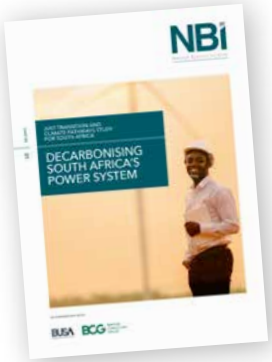
It all hinges on renewables

National Business Initiative

IN PARTNERSHIP WITH

BUSA BUSINESS UNITY SOUTH AFRICA

BCG BOSTON CONSULTING GROUP



Large scale deployment of renewable energy in South Africa can reduce ~60% of South Africa's national emissions.

South Africa's pathway to a competitive, net-zero economy hinges on the country's ability to unlock its wind and solar energy resources at scale and pace.

Renewable energy is the most cost effective way to meet South Africa's energy needs and decarbonise the power system

Three major energy mix approaches are available at sufficient scale to meet South Africa's energy demand forecast to 2050. The renewables dominant system has the lowest cost.

Renewables archetype – the least-cost solution with carbon price of R127/tonne	Renewables dominant electricity system	Coal + CCUS power electricity system	Nuclear energy dominant electricity system
DOMINANT TECHNOLOGY	Wind and Solar 52 GW + 78 GW	Coal-CCUS 35 GW	Nuclear 20 GW
REAL COST (CENTS/kWh)	100	129	116
CARBON EMISSIONS (Mt)	70	70	69
LEAST-COST PEAK-LOAD TECHNOLOGY	Gas turbine + CCGT 29 GW	Gas turbine 21 GW	Gas turbine + CCGT 20 GW
ADDITIONAL KEY SYSTEMS FEATURES	Storage 15 GW, Network investments	Carbon transport and storage	N/A
HIGH SENSITIVITY OF COST TO ...	Network cost, Peak-load management	Carbon price and CCUS cost	Build delays/CAPEX

A renewables-dominated power system is the most cost-competitive system for South Africa.

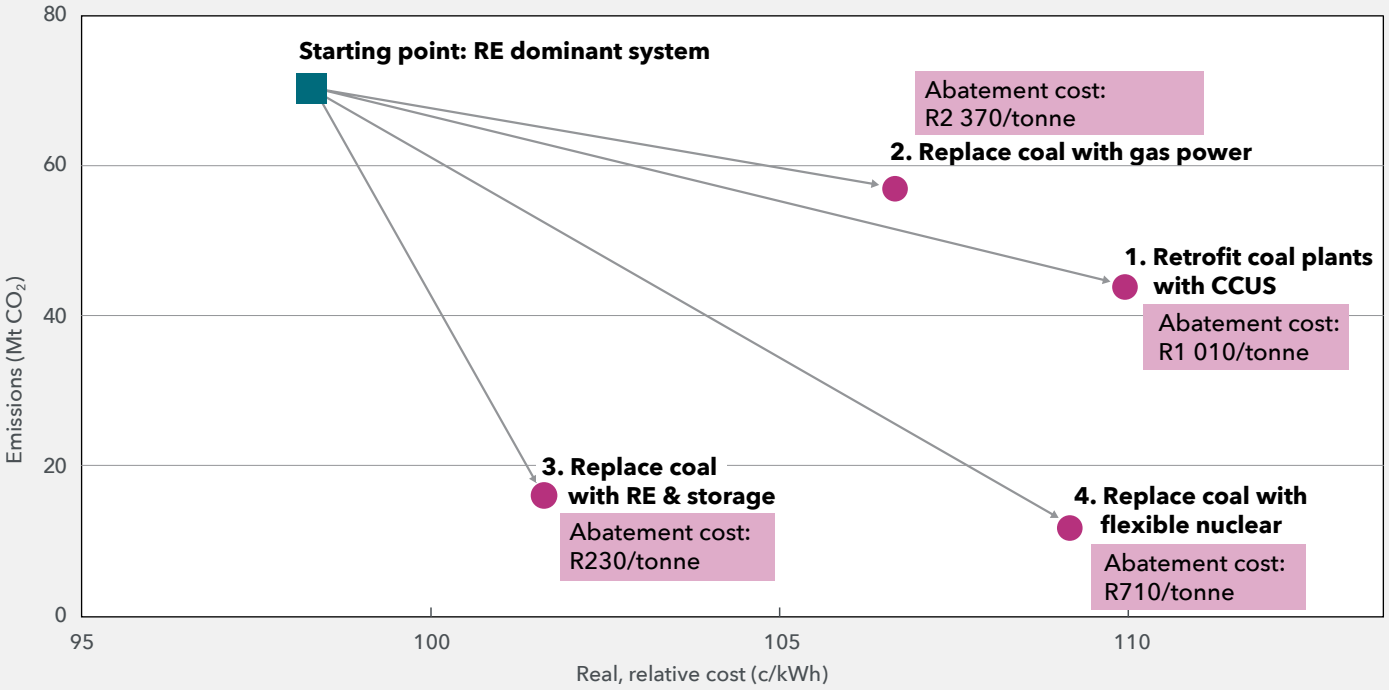
Renewables have the lowest cost and relatively narrow risk envelope or variability in cost, even under the most unfavourable assumptions.

