WINDAC AFRICA

BREAK THE GRIDLOCK!
WIRE FOR GROWTH!

SAWEA
South African Wind Energy Association

21 - 23 OCTOBER 2025
8:00 am – 5:00 pm

CAPE TOWN, SA
CTICC 2

2025 PRESENTATION

Decarbonising Energy Energy Access Through Innovation & Inclusivity

DR KAREN SURRIDGE

23 OCTOBER 2025

SPEAKER **OVERVIEW**

DR KAREN SURRIDGE

SOUTH AFRICAN NATIONAL ENERGY DEVELOPMENT INSTITUTE

PROJECT MANAGER RENEWABLE ENERGY

Who is SANEDI?

Department of Electricity and Energy

sanedi
South African National Energy Development Institute

- Technology RD&I
- Policy Information
- Data Management
- Thought Leadership
- Capacity Building
- Project Management
- Demonstration & Pilot Projects

“Decarbonising energy involves replacing carbon-emitting fossil fuels with low- or zero-carbon alternatives to reduce greenhouse gas emissions, central to achieving climate goals and sustainable development.”

Current Global Scenario

World Population

10 March 2020, 09:25

7,769,872,292	Current World Population
26,632,345	Births this year
150,322	Births today
11,180,897	Deaths this year
63,109	Deaths today
15,451,449	Net population growth this year
87,213	Net population growth today

22 October 2025, 08:43

8,253,718,709	Current World Population
106,782,840	Births this year
131,682	Births today
50,316,574	Deaths this year
62,049	Deaths today
56,466,265	Net population growth this year
69,633	Net population growth today

Climate Change

Hotter temperatures
Increased drought

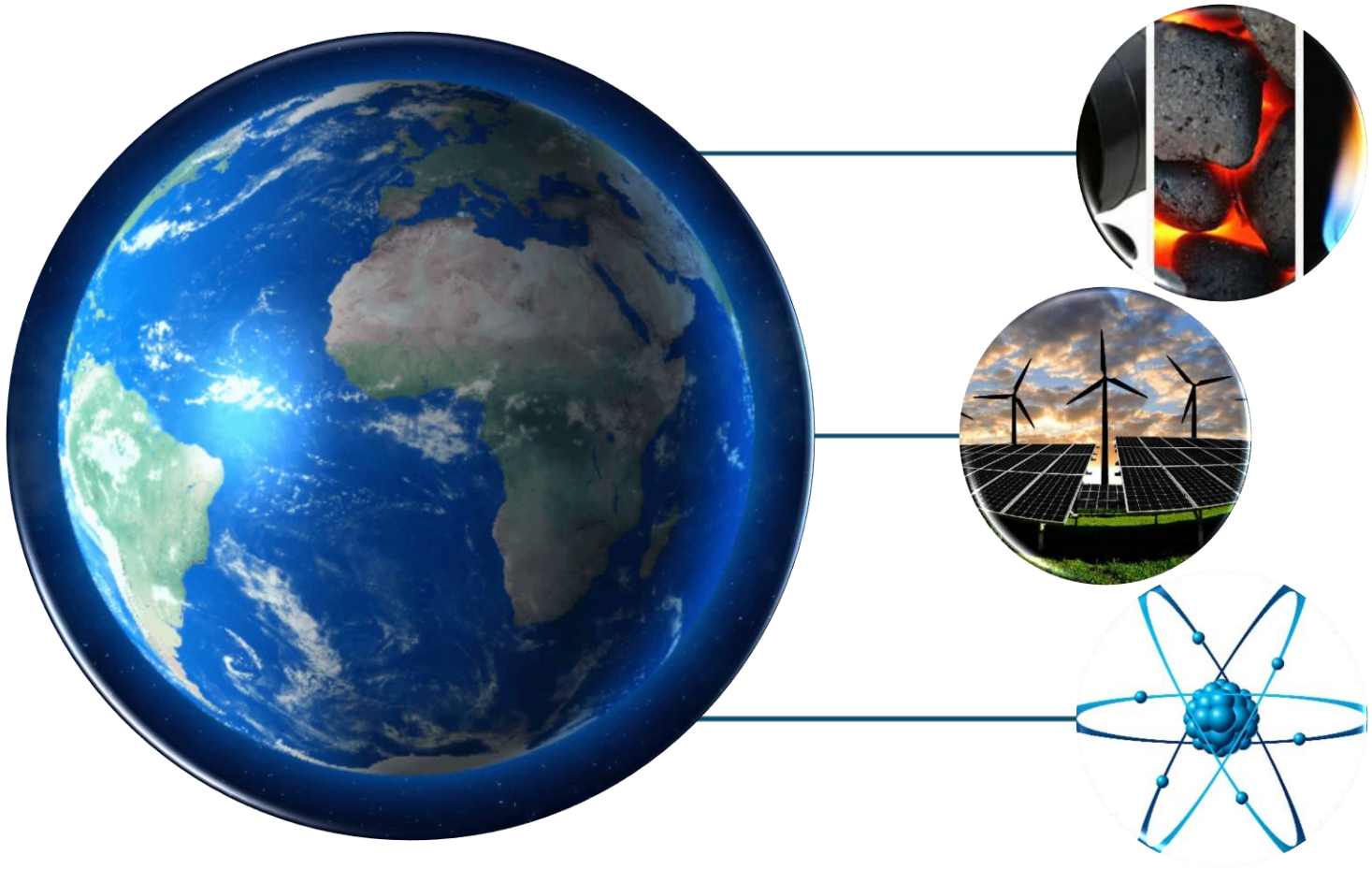
More severe storms
A warming, rising ocean

