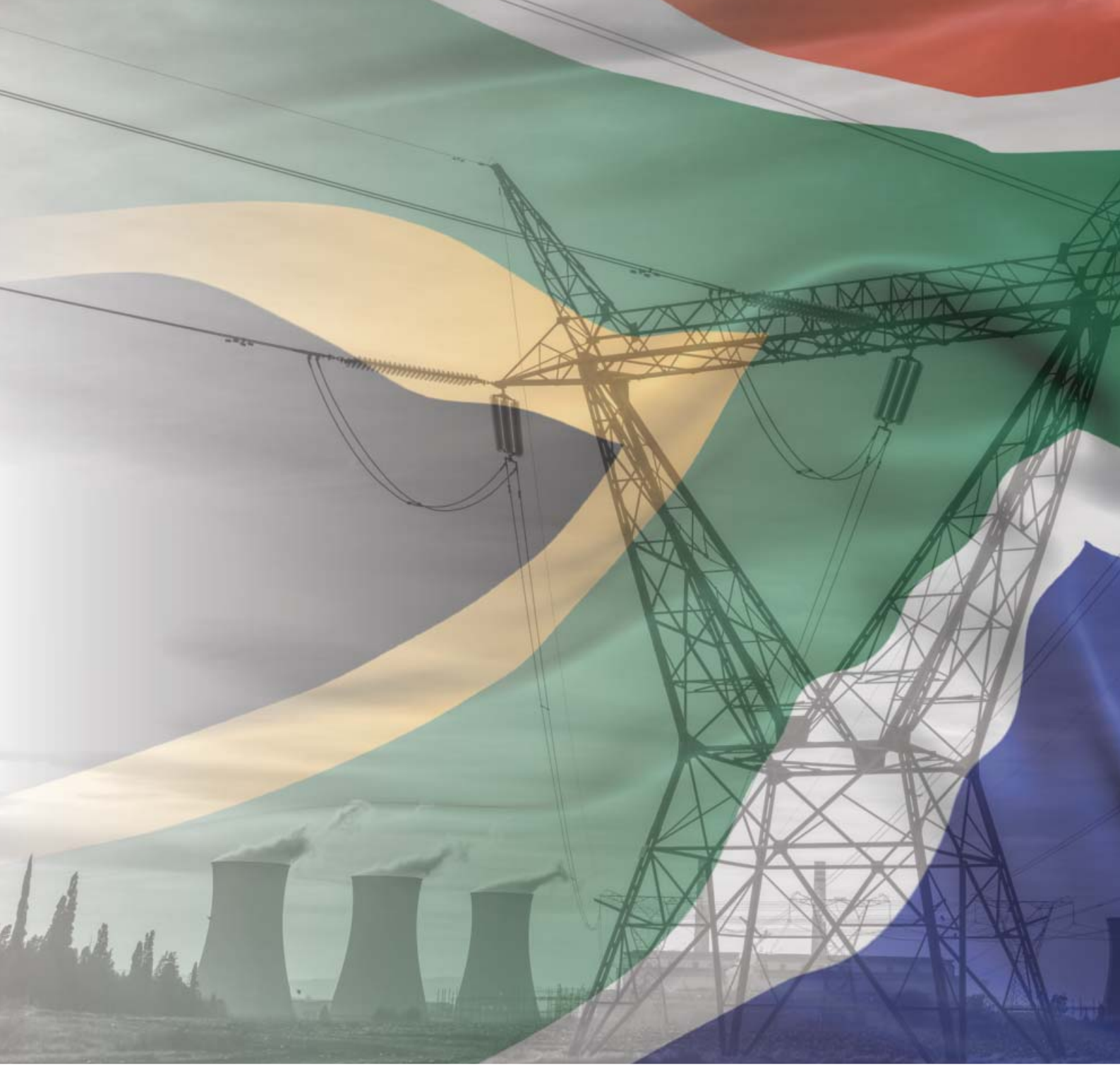


SOUTH AFRICA'S JUST ENERGY TRANSITION INVESTMENT PLAN (JET IP)

for the initial period 2023–2027

THE PRESIDENCY
REPUBLIC OF SOUTH AFRICA

MESSAGE FROM PRESIDENT CYRIL RAMAPHOSA

Across the world, we have seen the devastating impact of climate change particularly on the poorest and most vulnerable. In South Africa, we have experienced the loss of life and destruction of livelihoods from worsening fires, floods and droughts. Unless the entire international community addresses the root cause of climate change by reducing greenhouse gas emissions, our people will increasingly be vulnerable to its effects.

South Africa's commitment to tackling climate change is long-standing and unwavering. It is borne out of the understanding that although developing economies have made little contribution to global warming, we must all contribute our fair share to addressing it. Our Nationally Determined Contribution, submitted in 2021, sets out an ambitious emission reduction trajectory that is compatible with the Paris Agreement. It requires international support for its achievement.

Our commitment to implementing a long-term and well-managed transition to a low carbon economy is now concretised in this Just Energy Transition Investment Plan. The plan takes its direction from South Africa's energy and climate policies. These policies reflect our determination to diversify our energy mix and ensure that our transition to a low-carbon economy contributes to our efforts to tackle inequality, poverty and unemployment.

The plan is clear that there is no trade-off between tackling climate change and supporting economic growth. Instead, a just energy transition can attract investment, create new industries and jobs, and help us to achieve energy security and climate resilience.

We invite international and local investors to partner with South Africa to turn our vision of a better, sustainable future for South Africa and the world into a reality.

TABLE OF CONTENTS

PREAMBLE

South Africa's Just Energy Transition Investment Plan (JET IP) for the initial period of five years (2023-2027) gives effect to the historic Just Energy Transition Partnership (JETP) forged at the UNFCCC's (United Nations Framework Convention on Climate Change) 26th Conference of the Parties (COP26) between the government of South Africa and the governments of France, Germany, United Kingdom (UK), United States (US), and the European Union (EU) (forming the International Partners Group [IPG]). The JETP followed engagements between the parties on the unique economic and social challenges inherent in transitioning South Africa's fossil fuel-dependent economy in a just manner. The JETP supports South Africa in achieving the most ambitious emissions reduction range as stated in the country's updated Nationally Determined Contribution (NDC) of 420-350 megatonnes of carbon dioxide equivalent ($MtCO_2$-eq) by 2030. A distinguishing feature of the JETP is the centrality and commitment of the partners to enable a 'just transition', thus recognising the direct and indirect impact that the energy transition has on livelihoods, workers, and communities.

The vision and objectives of the JETP are articulated in a Political Declaration[1], which aim to *"establish an ambitious long-term partnership to support South Africa's pathway to low emissions and climate resilient development, to accelerate the just transition and the decarbonisation of the electricity system, and to develop new economic opportunities such as green hydrogen and electric vehicles amongst other interventions to support South Africa's shift towards a low carbon future."* The Political Declaration provides that the IPG will mobilise an initial US$8.5 billion between 2023 and 2027, subject to concurrence on an investment framework. This catalytic financing is in turn intended to leverage a much greater level of resources from both private and public sources.

In order to give effect to the JETP, a Presidential Climate Finance Task Team (PCFTT), established by President Ramaphosa in February 2022, was tasked with engaging the IPG and analysing the offer, with a view to advising Cabinet (through an Inter-Ministerial Committee [IMC]) on its composition, affordability, and alignment with South Africa's ambitions and priorities in relation to its climate change risks. An independent JETP Secretariat, supported by the Climate Investment Funds (CIF), provided technical and convening capabilities for developing the investment framework, under the guidance of the PCFTT and IPG. Figure 1 illustrates the relationship, mandate, and accountability of these structures.

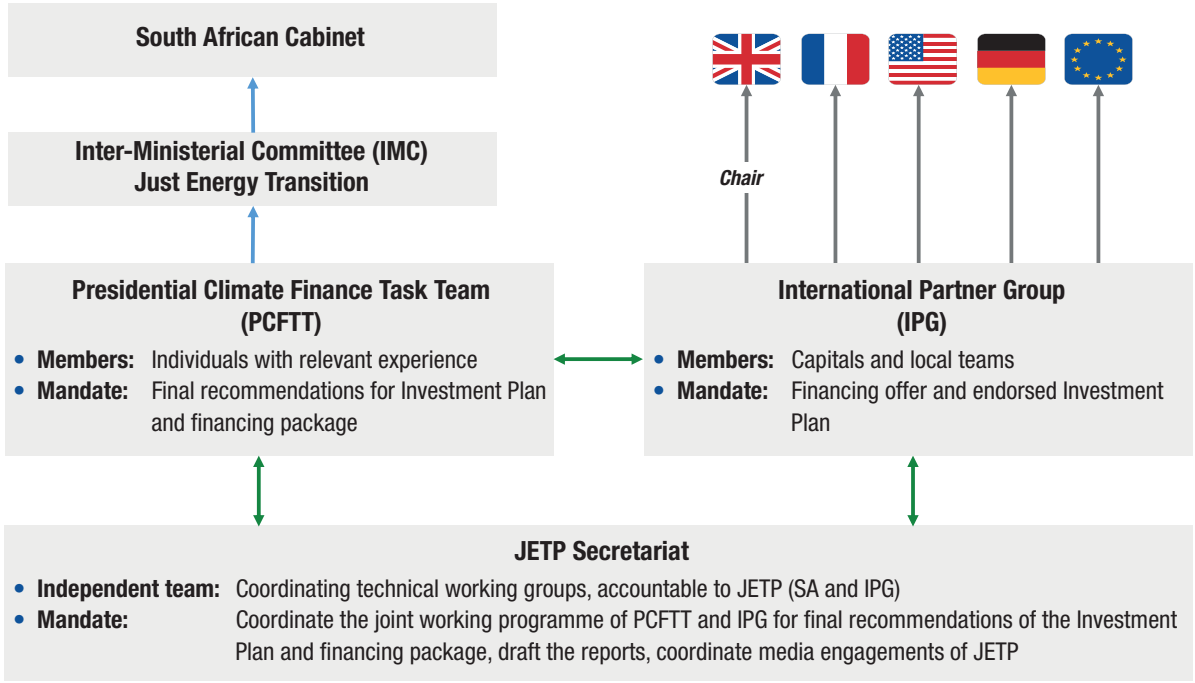
The South African government and its IPG partners recognise the milestone achieved during 2022 in developing this JET IP, which is important for advancing the partnership and attracting resources

[1] Paragraph 17 of the Political Declaration.

from other funding sources. The initial portfolio described in this JET IP, focuses on the priorities essential for catalysing a sustained just energy transition within the next five years in order to achieve the country's economic, social, and economic outcomes over the coming decades. It also considers how best the initial IPG offer of US$8.5 billion may be utilised.

The JET IP represents one milestone in a longer-term process and the partners will continue working together into 2023 and beyond. Such work includes the development of a comprehensive implementation plan, informed by more detailed information on the financing structures, timing of financial flows, and other implementation modalities, which will, inter alia, address governance, accountability, results monitoring, and evaluation mechanisms to ensure the achievement of desired and impactful outcomes, with refinements where necessary in response to unfolding conditions. This work will be informed by continued close collaboration between South Africa and the IPG, with regular progress reports on the JET IP being provided going forward.

