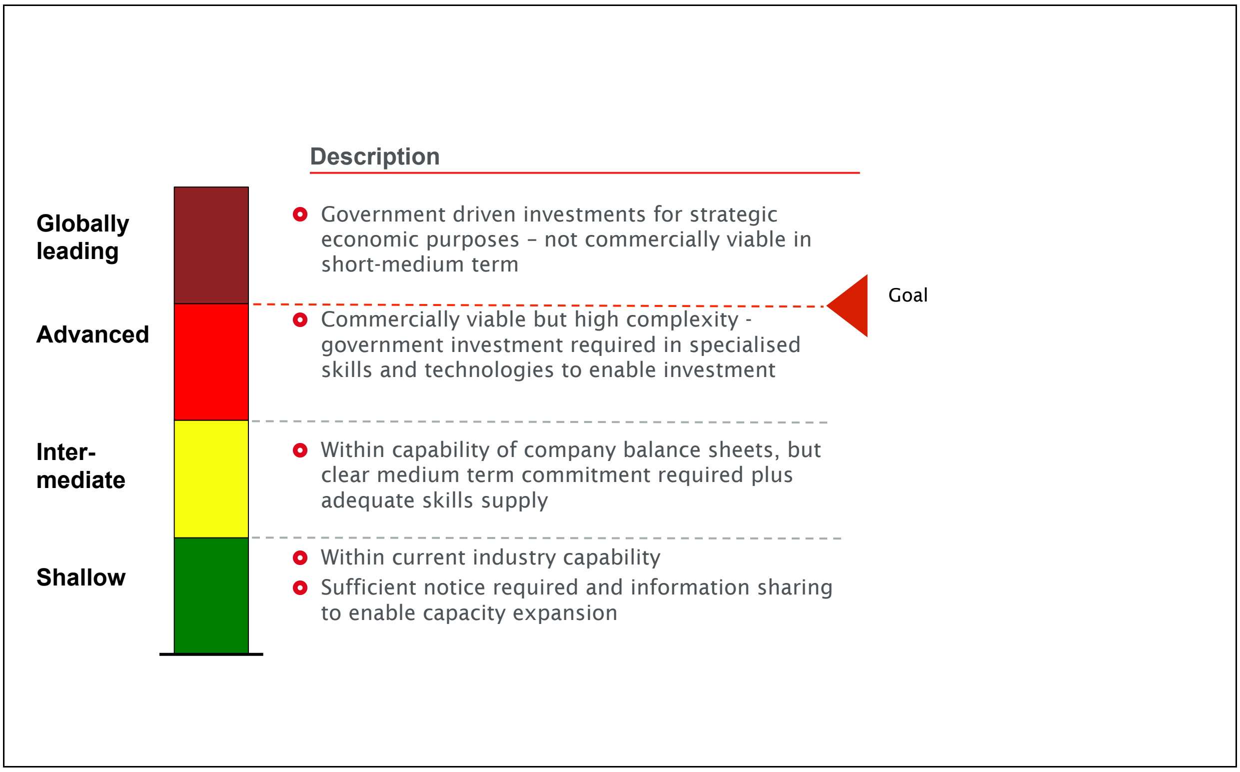
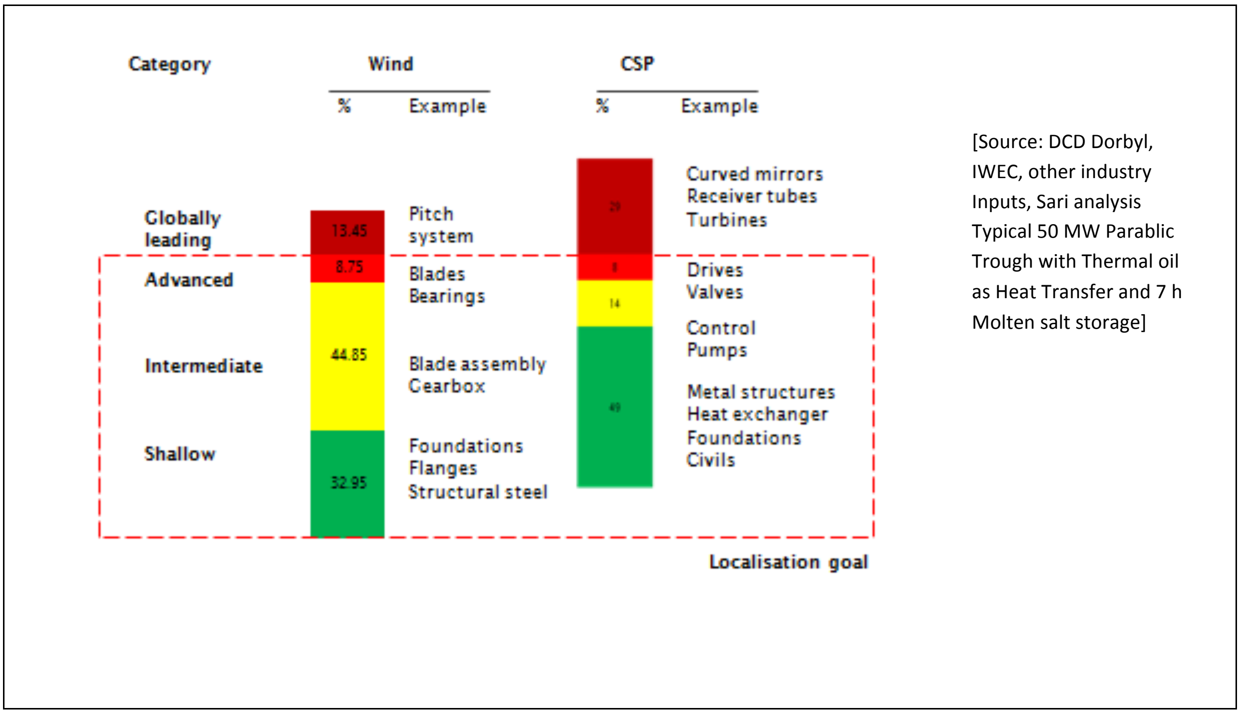


Exhibit 11: Localisation potential for two key strategic technologies



The REFIT level needed to secure this level of localisation will need to be refined through specific technical studies and detailed local development cost commitments as part of the initial process of negotiation of projects.