Glaciers shrinking Loss of species

Not enough food Poverty & displacement


ENERGY

Types of Energy



Why Decarbonise Energy?

Climate Action Targets:

- Meeting global climate targets, e.g. Paris Agreement (legally binding international treaty on climate change, adopted in 2015 by 195 countries, goal to limit global warming to well below 2°C and pursue efforts to reach 1.5°C above pre-industrial levels) for achieving net-zero emissions (Net zero - GHG going into the atmosphere balanced by removal out of atmosphere)

Sustainable Development:

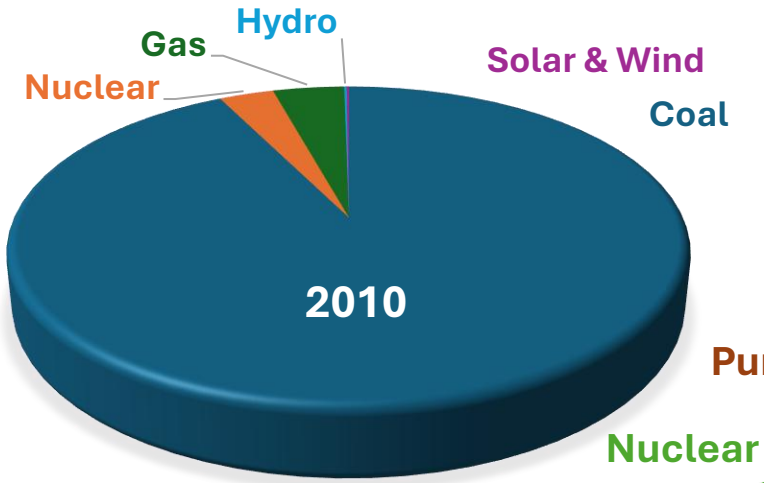
- Aligns with broader development goals, such as 2030 Agenda for Sustainable Development, contributing towards building healthier, more resilient communities.

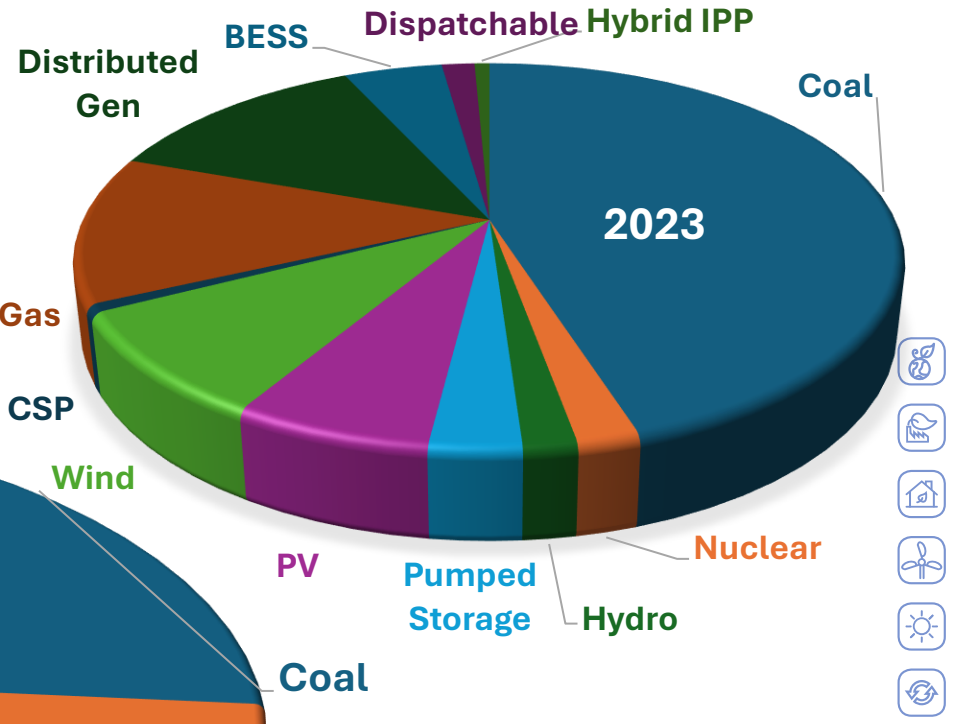
Economic Benefits:

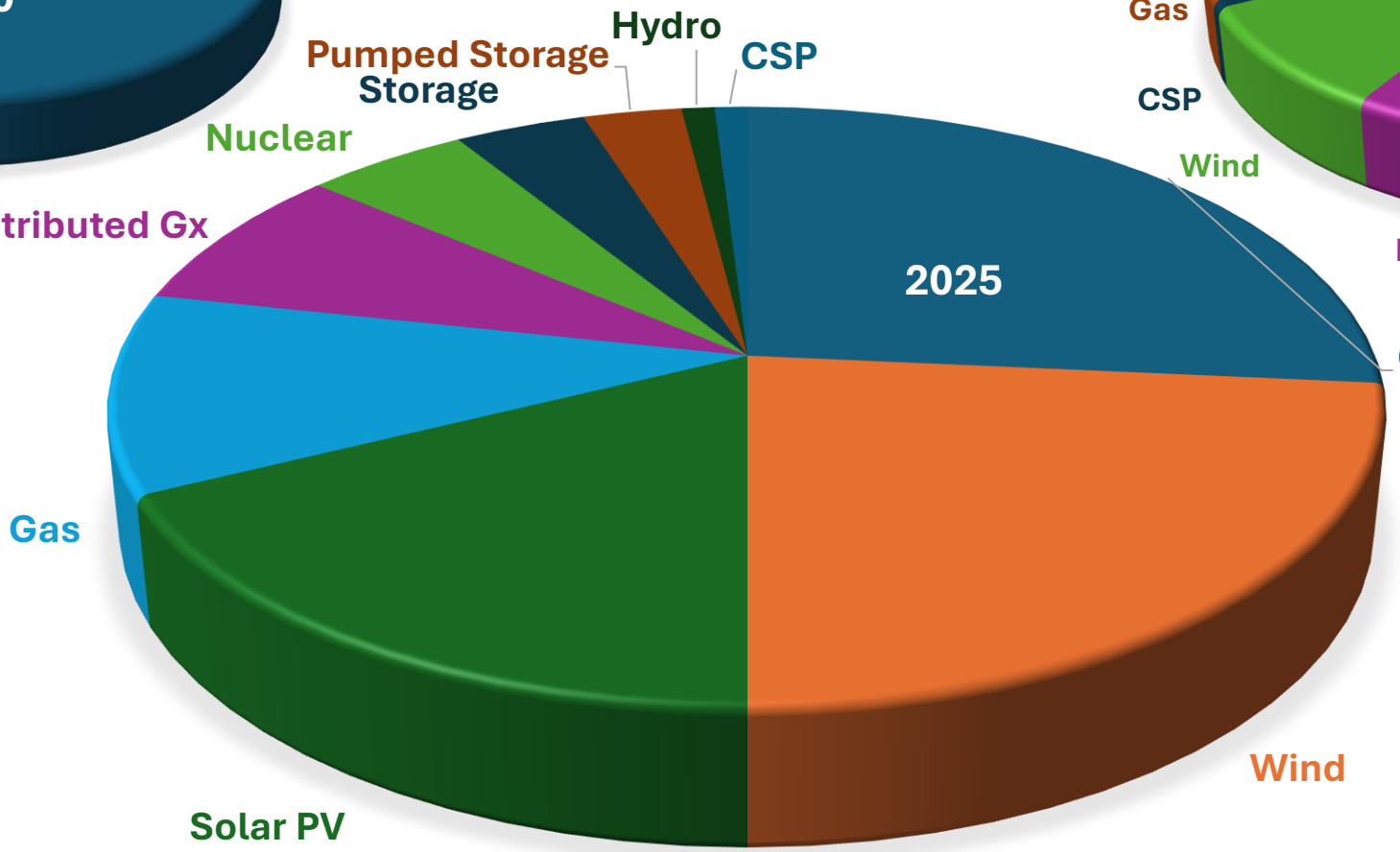
- Studies show deep decarbonisation can lead to significant net financial benefits, with lower operational costs and positive impacts on health and productivity, offsetting initial investments