Figure 1. JET IP governance



The JET IP was developed over the course of 2022, in a dynamic context, along with several supportive policies and processes being launched, including the Just Transition Framework adopted by Cabinet in August 2022 and far-reaching energy sector reforms that are unlocking investment in renewable energy. The JET IP was developed through a country-owned, country-led, and engagement process, which involved a series of technical working groups and stakeholder discussions with youth, labour, business, civil society, local government, and faith-based organisations. It drew on South Africa's extensive knowledge base amongst policymakers, academia, civil society, and business. The South African government has undertaken to maintain an open dialogue with the stakeholders, facilitated through the Presidential Climate Commission (PCC), to enhance the efficacy and impact of the JET IP, especially during the implementation phases ahead.

The South African government and the IPG are committed to an enduring relationship, whereby the priorities outlined in the JET IP and their resource needs guide the long-term partnership and contribute towards further resource mobilisation. The IPG offer of ZAR128 billion (US$8.5 billion)[2] is an important contribution to the overall ZAR1.5 trillion presented in this JET IP and all parties acknowledge that further public and private resources will be needed. In particular, JETP recognises the essential contribution required from the private sector and the role of philanthropic capital in contributing to the financing gap expressed in this investment plan, including developing approaches to support the just transition in affected regions of South Africa. All forms of finance are necessary to enable a sustained drive towards meeting South Africa's targeted longer-term economic, social, and environmental outcomes.

[2] Exchange rate used throughout the JET IP: 15:1.

EXECUTIVE SUMMARY

INTRODUCTION TO THE JET IP

South Africa's Just Energy Transition Investment Plan (JET IP) for the five-year period, 2023–2027, sets out the scale of need and the investments required to support the decarbonisation commitments made by the Government of South Africa.

The JET IP is in line with South Africa's updated Nationally Determined Contribution (NDC) which was lodged with the United Nations Framework Convention on Climate Change (UNFCCC) prior to its 26th Conference of the Parties (COP 26) in Glasgow in November 2021, and South Africa's Long-term Low-Emissions Development Strategy (LEDS) submitted to the UNFCCC in 2020. The NDC commits the country to reducing its emissions to within a range of 420-350 megatons carbon dioxide equivalent ($MtCO_2$-eq) by 2030. This target is consistent with a fair contribution by South Africa to the Paris Agreement's long-term temperature goal contained in its Article 2.1(a), whereby a target of 420 Mt in 2030 is consistent with a fair contribution to a 2-degree temperature goal, while a target of 350 Mt in 2030 is consistent with a 1.5-degree temperature goal. At the time of submitting this revised NDC, the South African government indicated that its ability to meet the bottom range would depend on the level of financial investment available to support its transition to lower-carbon technologies.

The JET IP is premised on South Africa's National Development Plan (NDP) 2030,[3] with its focus on tackling the country's systemic challenges of poverty, inequality, and unemployment. Accordingly, South Africa's energy transition is an opportunity for the country to drive industrial development, innovation, and economic diversification. It will take place over a number of decades in a well-planned manner, within the framework of the country's energy, climate, and other relevant policies, using both public and private sector resources, and is highly dependent on the scale and nature of financial support it can secure from the international community to complement domestic resources. The JET IP is thus an invitation to international and local investors and donors to partner with South Africa on the just energy transition journey.

The Political Declaration which was signed between the Government of South Africa and the Governments of France, Germany, United Kingdom (UK), United States (US), and the European Union (EU) (collectively, the International Partners Group [IPG]) at COP26, gave rise to the establishment of the Just Energy Transition Partnership (JETP). It undertook to *"Establish an ambitious long-term*

[3] South African Government, 2012, National Development Plan 2030: Our Future – Make It Work.

partnership to support South Africa's pathway to low emissions and climate resilient development, to accelerate the just transition and the decarbonisation of the electricity system, and to develop new economic opportunities such as green hydrogen and electric vehicles amongst other interventions to support South Africa's shift towards a low carbon future."

The Political Declaration envisaged, subject to the concurrence on an investment framework, the IPG to mobilise an initial US$8.5 billion over three- to five years to support the achievement of South Africa's low-carbon future in line with the most ambitious NDC scenario possible. The Political Declaration[4] resolved to establish a partnership comprised of South Africa and international partners, to enable:

- *"The accelerated decarbonisation of South Africa's electricity system to achieve the most ambitious target possible within South Africa's Nationally Determined Contribution (NDC) range to the extent of available resources;*
- *South Africa's efforts to lead a just transition that protects vulnerable workers and communities, especially coal miners, women and youth, affected by the move away from coal;*
- *South Africa's nationally determined efforts to successfully and sustainably manage Eskom's debt, define the role of the private sector, and create an enabling environment through policy reform in the electricity sector, such as unbundling and improved revenue collection;*
- *Local value chains (including Micro, Small and Medium Enterprises) to benefit from new areas of economic opportunity; and*
- *Opportunities for technological innovation and private investment to drive the creation of green and quality jobs as part of a prosperous low emission economy."*

3 South African Government, 2012, National Development Plan 2030: Our Future – Make It Work.

Following the signing of the Political Declaration, a Presidential Climate Finance Task Team (PCFTT) was announced by President Ramaphosa in February 2022 to engage the IPG, advise and develop South Africa's JET IP, and make recommendations on the financing package to an Inter-Ministerial Committee (IMC) convened for this purpose and chaired by the Minister in the Presidency. The IPG and the PCFTT are supported by a JETP Secretariat.

In the context of the JET IP's identified scale of need for investment in the priority sectors of Electricity, New Energy Vehicles (NEVs) and Green Hydrogen (GH_2), the JET IP outlines how the IPG pledge of US$8.5 billion will be allocated to these priorities in South Africa over five years, as set out in Table 1.

Table 1. JET IP Financing needs per sector and priorities to be supported by IPG funding

ZAR (US$) billion	Electricity	NEV	GH_2
JET IP Financing needs Total: *1 480 (98.7)*	1 030 (68.7)	128 (8.5)	319 (21.3)
IPG Total: US$ 8.5 billion indicative allocation to the JET IP			
Infrastructure	6.9	0.2	0.5
Planning and implementation capacity	0.7		0.2
Skills development	0.012		
Economic diversification and innovation	0.022		
Social investment and inclusion	0.016		

The partnership between South Africa and the IPG is thus a steppingstone towards the country's broader just energy transition plans. It seeks to galvanise and leverage further resources from the domestic and international community to support South Africa's larger five-year JET IP needs and the country's just energy transition over a longer time horizon.

4 Paragraph 17 of the Political Declaration.

JET IP OVERVIEW

South Africa faces considerable climate and energy-related risks. These include shortages of electricity supply, under-investment in the electricity system, as well as physical, social, and transition risks. High carbon-intensity of production and economic dependency on fossil-fuel value chains require specific interventions to manage and mitigate the consequences of transition, particularly for impacted workers, communities, small business, and exporters' exposure to carbon trade barriers. At the same time, embracing new economic opportunities in green technologies can drive industrial development, innovation, and economic diversification, leading to a sustainable and economically resilient future, characterised by decent work, social inclusion, and lower levels of poverty.

In considering the implications of a transition to a low-carbon economy and a climate-resilient society by mid-century, the concept of a just transition is centre stage. Following widespread consultations amongst government, business, organised labour, and civil society, the Presidential Climate Commission (PCC) concluded the Just Transition Framework which was adopted by Cabinet in August 2022 to guide South Africa's overall approach to the climate transition.

To support the goals of energy security, just transition, and economic growth, South Africa has developed this JET IP to clarify its priority investment requirements over the next five years in the electricity, NEVs, and GH_2 sectors. Just transition initiatives (particularly arising from the electricity sector's transition in the Mpumalanga Province) are elaborated within these sectors, and two cross-cutting priorities have been identified for skills development and municipal capacity as key components of the JET IP. The summary of the JET IP funding requirements is presented in Table 2.

Table 2. JET IP funding requirements per sector, 2023–2027

Funding requirements 2023–2027	ZAR billion (US$ billion)
Electricity Sector	711.4 (47.2)
New Energy Vehicle (NEV) Sector	128.1 (8.5)
Green Hydrogen (GH_2) Sector	319 (21.2)
Skills development	2.7 (0.18)
Municipal capacity	319.1 (21.3)
TOTAL	**1 480 (98.7)**

ELECTRICITY SECTOR

In the electricity sector, the infrastructure investment priorities are:

- to manage the decommissioning of the retiring coal generation fleet, in line with a revised Integrated Resource Plan (IRP), and in tandem with the development of renewable energy generation at scale and pace;
- to timeously strengthen the transmission grid infrastructure to accommodate the shift to renewable energy; and
- to modernise the electricity distribution system.

The JET IP's portfolio of interventions, if adequately financed, will provide critical support to South Africa's efforts to achieve the lower end of the NDC target range in 2030 (350–375 $MtCO_2$-eq), while also delivering upstream manufacturing employment and innovative models for social inclusion in electricity generation. Demand-side management interventions will play an important role in achieving these outcomes, as will investments by the private company, Sasol to achieve significant emissions reductions as part of the national effort.

The South African government remains committed to achieving the lower end of the NDC target range by 2030, to which the successful financing and implementation of this JET IP's large-scale portfolio of emissions-reduction initiatives will be a material contribution.

This electricity decarbonisation effort must address the whole coal belt and be accompanied by priority investments in the areas of Mpumalanga Province where coal plants are closing, in line with South Africa's energy policy. This requires a Provincial development plan guiding a new economic trajectory for Mpumalanga's sustainable, long-term regional transition away from coal, contributing to economic resilience in its communities, the restoration of its environment, the creation of more and better jobs, and an increase in human capacity and capabilities to capture new economic opportunities in the local geographies where plants and mines are shutting down. The JET IP proposes that these be achieved through:

- repowering (with clean technologies) and repurposing coal plants;
- restoring and repurposing coal mining land;
- developing local infrastructure;
- promoting economic diversification to support local livelihoods, enterprises, and job creation;
- supporting workers to transition out of coal; and
- investing in training, placements, and career opportunities for youth and workers currently in the coal value chain.

The five-year investment needs for the electricity sector transition have been estimated as set out in Table 3, Table 4, and Table 5 below. Table 3 itemises the electricity infrastructure investment need, while Table 4 itemises the Mpumalanga-specific investment needs and Table 5 itemises just transition investments for the sector.

Table 3. National electricity sector's infrastructure investment needs, 2023–2027

National electricity sector's infrastructure investment needs	ZAR billion
Coal plant decommissioning	4.1
Transmission	131.8
Distribution	13.8
New solar photovoltaic (PV)	233.2
New wind	241.7
New batteries	23.1
TOTAL	**647.7**

Table 4. Mpumalanga's just transition investment needs, 2023–2027

Mpumalanga's just transition investment needs, 2023–2027	ZAR billion
Repurposing coal plants	3.4
Repurposing coal mining land	13
Improving infrastructure for development	12.3
Diversifying local economies	24
Caring for the coal workforce	5.6
Investing in youth and preparing future generations for the transition	0.75
Planning for success	0.3
Instituting policies for post-mining redevelopment	0.05
Building capacity for success	1
TOTAL	**60.4**

Table 5. Electricity sector's just transition investments, 2023–2027

Electricity sector's just transition investment needs, 2023–2027	ZAR billion
Manufacturing and localising the clean energy value chain	1.60
Piloting social ownership models	1.65
TOTAL	**3.25**

NEW ENERGY VEHICLE (NEV) SECTOR

In the NEV sector, the focus of the JET IP is on transitioning the automotive sector value chains as the global shift to electric vehicle production gains momentum, building NEV supply chain localisation, and setting the base for NEV manufacturing and component manufacturing, to protect sector employment and promote new growth in sustainable manufacturing. The JET IP demonstrates how initiatives to incentivise investments in NEV-charging infrastructure, and the conversion of public transport and private vehicles to NEVs, will accelerate the decarbonisation of the transport sector and support healthier and more equitable cities through clean and efficient public transport. While more work is needed to plan this significant transition, a five-year investment need for the NEV sector has been estimated as set out in Table 6.