The current REFIT can be considered as the starting benchmark in assessing the potential cost of an ambitious procurement program. Taking into account the cost reductions which would be achieved through global technology learning curves if the current REFIT was expanded to finance procurement of 20 GW up to 2020, the incremental cost would be an average of $2.9 billion per year, or a present value of $21bn.

Taking on the burden of such incremental costs is not appropriate for the South African economy and its people. Further rises in electricity tariffs to fund the REFIT at this more ambitious scale would be a burden on competitiveness in relation to other mineral-beneficiation economies. Furthermore, rising consumer electricity costs and prices are an additional burden on consumers. South Africa has several policies and tariffs to subsidise poor households, so rising electricity costs would not directly impact on the poorest, but they would impact on the going viability of these cross subsidies and their cost to other electricity users.[20]

An innovative funding solution is needed, to enable the implementation of a strong industrial and technology strategy for renewables. Renewable energy projects are by their nature capital intensive, since they are long-term infrastructure investments with fuel costs that are low to zero. Their cost structures are therefore particularly sensitive to the cost of capital costs, and their risk profile means that these costs tend to be high. (See box 4).

Box 3: Key factors underlying high capital costs for renewables

- **Long exposure period to counterparty risk** for independent power producers.
- **Technological and natural risk** predicted generation depends on natural uncertainties in wind and sun conditions and limited availability of site and technology data.
- **High transaction cost** as new technology and less experienced developers make renewable energy projects more complicated and time-consuming from the lenders point of view, particularly where lower volumes are involved.
- **Policy risk** asrenewables returns depend on adequate regulation and standards, incentive policies and other enabling policy frameworks being put in place and implemented.

[Source: Center for American Progress/Global Climate Network (2010) Investing in Clean Energy: How to Maximize Clean Energy Deployment from International Climate Investments, and KFW (2005) Financing Renewable Energy, Discussion paper 38]

There is significant and growing international interest in the potential to combine public, and private funding flows and financial mechanisms to overcome these investment constraints holding back renewable energy development.[21] As John Podesta, Richard Caperton and Andrew Light conclude in a recent study of the potential for this approach in China, India, South Africa and Brazil conclude, "*clean energy investment requires a public–private partnership. Governments can use policy measures alongside relatively small sums of public* *money to catalyse private sector participation, enabling government involvement to help reduce the perception of risk, and consequently actual risk, among private sector investors.*"

The South African Renewables Initiative has engaged in detailed analysis and extensive consultation, both domestically and internationally to advance the design of a viable financing mechanism, and the underpinning institutional arrangements needed. The goals of this mechanism are to make an ambitious level of renewables viable in South Africa by

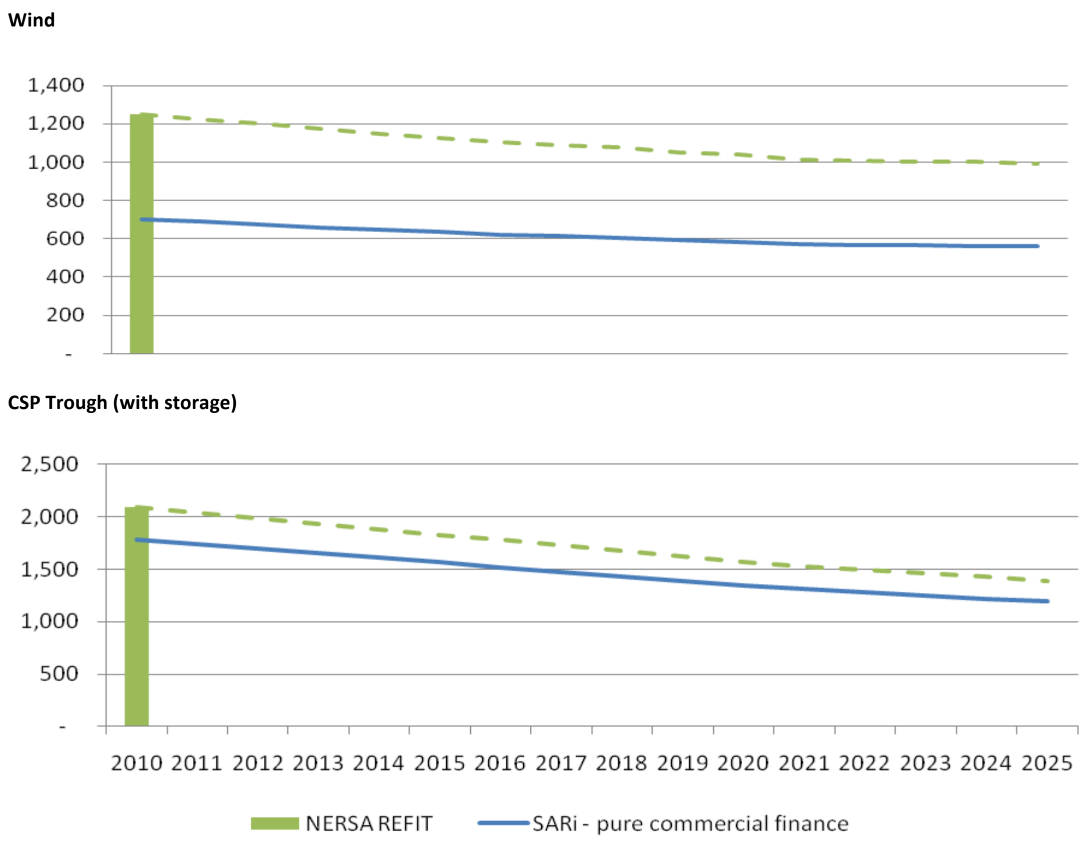
1) **Reducing the cost per MWh of renewables** by:
    - Reducing investor risk by demonstrating sound institutional frameworks
    - Reducing the cost of capital blended sources of concessional debt.
2) **Securing funding to cover the remaining incremental costs** from domestic and international sources, while ensuring a minimal burden on South African energy users and taxpayers.