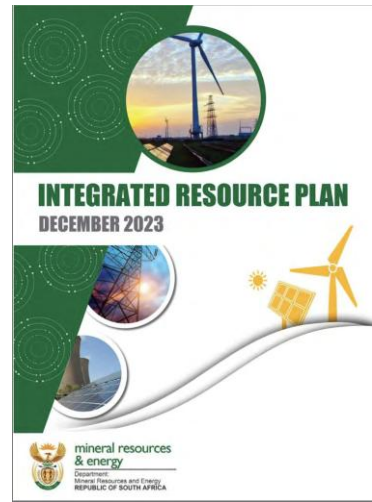
South Africa

IRP Energy Mix









SAWEA

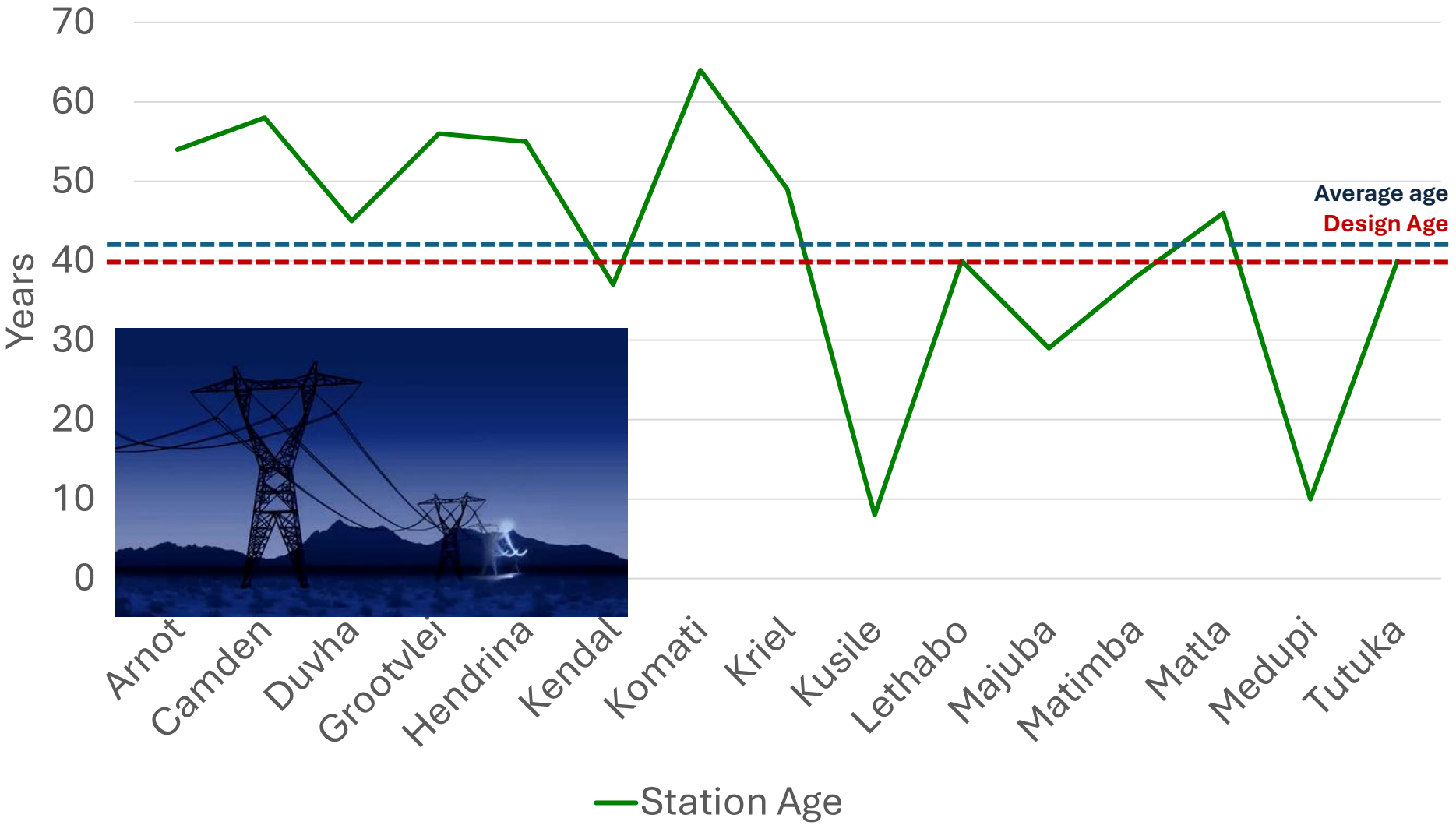
South Africa is pursuing energy decarbonisation through a Just Energy Transition (JET) strategy, focused on replacing coal-heavy power systems with renewable energy sources like solar and wind, alongside upgrading the grid and creating new economic opportunities.