Table 6. NEV sector's investment needs, 2023–2027

NEV sector's investment needs, 2023–2027	ZAR billion
Industrial development and innovation	41.4
Public transport	6.1
Mobility emissions abatement	6.8
Early adoption and innovation	1.8
Technical assistance	1.6
NEV deployment support	70.4
TOTAL	**128.1**

GREEN HYDROGEN (GH_2) SECTOR

In the GH_2 sector, investment is focused on key interventions to set South Africa up to become a world-leading exporter of GH_2 by incubating local GH_2 ecosystems; undertaking critical planning, feasibility, and proofs of concept; and developing the necessary skills. This will support new job creation, valuable exports, and in the long run, the domestic decarbonisation of key emissions-intensive industries. While more work is needed to plan for this new industry potential, the five-year investment needs for development of the GH_2 sector has been estimated as set out in Table 7.

Table 7. GH_2 sector's investment needs, 2023–2027

GH_2 Sector investment need 2023-2027	ZAR billion
Project Feasibility costs	
Aviation Fuel	0.10
e-methanol	0.12
Fuel Cell	0.16
GH and Green Ammonia	3.70
Green Steel	0.20
Hydrogen Mobility	0.10
Infrastructure	0.13
Subtotal	**4.51**
Capital costs (for above projects)	
Aviation Fuel	8.00
e-methanol	12.00
Fuel Cell	1.40
GH and Green Ammonia	109.30
Green Steel	13.20
Hydrogen Mobility	6.60
Infrastructure	13.00
Subtotal	**163.50**
Port project development	1
Port infrastructure capital	150
TOTAL	**319.01**

CROSS-CUTTING INVESTMENTS

The first cross-cutting investment set out in the JET IP is the development of a national skills plan for a just energy transition and the future of work to ensure that skills are in place to match the growth in new clean sectors and support worker transition. The five-year investment need for skills development has been estimated as set out in Table 8.

Table 8. Skills development investment needs, 2023–2027

Skills development investment needs 2023–2027	ZAR billion
Skills hub/platform for JET and the Future of Work (high-level coordination)	0.05
Pilot Skills Development Zones in Mpumalanga, Eastern Cape, Northern Cape	1.6
Mobilise allocations to JET from existing public and private post-school education and training (PSET) funding per annum	1
TOTAL	**2.65**

The second set of cross-cutting investments targets specific support for municipalities to navigate the energy transition and play a dynamic and responsive role in the energy system for the benefit of the communities they serve. This requires functional distribution grids that can accommodate an increasing penetration of renewable energy generation at different scales and connect all residential, public, commercial, and industrial energy users. It also requires the establishment of a financially sustainable service delivery model that provides for equitable access by the whole grid community, all local energy users, including small businesses and low-income and energy-poor households. The initial five-year investment priorities for municipalities have been estimated as set out in Table 9.

Table 9. Municipal investment needs, 2023–2027

Municipal investment needs, 2023–2027	ZAR billion
Infrastructure: Distribution maintenance	200
Infrastructure: Distribution modernisation for NEVs	73
Infrastructure: Electrification backlog	45
Operational: Demand-side management	0.5
Operational: Energy access design	0.1
Capability and capacity	0.23
Collective planning	0.03
Municipal revenue modelling	0.2
TOTAL	**319.1**

FINANCING THE JET IP

The success of the JET IP will depend on the scale and availability of concessional finance, including grants from relevant sources. Limited public finance must be strategically deployed in order to mobilise larger volumes of financing, particularly from the private sector and previously untapped sources such as institutional investors.

The ZAR1.48 trillion (US$98.7 billion)[5] financing targeted for the JET IP is categorised under infrastructure, planning and implementation capacity, skills development, economic diversification and innovation, along with social investment and inclusion, as set out in Table 10.

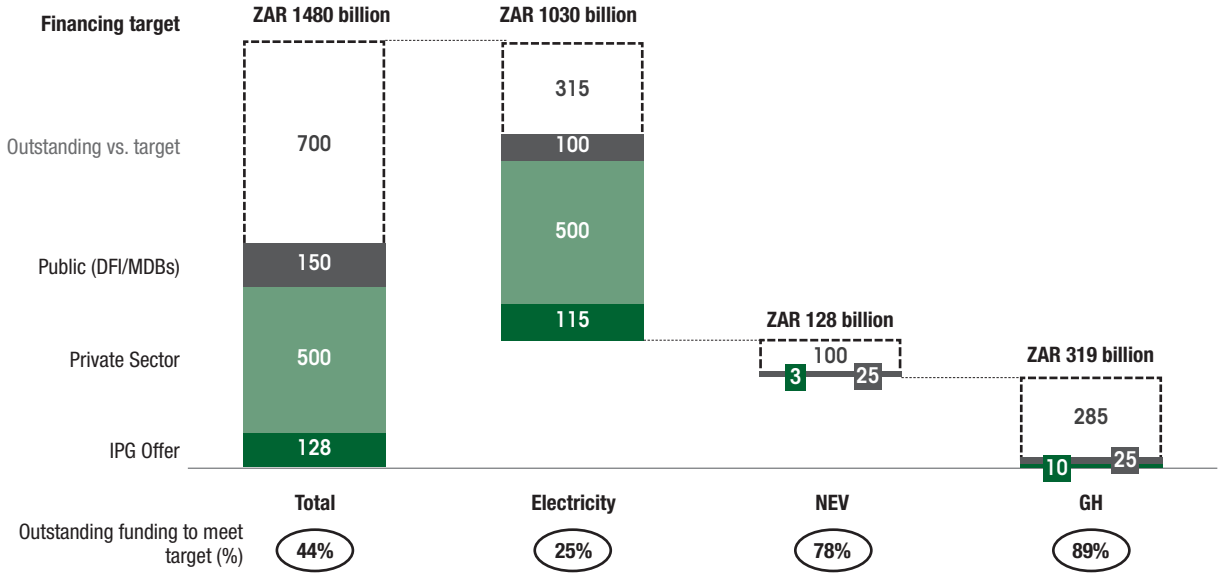
Table 10. Financing needs of the JET IP for the period, 2023–2027

ZAR (US$) billions	Electricity	NEV	GH_2	Subtotal
Infrastructure	978	83	313	1 374
Planning and implementation capacity	2.14	2	5.5	9.9
Economic diversification and innovation	40.4	43	–	83.4
Social investment and inclusion	9.6	–	–	9.6
Skills development			2.7	2.7
Subtotal	1 030.4 (68.7)	128 (9)	319 (21)	
TOTAL				**1 480 (98.7)**

[5] Exchange rate used throughout the JET IP: 15:1.

The estimated availability of funding per sector and source, together with the outstanding funding to meet targets, is depicted in Figure 2.

Figure 2. Projected funding needs and estimated availability by source



Priorities for financing from the IPG's US$8.5-billion pledge in the next five years have been allocated as set out in Table 11.

Table 11. Allocation of US$8.5 billion pledge for the period, 2023–2027

IPG US$8.5 billion allocation, 2023–2027	Electricity	NEV	GH_2
Infrastructure	6.9	0.2	0.5
Planning and implementation capacity	0.7		0.2
Skills development	0.012		
Economic diversification & innovation	0.022		
Social investment and inclusion	0.016		

The partnership between South Africa and the IPG realises an important scale of initial financing which will be deployed as catalytic investments in the JET IP. For this reason, the JET IP's priority focus for investment in state-owned infrastructure is to upgrade the transmission grid and the distribution networks to enable them to take up the renewable energy that will be generated largely by the private sector in the coming five years. This critical network infrastructure investment will leverage large-scale private investment in renewable energy, supporting both energy security and decarbonisation. In parallel, it is particularly important to seek ways, with the IPG partners, to scale up grant funding in support of the just transition investments that need to be made in the communities and workforces affected by the transition to renewable energy generation.

From the needs identified, the required grant and concessional financing is far greater than supply for this initial period of the JET IP. The scale and pace of concessional capital that can be made available in response to the JET IP, both for the initial period and beyond, will be critical in ensuring that JET objectives are met. It will require that the most optimal financing instruments are applied from across the widest range of development and climate financing sources in a manner that is affordable, sustainable, optimises the use of public funds, and leverages private sector investment at scale.

The partnership between South Africa and the IPG provides a first phase of investments in South Africa's managed energy transition. South Africa welcomes international and local investors and donors to become partners in its pursuit of a just transition to a sustainable and resilient economy.

IMPLEMENTING THE JET IP

South Africa's just energy transition will be a managed, phased, long-term process of economic, social, and environmental change. It will involve multi-year, multi-sectoral, and multi-jurisdictional initiatives with many stakeholders, including significant capacity building to manage the scale of the just energy transition. Implementation of the first five-year JET IP must therefore be based on solid foundations for a sustained, focussed, and visible effort across government, civil society, trade unions and the private sector that is able to adapt as needed over time. The Implementation Plan, to be developed in full with relevant timelines upon approval of the JET IP, will be grounded in existing South African institutions and systems and will adopt both local and global best practice in identified disciplines. Its cornerstones will be:

- **Strong governance arrangements** to ensure leadership, oversight, transparency, safeguards, and accountability at the various locations of JET IP delivery;
- **Robust management arrangements** for planning, performance, reporting, and communications at various locations of the JET IP delivery;
- **Monitoring, Evaluation, and Learning Framework** for the measurement of success and continuous improvement; and
- **Risk Management Framework** for identifying potential risks and implementing mitigation measures to reduce material risks to the JET IP.

Features of the JET IP implementation arrangements include:

- **Ministerial oversight,** governance, and political coordination;
- **National government oversight,** coordination of the country-wide JET IP to update national plans, mobilise ongoing financing, and monitor and report national results;
- **Institution-specific funding agreements** between the providers of finance and implementing institutions;
- **National Treasury**-managed sovereign loan agreements with providers of finance;
- **National intermediary institutions** (for example, the Development Bank of Southern Africa [DBSA] and the Industrial Development Corporation of South Africa Ltd [IDC]) managing disbursements of capital from providers of finance to municipalities, private companies, and non-governmental organisations (NGOs);
- **Community-level governance and trade union structures** for ongoing needs identification, visibility of projects progress, monitoring, and learning;
- **Social partner organisations** playing intermediary roles in social support investments; and
- **Private sector investors** in renewable energy infrastructure, just energy transitions, social support, NEVs, and GH_2, will also contribute to national results monitoring.

SCOPE AND OBJECTIVES OF THE JET IP

South Africa presents its Just Energy Transition Investment Plan (JET IP) for the five-year period 2023-2027, which sets out the scale of need and the investments required to support the decarbonisation commitments made by the Government of South Africa in line with its updated Nationally Determined Contribution (NDC) lodged with the United Nations Framework Convention on Climate Change (UNFCCC) prior to its Conference of the Parties 26 (COP 26) in Glasgow in November 2021, and South Africa's Long-term Low-Emissions Development Strategy (LEDS) submitted to the UNFCCC in 2020.