BRINGING DOWN THE REFIT COST

REFIT costs can be reduced if investor risk is lowered. Higher risks require higher returns, especially for private investors. Accordingly, the current REFIT has been conceived at a generous level in order to overcome the risk premium for early developers. However bottom-up analysis undertaken as part this work indicates that the expected costs and required in South Africa, are significantly lower than suggested by the current level of REFIT, particularly for wind. An ambitious renewable energy target, supported by adequate institutional arrangements would be able mitigate many of the risks that are currently priced into the REFIT, enabling this dead weight cost to be eliminated and enabling a more competitive price equilibrium to be found.[22]

Domestic institutional, regulatory and public policy measures are crucial in reducing investor risk in order to bring down the necessary REFIT premium. The South African government has put in place a process of regulatory reform and institutional development, to address real and perceived risks and create an enabling environment for a sustainable renewable energy industry. It is developing the legal and regulatory framework to support the REFIT, and putting in place measures to enable the introduction of independent power providers into an environment where Eskom has dominated electricity generation, distribution and transmission.[23]

Exhibit 12: Comparison of NERSA and SARi LCOE estimates R/MWH



[Source: NERSA REFIT documentation; industry research; Marquard et al (2008); team analysis; SARI model v13.0]

If domestic risk reduction measures are successful, it will become possible to attract investment at the scale needed, with a lower set of REFIT prices. Overall the investment need is US$55 billion, up to 2020 to develop 20GW, or $60 by 2025 for 23GW. This does not include the additional private investment that would be attracted into the manufacturing supply chain for the renewable industry.[24]

Successfully negotiating a lower REFIT price would reduce funding gap for procuring a critical mass of renewables to $9.1 billion (for 20GW by 2020). If the ramp up of renewable capacity were slower, achieving the 15% target by 2025, the total present value of the funding gap comes down to S$5.5 billion**.** Both faster and slower scenarios would deliver a critical mass sufficient to generate significant economic benefits.

Exhibit 13: Comparing the outcomes of ramping up to 15% renewables by 2020 or 2025

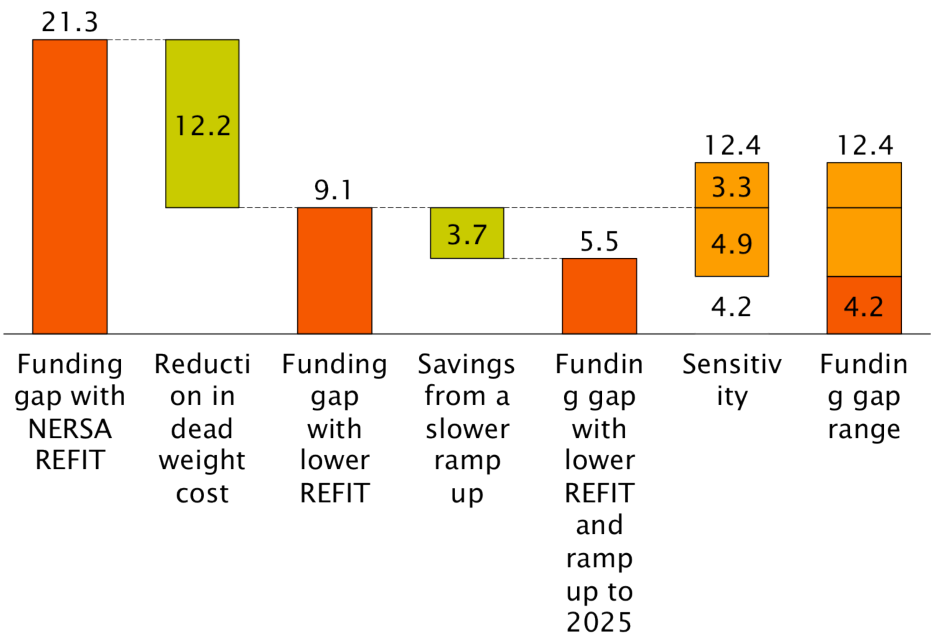
Scenario	20GW by 2020	23 GW by 2025
Contribution to low carbon targets	22%	17%
Investment required	US$ 55 billion by 2020	US$ 60 billion by 2025
Average annual incremental cost	US$ 1.2 billion	US$ 0.7 billion
Total discounted funding gap	US$ 9.1 billion	US$ 5.5 billion
Potential jobs created	50,000	35,000

[Source: SARi Economic Model v 13.0, team analysis]

The actual viable REFIT price will depend on a number of factors that could increase or reduce the actual funding necessary to make projects viable. Our sensitivity analysis considers a range of LCOE estimates, the impacts of a rising cost of coal, and the potential for further reductions in capital costs through refinancing of projects following a build up of successful experience. This gives a range for the total discounted funding gap of between US$4 billion and US$12 billion.

Exhibit 14: Funding gap can be reduced from US$21 billion to between $4 billion and $12 billion

Present value of funding needed from 2012 to 2025 $bn



[Source: Team analysis; SARI model v13.0]