Key elements include the Just Energy Transition Investment Plan (JET-IP), large-scale renewable energy deployment, and managing the decommissioning of coal plants to achieve climate goals while addressing socio-economic challenges

sonedi
South African National Energy Development Institute (SOC) Ltd.

Electricity for South Africa

Eskom Generation fleet is aging >JET



Eskom Energy Availability Factor (EAF) from Week 1, 2021, to date

Data source: Eskom; Graph: EE Business Intelligence

IF YOU DON'T SCHEDULE TIME FOR MAINTENANCE, YOUR EQUIPMENT WILL SCHEDULE IT FOR YOU

Strategies for Decarbonising Energy

Energy Efficiency:

- First Fuel
- Reducing amount of energy required by improving efficiency of use

Renewable Energy:

- Transition
- Fossil fuel to renewable energy – a core strategy for reducing the carbon intensity

Electrification Energy:

- Source shift
- Fossil fuel towards renewables, for heavy users (transport, industry & heating)

Fossil Fuel Switch:

- Substituting high emission fuels, e.g. coal to gas – short term to avoid long term direct fossil fuel use

Hydrogen Potential:

- Using hydrogen as an energy carrier
- "blue" (fossil fuels + carbon capture) or "green" (renewable energy)

Carbon Capture Utilisation/ Storage (CCUS):

- CC technology used to capture emissions at source

SA Key Interventions

Renewable Energy (RE):

Large-scale and distributed renewable energy generation central to strategy

Grid Modernisation:

Significant investment planned for extending transmission network and upgrading distribution systems

Coal Plant Transition:

Plan is in place to decommission, repurpose, or repower coal power stations as they reach the end of their economic life

Just Energy Transition Investment Plan (JET-IP):

Plan detailing the financing needs (USD 98 billion over five years) and investment priorities for transition, focusing initially on power sector

New Energy Vehicles (NEVs) & Green Hydrogen:

Also prioritised for decarbonisation efforts, alongside the power sector

Challenges for SA In Decarbonising Energy

- **Heavy reliance on coal:** SA one of the world's most carbon-intensive economies, >80% of electricity coming from coal
- **Eskom financial and operational issues:** decades of financial difficulties, and aging infrastructure, often leading to energy crises and unreliable supply, making a stable transition more difficult
- **Inadequate grid infrastructure:** current grid designed for centralised, fossil-fuel-based system. transitioning to distributed, RE-heavy system requires expansion of transmission network, upgrades to distribution systems & investment in energy storage
- **Socio-economic impact:** transition threatens jobs in the fossil fuel sectors, effecting dependent communities, therefore a "just transition" protecting these vulnerable workers and communities is imperative
- **Policy uncertainty:** Delays in updating the national Integrated Resource Plan (IRP) can create uncertainty and hesitance for investors and other stakeholders regarding the future energy mix
- **Funding gaps:** JET IP for 2023–2027 requires an estimated R 1.5 trillion in investments. International partners have pledged over US$11 billion, bridging the significant financing gap will require extensive private sector investment and further international support

Opportunities for SA In Decarbonising Energy

Abundant renewable resources: SA has world-class solar and wind resources, providing a strong foundation for developing cost-effective renewable energy at scale

Independent power producers (IPPs): regulatioins opened electricity market to IPPs, attracting significant investment (Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) attracted >US$20 billion in investment)