The JET IP is premised on South Africa's National Development Plan (NDP) 2030[6] with its focus on tackling the country's systemic challenges of poverty, inequality, and unemployment. It is located within an evolving climate response and energy policies, strengthening collaboration between the public and private sectors, and in the overall drive for sustainable development. Periodic updates to the JET IP will respond to shifts in global and national initiatives on the climate crisis and the just energy transition imperatives, and to South Africa's sustainable development challenges.

The JET IP aims to reflect the aspirations and ambitions of the South African government and its social partners in enabling a just energy transition, as an essential basis for South Africa's commitment to reduce greenhouse gas (GHG) emissions to 2030 and beyond as set out in its updated 2021 NDC. As such, it presents the initial building blocks for managing South Africa's just energy transition and broader climate response, recognising that: (i) the energy transition has significantly disruptive social and economic consequences for a country which is heavily reliant on fossil fuels; and (ii) the just energy transition gives rise to valuable new economic opportunities for South Africa. Both require support from the international community. It also locates the Just Transition considerations and in particular the need to support affected workers and communities through the transition as a central and critical concern and a key area for investment, including in reskilling, skills development, SME development and social support.

The JET IP identifies the initial priority investments to transition the electricity sector to a low-emissions trajectory. It also looks to develop green industrialisation opportunities in this sector and in the new energy vehicles (NEVs) and green hydrogen (GH_2) sectors.

[6] South African Government, 2012, National Development Plan 2030: : Our Future – Make it Work.

The JET IP identifies the initial investments that will have the greatest prospect of supporting the achievement of the current NDC target and longer-term decarbonisation, and it embeds the 'just transition' approach from the start in line with the country's Just Transition Framework.[7] In so doing, it sets out the investments needed over the next five years to establish a phased low-emissions development trajectory in line with the Paris Agreement and in the context of the country's national circumstances and policy, while both mitigating the social and economic impacts of decarbonisation and embracing the new economic opportunities.[8]

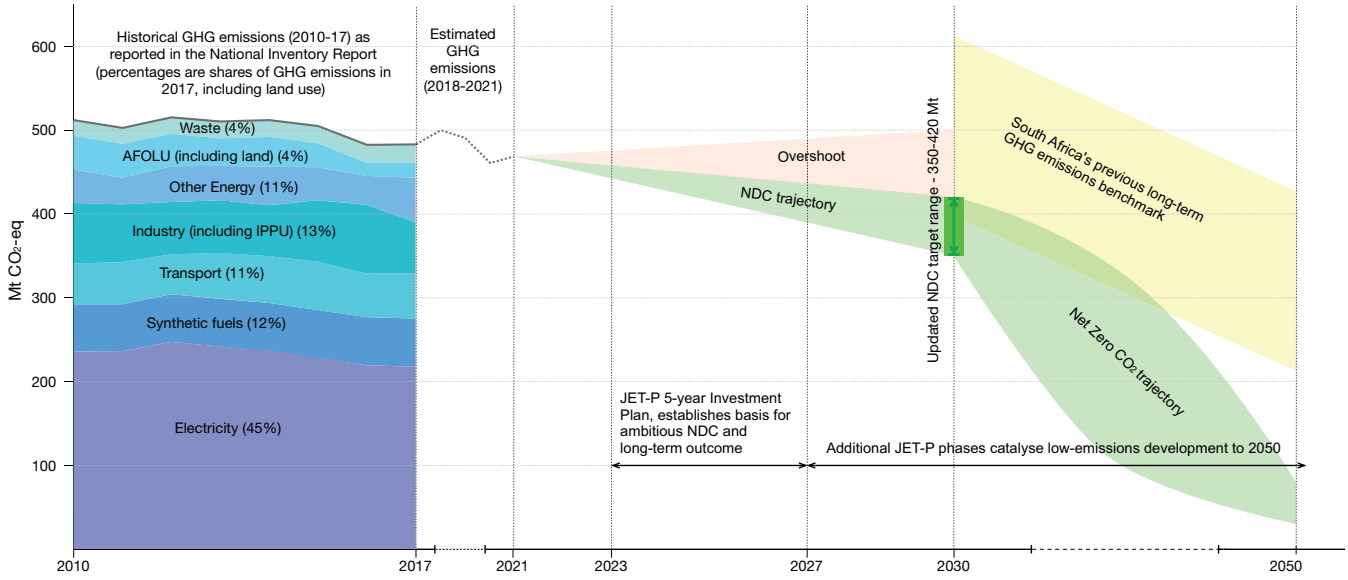
The JET IP is thus located within the context of international climate agreements, commitments, and institutional arrangements, in particular, the obligation on the developed world to support developing countries in their climate change mitigation and adaptation needs contained in the Paris Agreement and associated decisions, and specifically Article 4.5, which recognises *"…that enhanced support for developing country Parties will allow for higher ambition in their actions."*

South Africa's NDC lays out an ambitious goal for 2030, which is contingent on the provision of finance and other support that positions the country to achieve the best possible outcome in relation to the NDC. This is challenging and requires substantive actions over the next five years, which, if adequately resourced and implemented, will facilitate the "most ambitious possible" outcome in 2030. An equivalent level of ambition in support for South Africa from the international community is thus also required to achieve this outcome.

The outcome in 2030 and beyond depends strongly on what South Africa is able to achieve within this five-year time frame, and this, in turn, depends on the effective commitment and mobilisation of the necessary resources.

7 PCC (Presidential Climate Commission), 2022, A Framework for a Just Transition in South Africa.
8 https://newclimateeconomy.report/.

Figure 3. South Africa's GHG emissions up to 2017 by major sources, and estimations to 2021 (left), and 2030 NDC target range and long-term decarbonisation pathway (right)



South Africa's updated 2030 NDC target range and long-term trajectory to net-zero CO_2 emissions are considerably more ambitious than the previous long-term GHG emissions benchmark. JET IP investments are designed to catalyse climate action that will put South Africa on a path to meet its NDC targets in the most ambitious way possible and propel its low-emissions development trajectory to 2050.

Source: *Energy Systems Research Group, University of Cape Town.*

Figure 3 presents historical emissions (of which the electricity sector comprises 45%), the updated 2030 NDC target, and the long-term pathway to net-zero CO_2 emissions around 2050. The five-year investment plan is designed to achieve the most ambitious outcome possible in 2030 and establish the basis for long-term decarbonisation.

The scale of need is far greater than the initial financial offer mobilised by the IPG, and therefore, the JET IP seeks to identify how this initial offer can support a sequencing and scaling of activities that attract, leverage and crowd-in larger financing from domestic and international public and private sources. It also assumes that many areas identified for low-carbon investment will be attractive to the private sector and thus suggests that strategically deployed concessional and public finance can leverage such private investment.

The JET IP is a subset of comprehensive country climate transition planning in relation to climate change mitigation and adaptation. There is already a significant body of policy and regulation that supports the JET IP, with multiple initiatives underway.

The JET IP is designed to:

- Highlight the **actions and investments required for South Africa's economic and social diversification** away from a predominantly coal-based economy, including the creation of new industries, employment, skills, and livelihoods in geographies and sectors most affected by the transition, in particular, to ensure that the resources are available to support the workers, communities, and businesses whose livelihoods are negatively affected by the transition;
- Locate the **targeted IPG investments within the context of broader country planning for a just transition** towards a sustainable, inclusive, and climate-resilient economy, including an emissions reduction trajectory that strives to achieve the lower range of South Africa's updated 2021 NDC;
- Identify the **early and catalytic investments required** in the sectors identified in the Political Declaration over the next three- to five years;
- Identify the **indicative costs** of these priority interventions and the time scales within which they are required;
- Specify key interventions and the scale of financing required to support workers, communities, and **sectors affected** by the transition;
- Set out the **prioritisation and financing principles** that will guide the investments;
- Identify the potential for **private sector investment** opportunities and partnerships with the public sector; and
- Confirm the **enabling policy and regulatory framework** that is in place to support the implementation of South Africa's just energy transition.

The JET IP is derived from existing research, data analytics, published studies, bodies of information, policy documents, and financial information which has been collated and analysed for the purpose of compiling the JET IP. Drafting was subjected to scrutiny and analysis by experts in the respective fields, including government officials, and updated on the basis of input received. A multi-phase consultation process was also followed, as summarised in Annexure A.

The JET IP, with its priority allocations for the five-year period, was endorsed by the South African Cabinet and by the IPG in October 2022.

CONTEXT

South Africa is one of the most carbon-intensive developing economies in the world, emitting 0.6kg CO_2 per dollar of Gross Domestic Product (GDP), and the largest carbon emitter in Africa, driving 40% of the continent's total emissions. South Africa is also one of the most unequal country in the world, with the top 10% of the population owning 86% of the aggregate wealth, over 30% of the population unemployed, youth unemployed exceeding 65%, and 55% of people living in poverty.[9] The economy is fragile, growth rates have slowed over the last decade, and the optimal debt-to-GDP ratio is under strain.[10] Given this context, South Africa's climate response must support initiatives that result in positive developmental outcomes in relation to these challenges.

This section describes South Africa's major climate risks, the country's approach to a just energy transition, the approach to inter-sectoral decarbonisation investments, the enabling policy context for a just energy transition, and recent developments in reforms to the electricity sector.

2.1 CLIMATE RISKS FACING SOUTH AFRICA

The electricity sector is the source of almost half of South Africa's GHG emissions, and the ageing fleet of coal power plants (39 gigawatts [GW]) is being retired over the next three decades, with 22 GW due to be decommissioned by 2035.[11] This has significant implications for security of energy supply nationally, as the rate at which new generation capacity is currently being added to the grid is not keeping pace with the rate at which coal generation capacity is being retired. In addition, the current lack of sufficient new capacity is increasing the frequency of unplanned outages, as coal plants nearing the end of their lives are utilised more intensely. These unplanned outages, combined with a lack of reserve capacity, are currently impacting the economy severely. Coal fleet closure will directly impact about 90,000[12] coal workers in the mines and power plants of the poverty-stricken Mpumalanga Province where the sector is concentrated, having dire consequences for the extended number of livelihoods supported by workers in the sector, both in Mpumalanga and elsewhere in the country. The impact in the coal value chain is even greater, where coal-dependency exposures in the manufacturing, transport and

9 SA Quarterly Labour Force Survey Q1, 2022.
10 National Treasury Budget Review, 2022.
11 Eskom, 2022.
12 TIPS (Trade & Industrial Policy Strategies), 2020; Makgetla and Patel, 2021.

agriculture sectors will threaten the livelihoods of many more families and communities. These social risks must be addressed for a successful energy transition to take place.

South Africa's JET IP thus seeks to build the country's resilience in the face of its physical, social, and transition climate risks.

2.1.1 PHYSICAL RISKS

The Intergovernmental Panel on Climate Change (IPCC) reports show that global warming and its effects will proceed twice as fast on the African continent, with rapid desertification, bush encroachment, extreme seaboard storms, and more frequent and intense fires and floods (as experienced recently in South Africa). The country's National Adaptation Strategy[13] emphasises the need to mainstream climate adaptation measures into government planning and budgeting to build resilience across society.