BRINGING DOWN THE COST OF CAPITAL

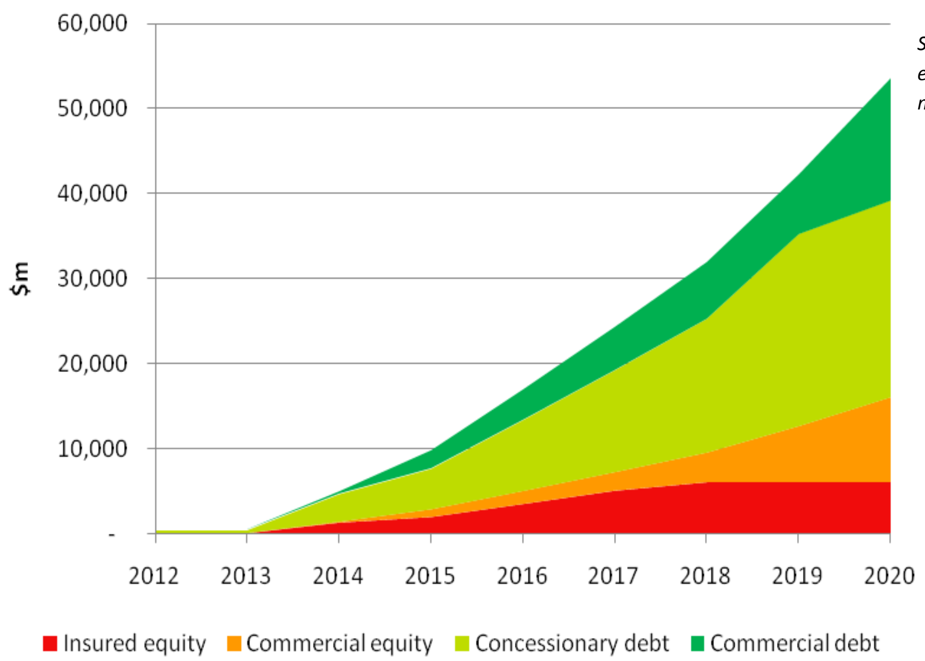
Concessionary debt, political currency hedges and investment guarantees offer a significant opportunity to further bring down the REFIT cost by reducing cost of capital and the associated incremental costs of renewables. Key available instruments include:

- Concessional loans
- Political risk insurance against policy related risks
- Currency hedges: to reduce the exchange rate risks that renewables projects are exposed to by earning revenues in Rand while repaying loans in foreign currencies,
- Loan guarantees where a guarantor takes on the project risk.

Each of these instruments addresses a barrier to private investment in renewables. Making them available to qualified projects and project developers, through a 'one stop shop' mechanism would enable the development of viable projects with lower hurdle rates of return to equity, as well as lower debt costs.

$23 billion of concessionary loans are required to support the base case scenario, together with publicly financed insurance products to cover $6 billion of equity. If this could be secured and negotiated internationally as part of an international cooperation arrangement it would bring down the cost of capital and reduce transaction costs bringing more projects, more quickly into development. Concessionary loans would combine with an increasing volume of commercial debt and equity to give a total investment growth to South Africa, worth $53 billion.

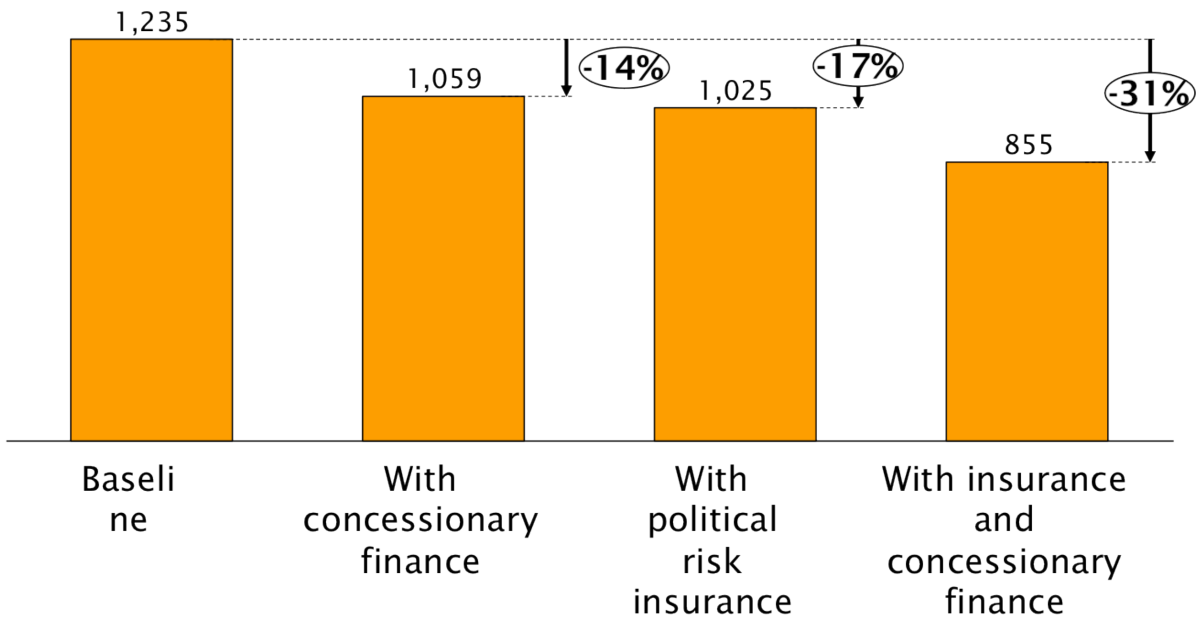
Exhibit 15: Investment flows for critical mass



Source: Team analysis, expert interviews; SARi model v13.0

Applying these instruments optimally across the whole build program, would result in a reduction of the annual average gap by more than 30%, reducing the annual gap to less than $US1 billion (the range is between $US 0.4 billion and $US1.1 billion based on the underlying LCOE factors considered in the sensitivity analysis).

Exhibit 16: Concessionary debt and political risk insurance reduce the funding gap to US$ 855