Using natural gas as part of the energy mix for peaking will be key to managing seasonal variability and lowering system cost in early years when battery storage is still expensive.

This study was completed in partnership with the NBI, BUSA and BCG. Data was gathered from detailed modelling coupled with robust stakeholder engagement from 2021-2023. Further detail can be found in the accompanying report and broader Just Transition Pathways report series
The full report is available for download from the NBI website.

A net-zero power system is achievable by 2050 with a further ramping up of renewables

Achieving a net-zero renewable energy (RE) dominant power system will require the elimination or compensation for ~70 Mt CO_2e of residual emissions, predominantly driven by the remaining coal-based emissions. Ramping up renewables is the most affordable way to achieve last mile decarbonisation of the South African power system.

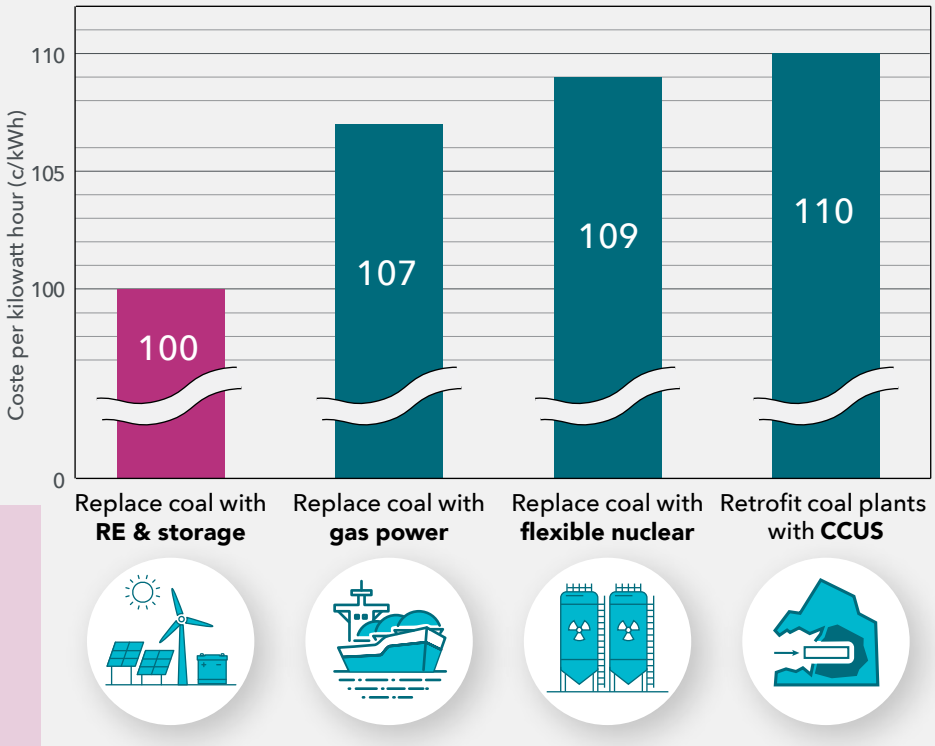


Ramping up renewable energy is the most cost-effective option at about 100 cents per kilowatt hour (c/kWh) (Option 3 on the chart above).