2.1.2 SOCIAL RISKS

With high levels of inequality, unemployment, and poverty, the impacts of climate change for the poor are particularly severe, requiring social safety nets that will build resilience in vulnerable communities. The fossil fuel intensive and coal-based economy creates large challenges in the scale of the energy transition required for decarbonisation, with material implications for workers, communities, municipalities, and businesses that currently operate within or depend on the coal value chain.

2.1.3 TRANSITION RISKS

In addition to the substantive transition risks associated with decarbonising the coal sector, South Africa's trade systems are vulnerable because of the degree of carbon embedded in its commodities and products. Where trading partners are accelerating efforts to decarbonise, this directly affects demand for South African commodities, impacting the balance of payments and competitiveness. It is estimated that US$50 billion is the value at risk for the South African economy arising from the energy transition.[14] The anticipated introduction of carbon border tax adjustments on imports and other similar measures, in keeping with net-zero pledges, in EU, US, and UK, will expose more than 50% of South Africa's export value to increasing carbon tax levies.[15]

[13] https://www.environment.gov.za/sites/default/files/docs/nationalclimatechange_adaptationstrategy_ue10november2019.pdf.
[14] Climate Policy Initiative, 2019, Understanding the Impact of a Low Carbon Transition on South Africa.
[15] World Integrated Trade Solutions, 2018.

2.2 SOUTH AFRICA'S APPROACH TO A JUST ENERGY TRANSITION

The just transition focus in South Africa aims to achieve a quality life for all South Africans in the context of climate change. Cabinet recently approved the National Just Transition Framework – developed through a multi-stakeholder engagement led by the PCC, and building on the inclusion of a just transition in the 2011 White Paper, Chapter 5 of the National Development Plan, a previous work by the National Planning Commission (NPC) on just transition pathways,[16] along with extensive work on the topic by other governmental[17] and non-governmental institutions.[18] Notably, in 2021, the Just Energy Transition framework by the Department of Mineral Resources and Energy (DMRE) identified the need for inclusive, people-centric interventions to deliver a just transition in the mineral and energy value chains. The DMRE framework notes the importance of managing the socioeconomic impacts of an energy transition for coal-dependent towns in order to minimise and mitigate against social risks and protect the vulnerable, while maximising the opportunities of structural transformation.[19]

While the scope of defining a just transition varies internationally,[20] the National Framework for a Just Transition provides a definition of a just transition that is appropriate to South Africa's context:

> *"A just transition aims to achieve a quality life for all South Africans, in the context of increasing the ability to adapt to the adverse impacts of climate, fostering climate resilience, and reaching net-zero greenhouse gas emissions by 2050, in line with best available science. A just transition contributes to the goals of decent work for all, social inclusion, and the eradication of poverty. A just transition puts people at the centre of decision making, especially those most impacted, the poor, women, people*

16 RSA (Republic of South Africa), 2011 National Climate Change Response White Paper; RSA, 2015/2021, NDC; NPC, 2012, 2019.

17 For example, the National Employment Vulnerability Assessment (NEVA) and Sector Jobs Resilience Plan (SJRPs) of the Department of Forestry, Fisheries and Environment (DFFE); DMRE's JET Framework; and Mpumalanga's Draft Transition Strategy; the work of Eskom's JET Office.

18 COSATU (Congress of South African Trade Unions), 2011, 2022; Life After Coal (LAC)'s, [[Open Agenda on Just Transition; Hallowes and Munnik, 2019; Burton et al., 2017, 2019; Montmasson-Clair et al., 2022; Montmasson-Clair, 2021; Makgetla and Patel, 2021; Lowitt and Mokoena, 2021; Mohlakoana and Wolpe, 2021; Maseko, 2020, 2021; Hermanus et al., 2022; Swilling and Anneke, 2012; NBI (National Business Initiative) / BUSA (Business Unity South Africa) / BCG (Boston Consulting Group), Just Transition Pathways Process; TIPS (Trade & Industrial Policy Strategies) JT webinar series; and Marais et al., 2021.

19 DMRE, 2021, Towards a Just Energy Transition Framework in the Minerals and Energy Sectors.

20 See Montmasson-Clair, 2021 and COSATU, 2022 for a review of divergences. However, international convergence can be found in the goals of (i) decent work for all; (ii) social inclusion; and (iii) eradication of poverty. More recently, decarbonisation efforts have emphasised the importance of energy transitions being "just," thereby signalling the need to put people at the centre of decision-making and access to opportunities, as economies phase down fossil fuel use and move towards greener energy and industrial systems. For examples, see international approaches to just transition in the work of the International Trade Union Confederation [ITUC], the International Labour Organization [ILO], and in the UNFCCC).

with disabilities, and the youth–empowering and equipping them for new opportunities of the future. A just transition builds the resilience of the economy and people through affordable, decentralised, diversely owned renewable energy systems; conservation of natural resources; equitable access of water resources; an environment that is not harmful to one's health and well-being; and sustainable, equitable, inclusive land use for all, especially for the most vulnerable."[21]

The principles of procedural, distributive, and restorative justice lie at the core of the approach set out in the National Framework,[22] in which three major areas of policy intervention are identified, namely, (i) social protection, (ii) human resource development and skills development, and (iii) industrial development, economic diversification, and innovation.

Based on the national just transition definition, principles, and priorities, the JET IP proposes the following working definition of a just *energy* transition for the purposes of programme implementation for the next three to five years:

"A just energy transition in South Africa builds resilient economies and people to meet the NDC targets. It does so by (i) accelerating affordable, decentralised, diversely owned renewable energy systems; (ii) restoring previous and future ecosystems and natural resources impacted by coal mining and energy production; (iii) reskilling present workforces and educating future ones in green and other new and viable development pathways; (iv) building new productive models for comprehensive economic transitions; and (v) supporting various impacted constituencies to play an active role in decisions and implementation of energy transition programs (be it government or non-government actors)."

Just energy transition interventions in South Africa thus need to consider, first and foremost, the impacted and vulnerable groups, including:

- Direct workers at risk from energy transition changes;
- Indirect workers in associated value chains, as well as induced jobs and economic activity in affected regions;
- Local communities who may bear the brunt of environmental and social externalities, induced by the coal phasedown or the shift away from other fossil fuels;
- Small Medium and Micro Enterprises (SMMEs) and the self-employed who are part of both formal and informal value chains; and

21 PCC, 2022, A Framework for Just Transition in South Africa.
22 PCC, 2022.

- Those currently excluded from the existing structure of the economy (due to education, gender, race, or disability).[23]

Yet just energy transition interventions in South Africa can also be anticipatory in fostering new opportunities for specific groups, including for:

- Youth and future generations, particularly through new employment in green and emerging clean technology areas[24]; and
- Existing underserved communities who may have human and natural capital in which to locate decarbonising and innovative new industries.

Therefore, interventions in this JET IP have three arenas of action:

- Interventions within coal-producing and coal-reliant areas to spearhead diversification and socio-economic transition for those most impacted by the phase down of coal, in line with energy policy. This is especially important given the high concentration of distributional impacts that will be felt in Mpumalanga over the period covered by this IP and hence guides prioritisation in terms of timing.[25] It also draws on international experience in managing just transition for coal regions through a place-based economic development strategy that addresses distributional impacts through a package of interventions to promote regional transition. It specifically addresses the localised impacts to ensure restorative and distributive justice for coal communities;
- Interventions within communities negatively affected by the shift away from internal combustion engine (ICE) vehicle manufacturing and maintenance, as required; and
- Interventions across a multitude of forward-looking productive sectors in multiple localities (including in the electricity, the NEV, and the GH_2 sectors) to support decarbonisation and promote economic diversification and industrial development at a national level, building South Africa's economic resilience and embracing new opportunities.

23 See also Youth Climate Action Plan, 2021.

24 Youth Climate Action Plan, 2021.

25 DMRE (2021) notes that a key JET objective is to manage the decarbonisation process "in a manner which not only replaces lost work opportunities but promotes economic development, creating new and sustainable options, which initially prioritizes the coal regions to mitigate the prospect of 'ghost mining towns" and which targets vulnerable groups.

2.3 SOUTH AFRICA'S APPROACH TO INTER-SECTORAL DECARBONISATION INVESTMENT

The JET IP focuses on three priority sectors for its initial five-year period: Electricity, NEVs, and GH_2. This is a deliberate strategic decision, based on a clear understanding that as South Africa's electricity sector decarbonises, there are significant gains to be made by unlocking growth in the NEV and GH_2 sectors at the same time. Moreover, South Africa's exports from 'hard to abate' sectors and of ICE vehicles will be negatively affected by the proposed border tax adjustments of some of the country's main trading partners, if accelerated mitigation measures in these sectors are not implemented. As the energy transition advances globally, emerging experience demonstrates some key features in this regard:

- More complex linkages between sectors will develop, as zero-carbon electricity use replaces the use of fossil fuels in industry, transport, and other sectors, and thus the benefits of an integrated energy policy approach, which integrates energy policy closely with other key policy areas such as industrial policy, are very significant;
- Technologies can become progressively cheaper through economies of scale and where policies mitigate investment risks and / or technological breakthroughs. When they pass below the cost levels at which such technologies become pervasive, the technologies are described as 'disruptive' and are said to have passed 'tipping points'. Sector coupling can mean that tipping points in different technologies can reinforce each other.
- Clean energy investments scale up most rapidly when they experience certainty about demand for their production. Security of demand mitigates investment risk.
- Investments in existing storage technologies such as pumped storage; emerging technologies which include utility-scale batteries at all scales; thermal storage in concentrating solar power (CSP) plants and elsewhere; and other potential technologies such as GH_2 will enable faster uptake of renewable electricity generation in electricity systems and will become more and more important as the electricity system is decarbonised.

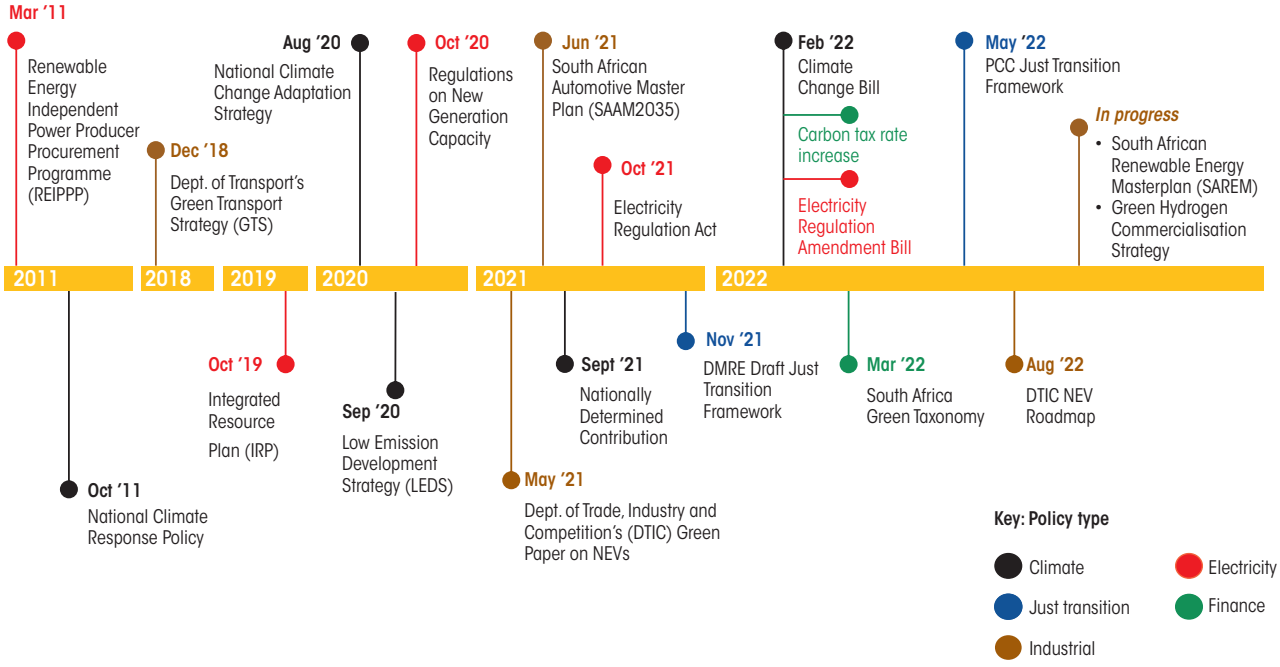
Applying these trends to South Africa's decision to drive the JET IP investments simultaneously in electricity decarbonisation, NEVs, and GH_2, the following observations are likely to be key features of the country's JET in the years ahead. The decarbonisation of the electricity sector in South Africa, the development of NEVs, and the development of GH_2 production are synergistic, just as they are in many other countries.