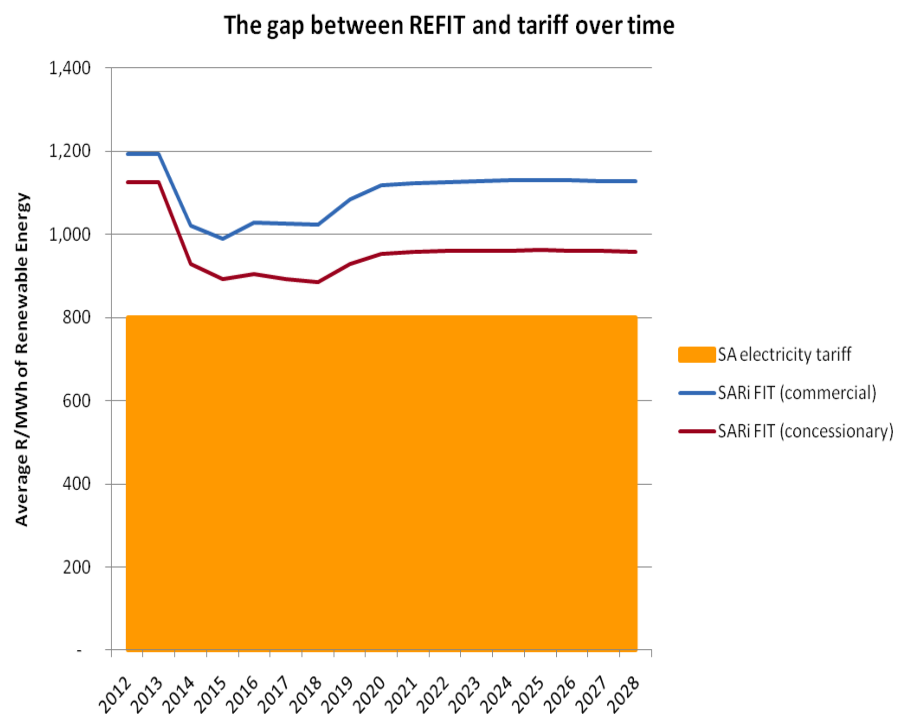


Assumptions:
(1) Concessionary finance reduces cost of debt from 11.5% to 8.5% nominal,
(2) 8.5% nominal cost of concessionary debt includes 2.5% hard currency denominated borrowing cost and 6% ZAR hedging cost; (3) Political risk insurance reduces cost of equity by 3% after netting purchase cost
Source: Expert interviews; team analysis; SARI model v13.0

FUNDING THE GAP

Concessionary debt and insurance products lower financing costs and in turn reduce the remaining incremental costs under the base scenario to a net present value of less than US$1 billion a year. This final gap which would need to be filled either by a top-up by international grants linked to climate or development objectives, or domestic funding, or some combination.

Exhibit 17: Funding gap remains after concessional debt



Base case scenario (20GW by 2020)

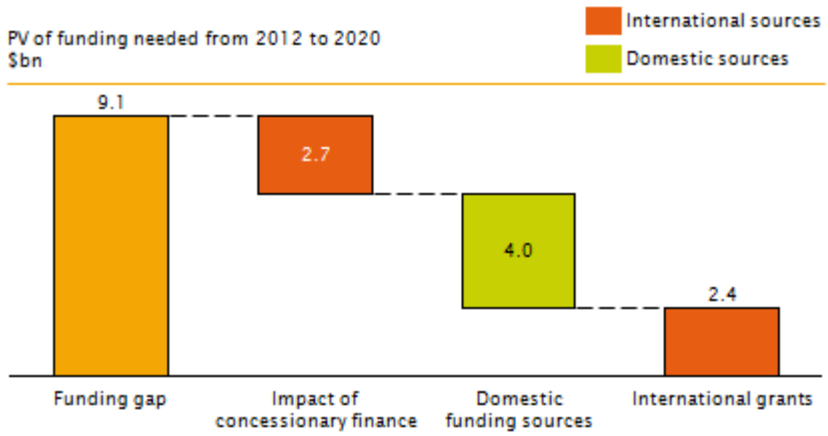
Source: Team analysis, expert interviews; SARi model v13.0

In applying the principle of minimizing the economic burden of renewables financing on South Africa, a scenario has been considered for illustrative purposes. It draws on two potential sources of domestic contribution.

- **Domestic tax revenues** at a level which could be effectively offset over the period by increased tax revenues associated with renewables investment, yielding in effect a fiscal-neutral outcome.
- **A carbon tax in the form of a green export levy**, that would equate to its estimated value to exporters facing increasingly carbon sensitive markets, thereby again effectively seeking to make the levy margin-neutral to impacted businesses.

Using this illustrative approach, over half of the remaining REFIT premium could be covered through domestic funding streams in ways that yield a commercially beneficial, and fiscally neutral outcome.

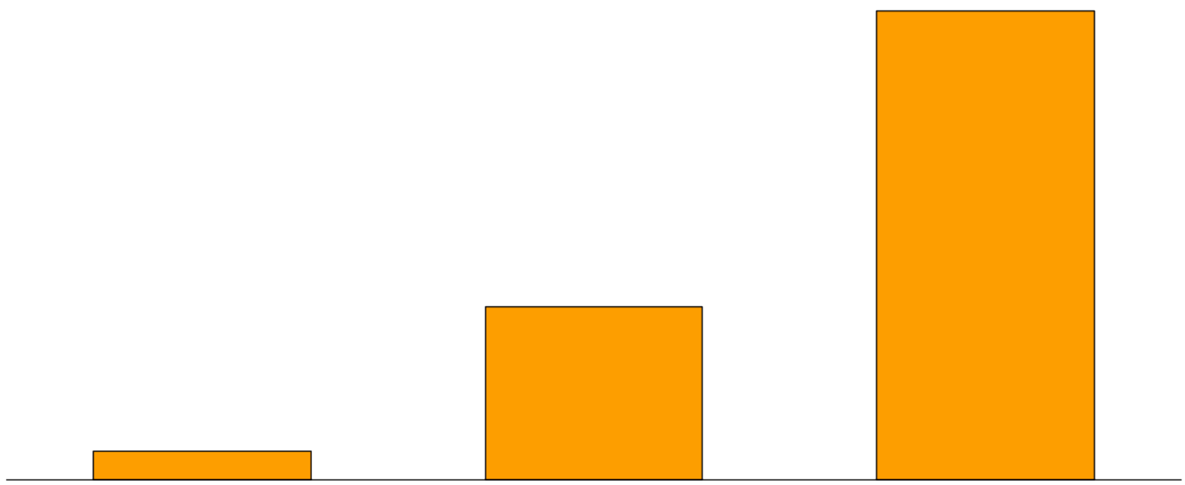
Exhibit 18: A potential solution for closing the funding gap



Source: Team analysis; SARI model v13.0

On this basis, the remaining incremental costs needing to be financed would have a net present value of US$2.4 billion - over the period 2012 to 2025, or US$ 855 million per annum over the period. From a traditional carbon financing perspective, the implied cost per ton of carbon mitigated would be US$ 5.5/ tonne CO2e over a total tons XX over the period. The leverage of such international finance would be very attractive, with each dollar of grant funding over the whole program leveraging six dollars of concessionary debt and sixteen dollars of private investment.