Compared to:

- *Option 1*: 110 c/kWh to upgrading the existing coal plants with new technology)
- *Option 2*: 107 c/kWh for baseload gas
- *Option 4*: 109 c/kWh for Small Modular Reactors (SMR)

Cost effectiveness of options for ramping up renewable energy



Terminology explained:
CO_2 – Carbon Dioxide
CCGT – Combined Cycle Gas Turbine
CCUS – Carbon Capture Utilisation & Storage
CAPEX – Capital expenditure
GW – Giga Watts
Mt – Mega tonne
SMR – Small Modular Reactors

Key outcomes needed to achieve a net zero power system in South Africa over the next 25 years

	2020-2030	2030-2040	2040-2050
Coal	Coal plants decommissioned/repowered/ repurposed according to dead-stop dates	Accelerated decommissioning/repowering/ repurposing of select coal plants	
RE and battery storage	Up to ~150 GW solar and wind capacity installed (capacity ramp-up from 2021) with battery storage to manage short-term variability		
Gas	10–25 GW gas capacity installed and utilised for load balancing as coal plants reach end-of-life		0–40 GW gas capacity mostly for peaking
Last-mile		Last-mile decarbonisation technologies (e.g., gas and direct air capture and storage (DACCS) or green H_2) deployed	
Broader power sector	• Expanded and upgraded transmission and distribution infrastructure to accommodate increased RE generation (and potential new load centres) and more embedded distribution • New power market structure with revised tariff structure • Continued research and technology development to cost effectively meet system inertia requirements		
Just Transition	• Increased local manufacturing of components for solar PV and wind, leveraging South African Renewable Energy Masterplan (SAREM) • Access to more affordable green funding, with mechanisms in place to hedge foreign exchange risks • National Just Transition strategy and roadmap, with an immediate focus on displaced workers in the coal value chain		

Irrespective of the pathway the country takes, there are a set of critical no-regret decisions that need to be made in the coming years.

Integrated policy and planning – from energy, fiscal, environmental and industrial prespectives – coupled with close collaboration and coordination of stakeholders will be critical.

South Africa has amongst the best solar and wind resources in the world, with evolving procurement and generation options for businesses

In South Africa, two dominant renewable energy technologies have emerged as leaders in the market: Solar photovoltaic (solar PV) and onshore wind.

Solar PV, harnessing the country's sunlight, is ideal for regions with long sunny days, such as the Northern Cape and parts of the Western Cape, making it a prime choice for daytime electricity generation and peak shaving.

Onshore wind, on the other hand, is better suited for coastal areas like the Eastern Cape and KwaZulu-Natal, where wind speeds are consistently high, providing steady energy production even during cloudy periods.

Deploying a renewable energy-dominant system in South Africa could unlock several value chains, fostering local job creation and economic growth

Expansion, strengthening and modernisation of **the power grid** to enable rapid renewables rollout could stimulate the **manufacturing sector**, creating jobs and reducing export reliance.

The **installation and maintenance** of renewable energy infrastructure, such as solar farms, wind turbines, and battery storage facilities, can boost the **construction industry**. The renewable energy sector has created over 38,000 jobs in construction and installation since the inception of the renewable energy independent power producer procurement programme (REIPPPP).

Developing and implementing advanced energy storage solutions, like lithium-ion batteries, can drive **innovation and technological advancements**. The South African battery storage market is expected to grow from 270 mwh in 2020 to 9700 MWh in 2030 under the base-case scenario.

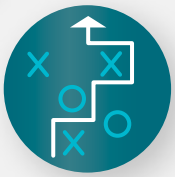
Providing **investment and funding** for renewable energy projects can strengthen the financial services sector. Investment in renewable energy projects has attracted over R209 billion in private sector funding through the REIPPPP.

Developing specialised skills and expertise in renewable energy technologies can enhance the **education and training sectors**, preparing a skilled workforce for this growing industry.

What can business do, alongside the public sector and others, to support the decarbonisation of South Africa's power system and unlock local green industry opportunities?

Commit to net zero by 2050.

Set a science-based target and report through CDP.



Develop a robust implementation plan.

Advocate for supportive regulatory environments for investment and implementation.

Work individually and with others to implement company plans, make investments and support Just Transition initiatives. Examples: Undertake workforce planning and re-skilling, explore green economic diversification opportunities, and build SMMEs into value chains.

Need help?

The NBI is working with business to identify and unlock green industrialisation opportunities for South Africa, including mapping the extensive skills required in the new economy.

NBI members can participate in three significant projects, each exploring a different set of questions:

1

How can my company unlock renewable energy at scale, through the procurement and generation of renewable electricity?

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How do we skill the South African workforce in a coordinated way for deployment in the new jobs being created in clean energy, in support of a Just Energy Transition?

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How can partnerships between the public and private sector help unlock localisation opportunities, and how can this inform skills development and planning?

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