- An acceleration of investments in renewable electricity capacity is necessary to end the current load shedding and restore energy security to the South African electricity system, and once this has been achieved, this accelerated investment rate will need to be maintained to maintain energy security, meet South Africa's energy and climate policy goals, and support synergistic policies including localising the renewables value chain.
- The increased usage of NEVs and the increased demand for GH_2 in South Africa (or for export) have the potential to provide considerable additional security of demand for renewable electricity.
- It is possible that NEVs can be used for electricity storage for the electricity grid (vehicle-to-grid [V2G]), while GH_2 is a potential form of long-duration renewable energy storage and a potential replacement for fossil-fuelled peaking plants. These potential sources of storage may significantly lower the cost of ensuring grid stability, as the share of renewable energy generation increases.
- GH_2 (and its derivative, green ammonia) are potential substitutes for natural gas and coal in industrial processes such as steelmaking. They may also play an important role in the future electricity grid. GH_2 will likely contribute to the decarbonisation of electricity and industry, and in doing so, create additional employment to further offset any job losses resulting from reduced coal use.
- Global market trends can be expected to play a major role in these developments. For example, the cost of electrolysers for GH_2 production is likely to fall globally, as the use of GH_2 scales up. The same can be said for electric vehicles, storage technologies in general, and power plant turbines that can run economically on GH_2 or green ammonia.
- The increased application of carbon taxes by developed countries in cross-border trade (for example, EU's Carbon Border Adjustment Mechanism [CBAM]) will put a premium on decarbonising electricity and industry in South Africa to protect global competitiveness.
- It is also possible that there will be a greater global provision of concessional climate finance to developing countries to offset any loss of competitiveness from those carbon taxes.

2.4 ENABLING POLICY AND REGULATORY FRAMEWORK FOR A JUST TRANSITION

The Government of South Africa, together with key constituencies and stakeholders across society, has developed, and continues to establish, comprehensive policy, regulatory, institutional, and governance frameworks that address climate risks. Taken together, they constitute the enabling framework for climate related investments in adaptation, mitigation, and the just transition, demonstrating South Africa's resolve to embark on a fundamental restructuring of the electricity sector to ensure equitable and affordable access to clean energy, address energy poverty and competitiveness, and build the human capital for a new energy economy. Key components of the enabling policy framework are depicted in Figure 4.

Figure 4: Key policy milestones enabling a just energy transition



2.4.1 CLIMATE-RELATED POLICIES

- South Africa's National Climate Response Policy[26] was issued in 2011 to inform both mitigation and adaptation planning. The country's Low Emission Development Strategy (LEDS)[27] sets out a long-term decarbonisation trajectory for key economic sectors and identifies actions required to achieve this.

[26] https://www.gov.za/sites/default/files/gcis_document/201409/nationalclimatechangeresponsewhitepaper0.pdf.
[27] https://unfccc.int/sites/default/files/resource/South%20Africa%27s%20Low%20Emission%20Development%20Strategy.pdf.

- South Africa's Climate Change Bill[28] was tabled before Parliament in 2022 and is currently being considered by the Parliamentary Portfolio Committee on Environment, Forestry and Fisheries. The Bill sets out a comprehensive set of institutional arrangements to ensure strong coordination both within and across the three spheres of government, the private sector, academia, and civil society, as well as establishing systems to manage mitigation and adaptation policies and actions. Among other measures, the Bill provides for the mandatory implementation of a carbon budgeting system and for the establishment of sector emissions targets across the economy. To this end, a Sector Emissions Targets framework[29] has been developed to guide government's approach to allocation and implementation.
- South Africa's updated NDC was communicated to the UNFCCC secretariat in October 2021.[30] It addresses the country's climate change ambitions on mitigation, adaptation, and a just transition in a comprehensive way. The updated NDC is framed within the context of the Paris Agreement, and it addresses the implementation support to be provided by developed countries in terms of Articles 9–11 (finance, technology, and capacity building) and the degree of mitigation ambition that can be achieved by a developing country. In this context, South Africa has committed to achieving an emissions target in a range between 420 and 350 $MtCO_2$-eq by 2030, dependent on the level of support received. The updated NDC was approved by Cabinet after a substantive national consultation that was led by the Department of Forestry, Fisheries, and the Environment (DFFE) and the PCC.
- The National Climate Change Adaptation Strategy was approved in 2020.[31]

2.4.2 ELECTRICITY-RELATED POLICIES

- The Integrated Resource Plan (IRP) 2019[32] sets out a long-term view of the electricity sector and its generation mix and guides investments in new generation capacity. The IRP 2019 is currently being updated by the Department of Mineral Resources and Energy (DMRE).
- South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPP) is considered to be world-class, having procured 6 422 megawatts (MW) of renewable electricity capacity in 10 years through four bid windows, with another two bid windows in progress.
- Since 2008, the DMRE has promoted energy efficiency (EE) and implemented a range of strategies for demand-side management (DSM) measures in cooperation with Eskom, public sector institutions, and the private sector.

28 https://www.gov.za/sites/default/files/gcis_document/202203/b9-2022.pdf.
29 DFFE (Department of Forestry, Fisheries and Environment), 2021, Framework for Sectoral Emissions Targets.
30 https://unfccc.int/sites/default/files/NDC/2022-06/South%20Africa%20updated%20first%20NDC%20September%202021.pdf.
31 DFFE, 2020, South Africa's National Climate Change Adaptation Strategy.
32 http://www.energy.gov.za/IRP/2019/IRP-2019.pdf.

- The Electricity Regulation Amendment Bill was published for comment in early 2022.[33] This legislation provides for the establishment of an independent transmission company which will act as the system and market operator. The legislative reform, which supports the ongoing restructuring of Eskom and the establishment of an independent Transmissions System Operator, will enable the emergence of a competitive electricity market. Over time, this will allow multiple generators to sell electricity in a day-ahead market in addition to long-term agreements, as well as to participate in markets for balancing and ancillary services. The rules of a future market will be determined by a market code. A revised Electricity Pricing Policy provides for an unbundled tariff (separating energy from use-of-system charges) to support this reform. While Eskom will continue to generate electricity itself, these reforms will introduce competition from private generators.
- The Regulations on New Generation Capacity were amended in October 2020 to allow municipalities to procure electricity independently for the first time, with at least five large municipalities now in various stages of renewable energy procurement.
- The 2021 amendment to Schedule 2 of the Electricity Regulation Act raised the threshold for electricity generation projects that do not require a license from 1 MW to 100 MW. This amendment has unlocked a significant pipeline of projects, predominantly from the mining and heavy-emitting sectors and has also allowed private generation projects to sell electricity to one or more customers, in addition to self-generation. Moreover, the requirements for registration with the National Energy Regulator of South Africa (NERSA) have been simplified, with the process now averaging 19 days. In July 2022, the President announced that the 100 MW licensing threshold was being removed altogether as part of wide-ranging interventions to address the electricity crisis (see 'Recent developments' sub-section below).

2.4.3 JUST TRANSITION-RELATED POLICIES

- The NDP sets the basis for South Africa's just transition policies in that it places people's livelihoods at the centre of the climate change response and envisions a low-carbon future as being integral to South Africa's development path.
- The PCC was established in 2019 following an agreement between the social partners in the National Labour and Development Council (NEDLAC). It is a multi-stakeholder body, with Commissioners nominated by societal constituencies and appointed for five years. The PCC's mandate is to develop a country strategy for the Just Transition and to ensure that frameworks, policies, and measures will achieve this outcome. After wide consultations, the PCC has concluded a Just Transition Framework[34] for the country that has been approved by South Africa's Cabinet. It is based on procedural, restorative, and distributive justice to be the tests

[33] https://cer.org.za/wp-content/uploads/2022/02/ELECTRICITY-REGULATION-AMENDMENT-BILL-10.02.2022-DMRE.pdf.
[34] https://www.climatecommission.org.za/just-transition-framework.

of interventions intended to support workers and communities affected by climate actions. It is premised on the understanding that just transition interventions must be designed so as to ensure that "no-one is left behind."

- The DMRE has published a Draft Just Transition Framework to support the decarbonisation of the mining and energy sectors in a socially acceptable manner that contributes to the economic development of the country, focussing on the issues related to workers in the coal value chain and specifically coal miners, the economic development of coal dependent regions, mitigating impacts on vulnerable groups such as youth and women associated with fossil fuel value chains, as well as access to modern energy services.[35]

2.4.4 FINANCE-RELATED POLICIES

- The Ministry of Finance has introduced a carbon taxation system.[36] In the 2022 Budget Speech, the Minister of Finance stated that *"The Carbon Tax is the main mechanism used to ensure we lower our greenhouse emissions. The (headline) carbon tax rate was increased from R134 to R144 effective from 1 January 2022. The first phase of the Carbon Tax, with substantial allowances and electricity price neutrality will be extended to 31st December 2025. However, in line with our commitments at COP 26, the (headline) carbon tax rate will be progressively increased every year to reach US$20 per tonne. In the second phase from 2026 onwards, the carbon tax will have larger annual increases to reach at least $30 by 2030 and the allowances will rapidly fall away."*
- National Treasury published the South African Green Taxonomy in March 2022 as part of South Africa's Sustainable Finance Initiative, providing a classification system that defines the minimum set of assets, projects, activities, and sectors that are eligible to be defined as 'green' in line with international best practice and national priorities. It can be used by investors, issuers, and other financial sector participants to track, monitor, and demonstrate the credentials of their green activities. National Treasury has also embarked on a Climate Budget Tagging pilot.

2.4.5 INDUSTRIAL-RELATED POLICIES

- The South African Renewable Energy Masterplan (SAREM) is in the process of being finalised by the DMRE. It addresses the potential for a sustainable renewables industry in South Africa, assesses which value chains could be competitive, and makes proposals for the development of the industry.

35 DMRE. 2021. Towards a Just Energy Transition Framework in the Minerals and Energy Sectors.

36 https://www.gov.za/sites/default/files/gcis_document/201905/4248323-5act15of2019carbontaxact.pdf.