Exhibit 19: Each dollar of international grant funding leverages 16 dollars of private investment



Source: SARi model v13.0; team analysis
NB: International public funding costs here only include international grant funding channeled through the REFIT, not the public support for insurance products.

DEVELOPING TOWARDS COMMERCIAL MATURITY

Ultimately the aim of this program is not simply to develop a discrete volume of renewables capacity by 2020 to 2025, but to catalyse the development of a fully commercial renewables industry in South Africa able to continue to develop without reliance on international support. The transition to this end point will take place in phases as the risk profile of projects matures and the need for concessional debt publicly supported insurance mechanisms is reduced.

Exhibit 20: Finance instruments for each stage in maturity

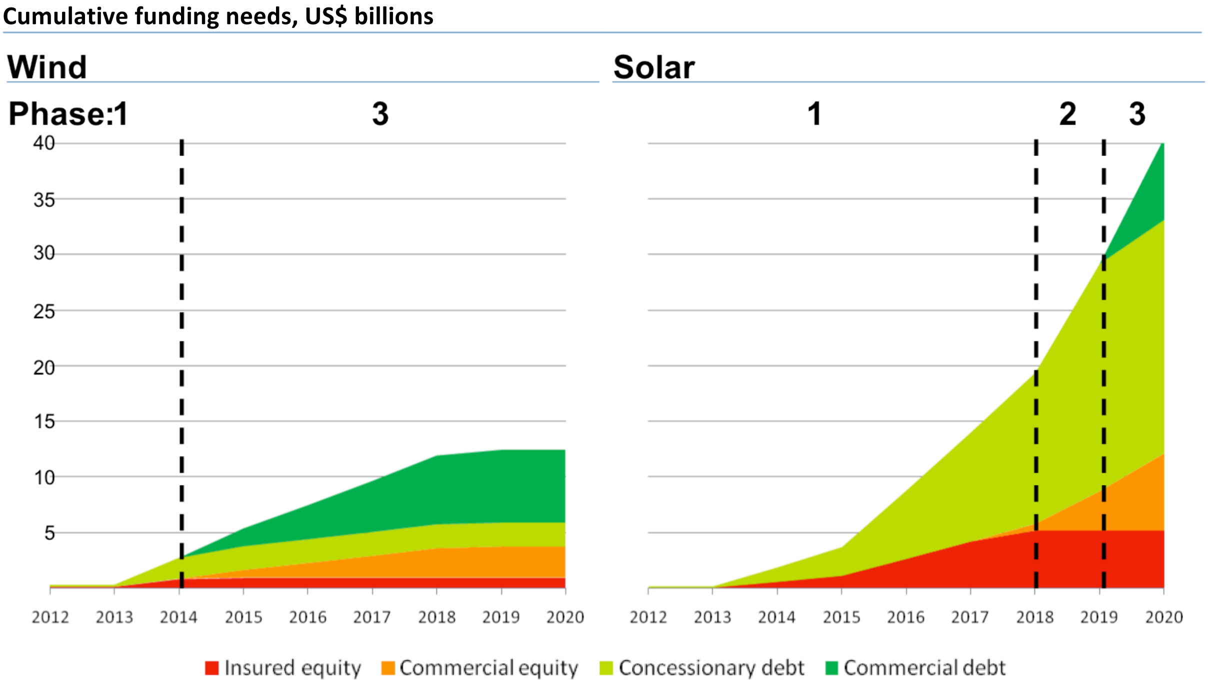
	Phase 1: Pioneering	Phase 2: Early independence	Phase 3: Fully commercial
Risk profile	• High policy and institutional uncertainty	• Policy, Institutional Alignment; Residual technology risks	• Mature markets, institutions; technologies
Description	• Support from concessionary funds to provide base capital, build investor confidence, institutional capacity and mitigate political risks	• Concessionary debt needed to support technologies not yet at grid parity	• Commercially viable markets, institutional and policy risks normalized to levels of mature, active markets
Type of debt	• Concessionary needed	• Concessionary withdrawing, commercial competing	• Pure commercial
Type of equity	• Insured against political risk, venture / high risks	• Managed / institutional risks	• Institutional / infrastructure risks

Source: Team analysis, expert interviews

For wind, once policy and institutional risks are addressed, there is the technological potential to reach full commercial maturity relatively quickly. Bottom-up analysis of the economics of wind development in South Africa indicate that commercial debt costs are likely to become supportable at realistic equity return hurdles after a first critical mass of 1.5-2.6 GW is reached.[25] At this point wind projects could move quickly to becoming commercial viable. At the same time the cost of wind power are expected to reach grid parity with coal. In the case of wind, since it will have also have reached grid parity already, no domestic funding is needed in phase 3

Solar come on stream later and require a greater use of concessional debt and publicly supported insurance products. By 2019 in our base case model, and by xxx in the 15% by 2025 scenario, the solar industry in South Africa is expected to have reached phase 3. This represents the point at which the technologies can be financed at commercial rates and any funding gap can be covered from purely domestic sources. PV is expected to reach grid parity where no domestic subsidy is needed by xxx . However CSP will still require additional incentives beyond this time. However, by this stage carbon prices and the rising cost of coal are likely to play a role in eroding the CSP premium. Initial estimates based on the IRP2 base case for long term coal power prices, and medium range estimate of carbon prices, are that CSP would be very close to grid parity by 2025.