Strategic projects: numerous large-scale renewable projects under development/construction (solar and wind farms). Projects focused on green hydrogen, battery energy storage systems (BESS) and electric vehicles are also advancing

Economic diversification: decarbonisation seen as an opportunity to drive economic growth by attracting investment, creating new green industries and jobs, and improving energy security

Policy and planning: government has established Presidential Climate Commission (PCC) and a Just Energy Transition Project Management Unit to coordinate efforts, mobilise finance, and ensure a just and transparent transition

International support: international Just Energy Transition Partnership (JETP) provides catalytic funding and technical assistance to support South Africa's decarbonisation goals

Electricity Access:

Access to electricity is not just about lights, it is about

- Education: Lighting schools, powering digital learning
- Health: Running clinics, cold chains for vaccines
- Jobs and Economic Growth: Powering enterprises and productivity
- Dignity and Safety: Lighting homes, charging phones, cooking cleanly

The State of Access

Global 

- ~89% of people have access to electricity (2021, IEA)
- 733 million still live in energy poverty
- Progress slowing in many low-income countries

Regional 

- ~58% populationwith electricity access in 2023 (ca. 626mil without connection)
- Uneven distribution: access lower in sub-Saharan Africa (80% live in rural areas)
- Regional disparities

SA 

- ~94% electrified overall
- Remaining households (~6%) concentrated in:
- Informal settlements
- Remote rural areas
- Municipalities with low technical or financial capacity

Universal Definition for Access to Electricity - SA

Universal access to electricity in South Africa

- Availability of reliable and affordable electricity services to at least 97% of households, businesses, and public institutions across the country
- Regardless of geographic location, socioeconomic status, or remoteness
- Should meet the basic energy needs of citizens, supporting both social and economic development

Universal access ensures that all households can meet their basic electricity requirements including at minimum:

- Lighting: The ability to power electric lights for household use, reducing dependency on kerosene or candles.
- Appliances: The ability to use essential electrical appliances, such as refrigerators, televisions, and mobile phone chargers

Unlocking Access through Technology

Electrification can be accelerated through a portfolio of technological approaches tailored to geography, demand, and affordability

Grid-Tied:

Suitable for urban and peri-urban areas with existing infrastructure

- Cost: Higher upfront cost but long-term sustainability and reliability
- Advantages: Supports high consumption and economic activity

Option 1:

Lowest Cost – FBE Services

- Provides basic electricity (lighting, refrigeration, phone charging, TV)
- Suitable for the most remote, low-income households
- Cost-efficient but limited in capacity

Option 2:

Medium Cost Solution

- Supports additional appliances (TV, small refrigerator)
- Targeted at semi-rural areas with moderate energy demand
- Higher cost but more comprehensive service

Option 3:

Full Solution

- Comparable to grid-tied access
- Full support for household appliances and greater energy demands
- Best for areas with potential for economic development

Distance to Existing Grid Infrastructure

Prioritise grid extension areas within 10-15 km of existing infrastructure, cost per connection viable

Areas beyond 15 km, microgrid deployment more cost-effective.

1

2

Population Density

High population density (urban/peri-urban) focus on grid connections, extending grid more economic connecting large numbers

Low-density rural areas better suited to microgrid solutions

Geography and Terrain

Challenging geographic regions where grid extension prohibitively expensive prioritises microgrid solutions

Flat accessible regions more suitable for grid extension

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Energy Demand

Higher energy demand (e.g. small business, schools, clinics) in rural areas justifies use of MG3 microgrids or grid extension

Low energy demand households, particularly indigent communities, MG1 microgrids

Cost per Connection

If cost per connection for grid extension exceeds a specific threshold (e.g. R70,000) microgrids should be deployed, offer more affordable alternative

5

Status Quo for RE in South Africa

Policy

- Integrated Resource Plan
- South African Renewable Energy Masterplan
- Solar Exclusion Norm
- Tax Incentives

Technology

- Currently no local manufacturing capacity
- BESS still expensive means thermal potential
- No competitive localisation potential

Society

- Energy security
- Decarbonisation
- Technology awareness & understanding
- Increased uptake recently

Next Considerations & Steps

- Electricity access is foundational to economic development, health, education, and dignity
- Rural, informal, and marginalised communities still face major gaps
- Need to match technology with local context
- Policy, finance, and governance are as important as infrastructure
- Community involvement and innovation are critical for sustainability

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THANK YOU FOR LISTENING!

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