- The South African Government sees the development of a GH_2 economy in South Africa as a key element of a just transition and has developed a Roadmap[37] to position the country's competitive advantage in the sector, its support for the decarbonisation of the country's heavy industrial base, and opportunities for new export markets, value chains, jobs, and skills. A Green Hydrogen Commercialisation Strategy has also been developed and it is under Cabinet consideration.
- Policy direction has been provided on the advancement of NEVs in South Africa through the South African Automotive Master Plan 2035 (SAAM2035),[38] the Department of Transport's Green Transport Strategy (GTS) 2018-2050,[39] the Department of Trade, Industry and Competition's (DTIC) Green Paper on NEVs[40] and the recent announcement of an NEV Roadmap.[41]

2.5 RECENT DEVELOPMENTS IN ELECTRICITY POLICY

Recent developments in South Africa's electricity policy mark a rapid shift in the sector and are intended to bring about structural changes that will allow for a large-scale increase in renewable electricity generation capacity. This is an evolving process, and future iterations of the JET IP will reflect the outcomes and impacts of such changes and their contribution to a just energy transition:

- Eskom has made available parcels of its land for lease with access to transmission infrastructure in a competitive process for generation investments by the private sector. The first round of bidding for the land leases was oversubscribed. The 18 winning companies are due to enter into wheeling agreements with Eskom to deliver a total 1 800 MW to their respective off-takers. No government guarantees are required. Eskom plans further rounds of land lease auctions to enable more private renewables investments. This confirms the market's ability to price and absorb risks in bringing capacity to the grid without impacting the fiscus.
- The preferred bidders for Bid Window 5 of the Renewable Energy Independent Power Produce Programme (REIPPPP) were announced in October 2021, consisting of projects totalling 1 608 MW of wind and 975 MW of solar PV. Another 1 600 MW of wind and 1 000 MW of solar were announced in April 2022 for Bid Window 6. This confirms South Africa's intent to manage a rolling process of REIPPP bid windows resulting in utility scale renewable plant.

37 https://www.dst.gov.za/images/South_African_Hydrogen_Society_RoadmapV1.pdf
38 DTIC, 2018, Geared for Growth. South Africa's Automotive Industry Master Plan to 2035: A Report of the South African Automotive Master Plan Project.
39 DOT, 2018, Green Transport Strategy for South Africa (2018–2050).
40 DTIC, 2021, http://www.thedtic.gov.za/wp-content/uploads/EV_Green_Paper.pdf.
41 Minister of Trade, Industry and Competition presentation to the Presidential Climate Commission, August 2022.

- The South African Local Government Association (SALGA), together with many of its member municipalities, are promoting increased procurement of renewable electricity at a municipal level, advocating for municipalities to roll out embedded generation schemes to purchase electricity from independent power producers (IPPs), and are working on the development of a national wheeling framework that would expedite the use of renewable electricity. This confirms the growing opportunity for distributed renewable energy investments.
- In July 2022, the President of South Africa announced a suite of measures to address the electricity supply crises. These include accelerated procurement of new generation capacity, enablement for a large increase in private investment in generation capacity, enablement for business and households to invest in rooftop solar, and further steps in the transformation of the electricity sector. In particular, the President announced that:
  - The licensing thresholds for embedded generation are removed completely, enabling private investments in large, utility-scale generation projects.
  - Bid Window 6 for wind and solar power will be doubled from 2 600 MW to 5 200 MW.
  - Further requests for proposals will be issued for battery storage and gas power generation.
  - The IRP is to be reviewed to reflect the need for additional generation capacity and South Africa's climate commitments.
  - Special legislation is being developed and expedited to address legal and regulatory obstacles to new generation capacity, and regulations are being streamlined or waived where possible, including for solar projects in areas of low and medium environmental sensitivity.
  - Environmental authorisations have been waived for the development of new transmission and distribution lines and substations in areas of low and medium sensitivity and within strategic electricity corridors.
  - A pragmatic approach will be taken to local content requirements for near-term renewable energy investments, with the designated local content for solar panels reduced from 100% to 35% for Bid Window 5.
  - To incentivise rooftop solar, Eskom will develop feed-in tariffs for the purchase of surplus electricity from residential customers. National Treasury is undertaking further work on tax incentives for investment in small-scale embedded generation.
  - A law-enforcement team is working with Eskom to address crime and corruption.
  - Eskom restructuring into three entities will be enhanced with the appointment of boards for the transmission and generation entities. The transmission grid will remain state-owned.
  - The Minister of Finance will outline a sustainable solution to the Eskom debt in the Medium-Term Budget Policy Statement in October 2022.
  - Government will use climate funding provided through the JETP to invest in the transmission grid and repurpose coal power plants that have reached end of life.

The JET IP and its priority investments for the next five years are built on the foundation of this enabling policy environment.

PORTFOLIO OUTCOMES AND PRIORITISATION CRITERIA

South Africa's JET IP represents an evolving portfolio of interconnected and mutually enhancing just energy transition programmes and projects designed by the South Africa government to position the country, subject to available financing, to achieve the most ambitious possible outcomes within the range of the updated NDC and in the context of a just transition that supports economic growth and development. A key feature of the portfolio's design in all three priority sectors (electricity, NEVs, and GH_2) is that it embeds the principles of distributive, restorative, and procedural justice which are the pillars of South Africa's official Just Transition Framework.

The targeted outcomes and prioritisation criteria set out below are central to the design of the JET IP and will inform implementation planning and sequencing of its programmes and projects in the coming years.

3.1 PORTFOLIO OUTCOMES

South Africa's targeted environmental, social, and economic outcomes embody a longer-term vision to be achieved over decades, while the prioritisation criteria influence the sequencing of the investments, particularly in the first five-year period. The financing principles, set out in Section 5, also inform the quality and quantity of resources required to achieve these outcomes.

Environmental outcomes: The JET IP responds to South Africa's commitment to reduce its GHG emissions as communicated in its NDC pathway.

Transition:	Absolute reduction in GHG emissions against predetermined baselines.
Location:	Spatial priorities relative to site- or issue-specific risks.
Pace:	Aligned to meet the NDC target range and the 2050 net-zero emissions goal.
Co-benefits:	Improved air quality and positive health and well-being impacts.

Social outcomes: The JET IP recognises the direct and indirect impacts of the energy transition on the livelihoods of affected communities and workers.

Transition:
- social safety nets due to timing differences with job displacement and losses,
- regional development reflecting on multiplier effects of localisation, value chain development, and linkages to SMME development,
- resilience of municipalities to infrastructure and related impacts, and
- skills ecosystems to support innovation and broad access to transition-related investment opportunities for youth, women, and SMMEs.

Location: Spatial priorities relative to site or issue-specific risks.

Pace: Rate of investment in social programmes synchronised with rate of decommissioning, repurposing, and repowering.

Co-benefits: Inclusive, direct access to finance and equitable ownership structures (where applicable) offering wealth accretion within reasonable time frames.

Economic outcomes: The JET IP is grounded in the NDP and thus seeks to contribute to the achievement of national and regional economic goals, including immediate measures to address the energy supply crisis and manage fiscal constraints.

Transition:
- energy security through essential clean power infrastructure,
- affordable and accessible clean energy to the poor and vulnerable,
- economic growth through diversified industrialisation programmes,
- complementary industries essential to support low-emissions interventions,
- new economic growth and new jobs in the transport, automotive, agriculture, and high-emitting sectors, and
- regional food security and water use sustainability.

Location: National-, regional-, and community-level interventions as relevant.

Pace: Relative to national imperatives and global shifts, particularly of trading partners.

Co-benefits:
- contribution to South Africa's NDP such that it reduces the fiscal burden, offering equitable risk-sharing between public and private sectors,
- contribution to the national tax base, and
- reduces reliance on state-supported subsidies and social grants.

Governance: The JET IP is premised on robust governance of portfolio implementation, as further elaborated in Section 7.

Transition:	Embed sound processes of decision-making and accountability, with clear mechanisms to ensure good governance.
Pace:	Demonstrate that JET IP programmes and projects set exemplary governance standards from the outset, tracking performance in all relevant indicators.
Co-benefits:	A knock-on good governance effect in all institutions associated with the JET IP.

3.2 PRIORITISATION CRITERIA FOR THE USE OF FUNDS

The JET IP initiatives set out in Section 4 have been identified based on sectoral analysis and planning work done by a wide range of South African institutions and experts (public, private, and civil society). If resources were available to execute at the scale and pace described in this JET IP, South Africa would make considerable strides in its just energy transition by shifting its trajectory of GHG emissions in a manner that captures opportunities for social justice and distributive economic growth.

Mindful of limited resources and acknowledging certain constraints in execution capacity, the portfolio has been prioritised to achieve the highest probability of moving South Africa towards its NDC commitment and those that can be delivered efficiently and effectively for the benefit of vulnerable communities, workers, and municipalities immediately at risk. As more resources are mobilised for the JET IP over time, it will be possible to roll out the investment plan at a higher pace of delivery. The pace of delivery on the JET IP will increase, as certainty on resourcing and implementation plans materialise.

Prioritisation is particularly needed for South Africa to respond to the IPG's pledge of US$8.5 billion between 2023 and 2027. Given that the overall scale of need for the identified sectors in this period is estimated at ZAR1.5 trillion (US$98.7 billion), it is essential that the IPG contributions be deployed to the most catalytic and ready programmes and projects in the JET IP's portfolio of needs.

The following prioritisation criteria apply for programmes and projects to be financed under the JET IP during the initial period 2023-2027 and will influence the sequencing of IPG resource allocations with due regard to available financing instruments:

- **Be catalytic and complementary:** The programme / project should demonstrate how it responds to the transition needs, unlocks other investments in the JET IP, and/or increases the speed and scale at which these can happen, and contributes to the country's immediate energy security needs.

- **Set the foundations for addressing the NDC's GHG reduction targets:** The programme / project should demonstrate its impact on GHG mitigation, either directly or indirectly.
- **Deliver just transition outcomes:** The programme / project should have tangible socio-economic benefits for communities, workers, and youth affected by the energy transition.
- **Be ready to implement:** A proposed *capital project,* should demonstrate an advanced stage of due diligence, technical, and financial feasibility study approval by the implementing institution; and a proposed *operational project* should demonstrate the implementing institution's management and governance capacity to execute.

The investment priorities – elaborated in Section 4 for the electricity, NEV, and GH_2 sectors – have applied these prioritisation tests and fulfill them to varying degrees.

The results of prioritising programmes and projects under the JET IP are set out in Sections 5 and 6, along with financing principles. These results will inform further engagements between South Africa and the IPG partners to conclude subsequent financing agreements of the IPG-supported components of South Africa's JET IP from 2023 to 2027.

The financing features that will affect the catalytic impact of each investment will be in respect of (i) price (below the market cost of capital); (ii) patience (the investor's willingness to defer returns on the invested capital); (iii) the ranking position of the capital (its level of subordination); (iv) administrative fees charged or waivered; and (v) whether sovereign guarantees or other forms of collateral are required. These features of the IPG offer have, therefore, also informed the identification of JET IP priorities for five years of investment under the JET IP.

More granular prioritisation criteria will be developed for the JET IP portfolio at programme and project levels between the South African government, the implementing institutions, and the intended beneficiaries in due course, cognisant of targeted environmental, social, and economic outcomes.