Exhibit 21: Funding blends for wind and solar over time



[Source: Team analysis, expert interviews; SARi model v13.0]

ENSURING AN ENABLING INSTITUTIONAL FRAMEWORK

Domestic institutional arrangements, including regulatory and other policy measures, are crucial in reducing investor risk and the associated REFIT premium. Key areas where policy reform and institutional developments are needed to reduce investor risk and increase the attractiveness of investment opportunities are:

- **Ambitious targets.** Commitment to an ambitious ramp up of renewables needs to be embedded into the Revised White Paper on the Renewable Energy Policy (the South African government's overarching policy document on renewable energy currently being drafted) and the national Integrated Resource Plan, which sets out the long term costed plans for electricity generation.
- **Finalisation of the measures needed for implementation of the REFIT.** Key documents and processes such as the procurement criteria, power purchase agreement, direct agreement and the transmission and connection arrangement are still to be finalised. It is crucial that these arrangements provide the necessary balance of risk and reward to make South African renewables opportunities attractive to private investors. Issues such as co-insurance and step-in rights for lenders will need to be resolved in providing bankable agreements that meet the concerns of the market.[26]
- **Clarity on grid connection and costs**. Related to the above-mentioned measures required to be finalised for the implementation of REFIT, it is crucial that investors are assured clarity and certainty in respect of the arrangements for guaranteed and priority access to the transmission and distribution grid and the associated timing and costs. Also crucial will be clarity on which party is to be responsible for which aspects of connection to the grid and compensation to the seller for delays in accessing the grid.[27]
- **Appointment of the buyer for REFIT and clarity on the identity, composition and mandate of the Independent System Market Operator.** The government recognizes that greater competition is required in the electricity sector and that Eskom's generation and system operation systems should be separated and IPPs encouraged.[28] The Department of Energy is in the process of facilitating the establishment of an Independent System and Market Operator in an effort to level the playing field and eliminate conflict of interest between the buyer and seller of electricity in a manner that protects all players from potential market abuse.[29]
- **Grid and infrastructure maintenance build-out.** Accommodating new renewables capacity will require additional grid infrastructure. An intensive network rehabilitation program (to be funded by a combination of fiscal and tariff allocations) is planned, together with a regulatory plan to provide for maintenance and rehabilitation of the electricity transmission and distribution sectors.[30]

In each of these areas a policy process is already in place to address real and received risks and increase investor confidence. It is crucial that these processes are completed adequately, as they underpin investor risk reduction needed for development of sufficient viable projects and the resulting economies of scale and competitive pricing needed to reduce the basic REFIT price. This can best be achieved by aligning national economic, industrial, energy and climate objectives.

Exhibit 22: Developing the institutional framework for critical mass

Measures to reduce risk and increase attractiveness to investors	Key policies and instruments being developed	Enablers for critical mass
National commitment to ambitious target	• Revised White Paper on the Renewable Energy Policy • National Integrated Resource Plan (IRP2)	• Ambitious, costed renewable energy target and implementation plan. • Allocation and description of roles and responsibilities of governmental departments and agencies. • Clarity on electricity sector reform and role of Eskom and IPPs.
REFIT finalisation	• Selection Criteria • Power Purchase Agreement (PPA) • Direct Agreement	• Clear selection criteria with strong localization requirement. • Relevant, realistic and technically sound selection criteria. • Clarity and certainty on procurement process. • PPA with balanced and bankable risk allocation. • Derisking measures for investors provision for step-in rights, rights to be named as co-insured, termination rights of the buyer subject to extended cure periods.
Grid capacity, access and costs (Linked to REFIT finalization)	• REFIT Guidelines • Eskom's Connection Capacity Document • REFIT Fuel Supply, Transmission Connection and Transmission Use of System Agreements	• Clear rules on grid connection arrangements, responsibilities and costs.
Identity of the Buyer for REFIT	• New Generation Regulations (5 August 2009) promulgated under the Electricity Regulation Act 4 of 2006 (as amended)	• Procedures and process put in place to ensure transparent operation and monitoring of procurement by the buyer's office. • Credible assurances and guarantees against counterparty risk.
Independent system and market operator	• Policies and legislation to be promulgated to provide for the establishment of ISMO	• Development of ISMO.

[Source: Desk-top review; Interviews with various experts in the South African renewables industry; Brodsky,S, November 2010, Power Point Slides entitled "Presentation to the Renewable Energy Road Show"]

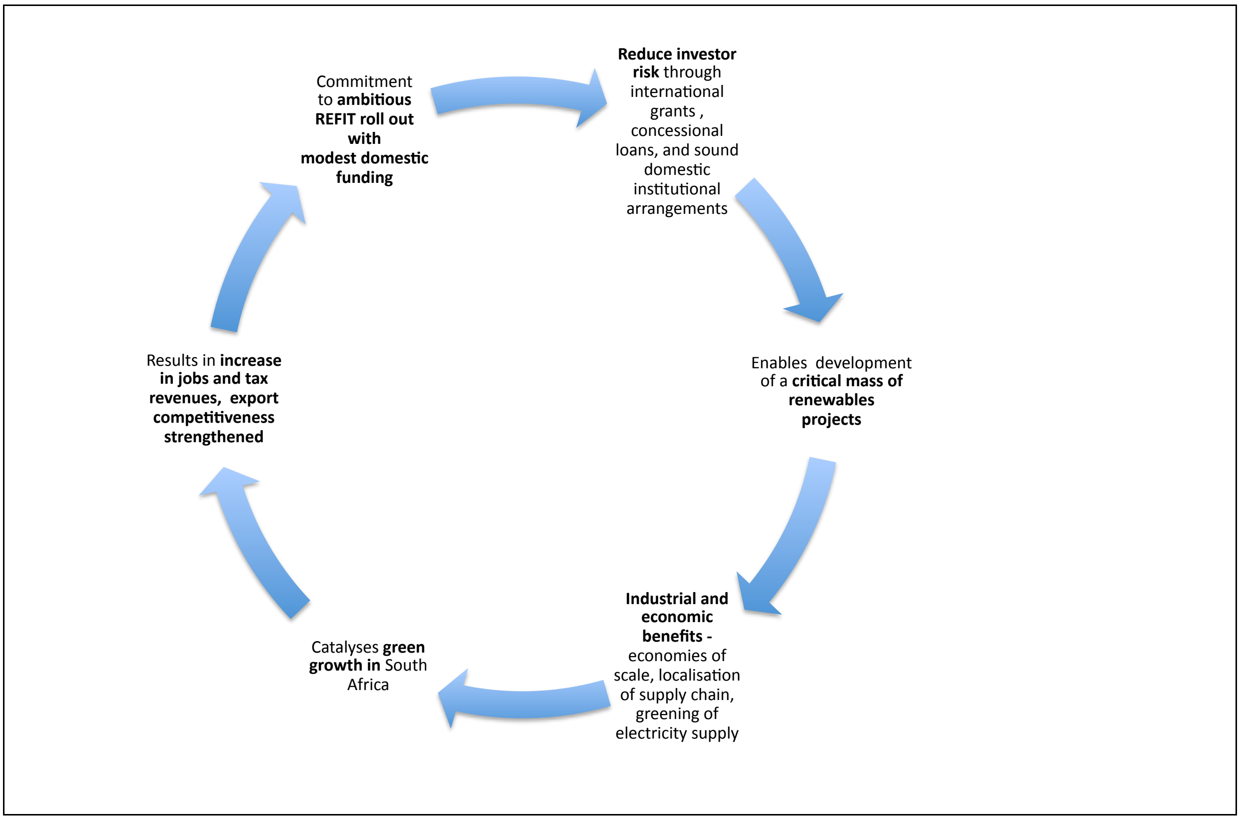
3. MOVING FORWARD TO IMPLEMENTATION

CONCEPT

The initial design analysis undertaken under the South African Renewables Initiative indicates that South Africa could initiate an ambitious ramp up of renewables at an acceptable cost to all parties. The analysis and initial design outlined here provides the basis for an initiative which if successful would:

- Deliver to 20-23GWs of renewables, or about 15% of the grid, by 2020-25.
- Use modest amounts of public funding to leverage stimulate US$55-60 billion in investment,
- Generate 35,000- 50,000 jobs.
- Contribute critical reserve generating capacity in the short to medium term to prevent the economic and social disruption of brown and black outs.
- Help to protect the competitiveness of billions of dollars of energy intensive exports in increasingly carbon sensitive international markets.
- Abate up to 1.2 billion tonnes of CO_2 emissions by 2045 or 60Mt per annum at full ramp-up. This would secure up to 22% of the emission reductions needed for South Africa to transform towards an emissions pathway that peaks, plateaus and declines by 2020-2025.

Exhibit 23: A proposed approach to unlocking South Africa's green growth potential



DETAILED DESIGN

SARi is now moving into a detailed design phase to advance the development of a coordinated domestic industrial, technological, institutional and financing strategies, connected to energy policy and supported by international co-operation. More detailed design work remains to be done, moving from technical research, to broad consultation, to negotiating the basis for a first set of deals, and development of policies. The key critical areas for the next phase of work are therefore:

- **Developing the technological strategy.** Greater precision is needed on the dimensions of critical mass and the real dynamics of the industrial strategy needed to achieve it. To date the feasibility assessment has been based on available international and local benchmarks and data points. However, local cost factors such as infrastructure, labour and grid connections need to be further refined through specific technical studies, detailed local development cost commitments and early project experience. These assumptions and technology costs need to be refined and tested, through consultation and research and through the initial process of negotiation of projects to reflect the actual levels suppliers are willing to commit to in South Africa.
- **Securing financing.** An fully costed implementable strategy will need to be developed, supported by a financing framework that is consistent with the Integrated Resource Plan (IRP2), NERSA pricing structures and treasury budgets, as well as with available and agreed sources of international support.
- **Getting started**. SARi will be implemented in practice through the negotiation of specific wedges of wind and solar deployment aligned to this industrial strategy and supported by the financing framework.
- **Establishing appropriate institutional arrangements**. These initial deals and those that follow will need to be supported by appropriate institutional arrangements aligned to South African decisions on the trajectory of renewable development, the financing arrangements and how international public support can be secured. The need to develop a preferred approach to SARi becoming an entity with an implementing role as well as a design role will be considered.

SARi is a South African Government initiative that has been championed by the DTI and DPE, but has already benefited from tapping into international knowledge and support. Similarly SARi will continue to engage with key experts and potential longer-term partners through its on-going design process, to tap into expertise and begin to identify potential longer-term operational partners.

COOPERATION

Moving forward to implementation depends on both domestic coordination and international cooperation. It requires that key actors, public and private, domestically and internationally, be aligned in their ambition and interests and in their contribution of capabilities and resources. Most of all, as for any innovative, large-scale plan, it will requires that these actors are willing to collaborate in realizing the potential.

The table below outlines the co-benefits, and the key concerns that an operational design and set of mechanisms and institutional arrangements would need to deliver and address, for each of the key stakeholders.

Exhibit 24: Aligning stakeholder co-benefits and concerns

Contributor	Co-benefit	Concern
South African Government	✓ Economic and broader social benefits of renewables development at scale ✓ Carbon mitigation, contributing almost a quarter of the emissions for to South Africa's Copenhagen Accord commitment to 2020.	**Viable and acceptable domestic contributions from South African public budgets and consumers**, approaching fiscal neutrality through tax revenues from the growth of the renewables industry.
South African Business	✓ Economic opportunities associated with renewables development ✓ Credible, certified reduction in carbon intensity for energy intensive exporters, of up to 35% by 2025 ✓ Mitigating risks of blackouts	**Globally competitive electricity supplies for South African business**, both in terms of cost and carbon intensity.
Business Investors	✓ Adequate, state-guaranteed prices for renewables ✓ Predictable and significant growth in the overall renewables mix	**Risk mitigation through financial mechanisms and long-term commitment to the sector by government.** **Viable deals and localization requirements,** given the volume and price of electricity supply contracts being offered.
International Cooperation Partners:	✓ Mitigation of 1164 Mt CO_2e abatement by 2045 ✓ Opportunities for concessional investment that advances the economic interests of domestic business communities in the renewables sector	**Cost competitive, performance based carbon mitigation** .

Over the next year the South African Renewables Initiative will provide a vehicle for bringing these key actors together in an increasingly intensive collaborative process to complete the design process and bring the initiative towards implementation.

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