THE JET IP PORTFOLIO

4.1 INTRODUCTION

This section of the JET IP sets out the portfolio of catalytic and ready JET investments for 2023–2027 that need to be made in:

- the Electricity sector (4.2), which includes:
  - infrastructure investments,
  - just transition investments in Mpumalanga's coal communities, and
  - just transition investments in the electricity sector;
- the NEV sector (4.3);
- the GH_2 sector (4.4); and
- cross-cutting initiatives (applicable to all three sectors above) that are foundational for a successful JET IP delivery:
  - Skills development for JET (4.5), and
  - Municipal capacity for JET (4.6).

Table 12 summarises the JET IP portfolio's investment needs over the five-year period. Given the early stage of planning in the case of the NEV and GH_2 sectors, the just transition elements will need further development.

Table 12: JET IP Portfolio summary of investment needs, 2023–2027

JET IP financing requirements, 2023–2027	ZAR billion
4.2. Electricity Sector	711.4
Infrastructure investments	647.7
Just transition investments in Mpumalanga's coal communities	60.4
Just transition investments in the electricity sector	3.25
4.3. New Energy Vehicle (NEV) Sector	128.1
4.4. Green Hydrogen Sector	319
4.5. Skills development	2.7
4.6. Municipal capacity	319.1
TOTAL	**1 480**

4.2 ELECTRICITY SECTOR

4.2.1 INTRODUCTION

This section of the JET IP contextualises reasons for the centrality of South Africa's electricity sector in the country's approach to building a low-carbon economy; the economic importance of the sector; and the impact of decarbonisation initiatives on coal workers and communities in the Mpumalanga province. It identifies the catalytic low-carbon investments that are required in the electricity sector, and the investments that are needed to support and transform the livelihoods of those who are most affected by the transition away from coal.

Two annexures to the JET IP provide background to the assumptions, costings, and technical analyses that have informed the preparation of this section:

- **Annexure B:** Electricity Sector Modelling Assumptions, Technical Analysis, Committed/ Planned Capacity, and Eskom JET Project Pipeline; and
- **Annexure C:** Methodological Notes on Just Transition Priority Areas and International Lessons on Coal Transitions.

4.2.1.1 ELECTRICITY: A PRIORITY FOR DECARBONISATION

The most recent South African GHG Inventory (for the year 2017)[42] reports that the electricity sector is the most important key category in the inventory – a position which the sector has occupied since national GHG emissions in South Africa have been formally estimated. The electricity sector's emissions comprised 43% of South Africa's GHG emissions in 2000, and 45% in 2017.[43]

Almost all these GHG emissions are produced by 15 large coal-fired power plants owned and operated by Eskom and one small privately-owned coal plant which provides power to City Power – the Johannesburg city utility. These plants are due to retire over the next three decades as they reach their end of life, except for the two newest plants, one of which is still not fully operational. Eskom's proposed schedule for retiring these plants specifies that up to 2030, Komati, Camden, Hendrina, Grootvlei, and Arnot will be closed, and by the end of 2030, Tutuka and Kriel will be closed.

These closures will reduce the overall capacity of Eskom's coal fleet from around 38.8 GW in March 2021 to 33.9 GW at the beginning of 2030, and 29.3 GW at the end of 2030. By the end of 2050, only the two youngest coal plants (Medupi and Kusile), and one unit of the older Majuba plant, will remain operational as currently envisaged.

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42 South Africa's most recent GHG inventory can be accessed below. The inventory reports GHG emissions up to and including the year 2017: https://unfccc.int/sites/default/files/resource/South%20Africa%20%20NIR%202017.pdf.

43 Calculated in relation to total GHG emissions including land use emissions.

Historically, the coal-fired electricity plant has been the cheapest means to generate electricity in South Africa (excluding externalities), but this has changed over the last decade, in common with the rest of the world, and renewable energy – specifically wind and solar PV – is now cheaper than coal power. South Africa is blessed with extremely good solar and wind resources. As Eskom's coal plants retire, the current economics of the electricity sector imply that coal generation will be replaced by renewable electricity generation capacity plus open cycle, combined cycle plants, and/or storage plants to support the grid. However, this will require a very large expansion of the transmission grid, since these renewable energy resources are located around the country, and particularly in provinces remote from Mpumalanga, where most of the electricity generating capacity is located.

Retiring coal plants will lead to a decline in GHG emissions in the electricity sector, but not at sufficient speed to meet the lower range of South Africa's 2030 NDC target. The rate at which GHG emissions from the electricity sector decline, within the context of the coal plant retirement schedule, will therefore depend on the utilisation rate of the remaining coal fleet. This in turn will depend on the rate at which renewable electricity plant can be added to the South African electricity system (which would include utility-scale plant, and distributed generation in the residential, commercial, and industrial sectors) and on the success of energy efficiency programmes, which will alleviate pressure on the remaining coal fleet and provide opportunities to decarbonise the sector more rapidly.

In addition, mitigation studies, recently undertaken to support the update of South Africa's NDC, indicate that in absolute terms, the electricity sector will be the source of the largest share of mitigation to 2030,[44] and in addition, long-term decarbonisation will require the electrification of other sectors which currently use fossil fuels, such as the transport sector. Decarbonisation of the electricity sector will not only address the current electricity supply crisis, through rapid investment at a large scale in new renewable electricity capacity, but also create opportunities for industrialisation, regional development, facilitate a managed, just transition in the electricity sector, and result in massive infrastructure investment, much of which will be financed through the private sector.

4.2.1.2 KEY ECONOMIC AND SOCIAL CONSIDERATIONS

The South African economy is more electricity-intensive than other comparable developing economies, which is due largely to South Africa's mining and minerals processing sectors. Although economic growth has been focused for the last 15 years on less electricity-intensive sectors of the economy (which has led to electricity demand remaining static for over a decade), South Africa

[44] See Figure 15 in Annexure B.

aspires to make effective use of economic development opportunities arising from the green economy, nationally and internationally, including the manufacture of electric vehicles, the manufacturing of green hydrogen, green iron and steel, and the exploitation of the large reserves of minerals South Africa possesses which are central to the global green economy. The electrification of energy services such as process heat which are currently provided by coal is also a prerequisite for South Africa's long-term decarbonisation and international competitiveness; this includes the need to protect South Africa's automotive industry by an accelerated shift to manufacturing NEVs. South Africa's abundance of high-quality renewable energy resources will position the country favourably in the coming international green economy of energy intensive goods and services, as well as for the decarbonisation of road transport via a shift to electric vehicles (EVs) and other potential zero-emissions vehicles.

Shifting from the current technology model for the electricity supply sector (large coal plants built adjacent to coal mines) to a low-carbon distributed[45] model, based primarily on renewable energy, will also significantly change the linkages between the electricity sector and the rest of the economy. Currently, the sector is tightly linked to coal mining and its associated infrastructure and geographies, including the applicable transport infrastructure. Though the future electricity system will have little or no connection to the coal mining sector, it will have linkages to a range of value chains underpinning the low-carbon energy system, including new local industries to supply and assemble renewable energy equipment and associated equipment and infrastructure. In addition, the regional development impacts of the current electricity supply sector are almost all focused in one area of the country (Mpumalanga Province), though renewable energy installations will be distributed widely in all provinces and in some areas where there is currently very little economic activity. In the long term, this will give rise to many regional sustainable development opportunities and create more employment opportunities than currently exist in the electricity sector. But it is imperative that the transition from the current system to the future system is a just one, which creates new economic opportunities for workers and communities in areas where economic opportunities will decrease as a result of the shift from coal-based electricity to electricity produced with very low or no associated GHG emissions, including artificial GHGs.

There are three other considerations which need to be addressed at the same time. The first of these is energy efficiency. Both national and international research has shown the benefits of energy efficiency programmes, which include the lowering of investment costs in generation capacity and in the transmission and distribution grids, as well as significant employment benefits. The current electricity crisis has again focused attention on demand-side management, and in addition to the continuation of existing programmes, government intends to establish a programme to save 600 MW by 2030. The technical analysis underpinning the update of the NDC in 2021

[45] While renewable energy-based electricity generation will be far more distributed than current systems, with a potentially high proportion of electricity being generated on site, there are also proposals for supergrids stretching across continents (for instance, from north Africa to northern Europe) to make use of different renewable energy resources with different generation profiles.

found unequivocally that the DMRE's draft post-2015 National Energy Efficiency Strategy (NEES) would if implemented, significantly reduce investment requirements for meeting the 2030 target and has positive economic outcomes.

The second is Eskom's current debt burden, which is at least partly due to non-cost reflective tariffs over the last three decades. In addition, local authorities which distribute electricity are often in a similar financial state, which in turn exacerbates Eskom's debt burden through non-payment. While Eskom's debt burden is being addressed jointly by Eskom and National Treasury, the current regulatory reform process (proposing amendments to the Electricity Regulation Act and the DMRE's draft electricity pricing policy update) aims to address the need for transparent and cost-reflective tariffs to prevent another debt crisis and ensure the financial sustainability of the sector, provide effective price signals to both consumers and investors in a transformed electricity sector, and provide affordable electricity to South African households and industry.

The third comprises the urgent need to address energy poverty through enhanced access to affordable electricity for poor households. While household electrification is much more advanced in South Africa than in the rest of the continent, energy poverty in South Africa is widespread[46] and a lack of affordable services leaves people dependent on wood, coal, paraffin, candles, and dung. In 2018, about 600 000 households, or 2 million people, were in extreme energy deprivation, relying on paraffin for much of their domestic energy use. Use of such fuels results in severe health impacts from indoor air pollution, burns, poisonings, shack fires, and deaths, with the burden of firewood collection and health impacts from indoor and local air pollution most often falling on women and children.[47]

South Africa has successfully connected households to the grid over the past three decades and continues to allocate support to households to enhance electricity access through the Free Basic Electricity (FBE)[48] initiative and the Integrated National Electrification Programme (INEP), spending over ZAR16 billion in 2020–2021. However, relatively high electricity connection rates of around 85% masks limitations of affordability and use for households, while unelectrified areas persist in both rural and in new informal settlements. Given the key role that access to electricity plays in human development and the especially gendered impacts of lack of access, resolving constraints to access is integral to the improvement of people's livelihoods and just transition outcomes, poverty alleviation, and reduced inequality.[49] International support is needed to expand government's response and address barriers to affordable access.

[46] About half of all households were considered energy-poor in 2012. Source: DoE (Department of Energy), 2013, A Survey of Energy Related Behaviour and Perceptions in South Africa: The Residential Sector, Pretoria: DoE, http://www.energy.gov.za/files/media/Pub/DoE- 2013-Survey-of-EnergyRelated-Behaviour-and-Perception-in-SA.pdf

[47] Ashley Van Niekerk, David Kimemia, Mohamed Seedat, and Harold Annegarn, 2022, "Energy Impoverishment and Burns: The Case for an Expedited, Safe and Inclusive Energy Transition in South Africa." South African Journal of Science 118 (3/4), doi.org/10.17159/sajs.2022/13148.

[48] Fifty kilowatt-hours (kWh) per month are provided to poor households for free, provided that the relevant local distributor has implemented the initiative. This amount of free electricity is not sufficient to cover thermal energy demand, particularly cooking.

[49] Tracy Ledger, "Broken Promises: Electricity Access for Low-Income Households: Good Policy Intentions, Bad Trade-Offs and Unintended Consequences," Energy and Society Working Paper #2, Public Affairs Research Institute, https://pari.org.za/broken-promises-good-intentions-bad-trade-offs-and-unintended-consequences/.

4.2.1.3 INVESTMENT IN RENEWABLE ENERGY IN SOUTH AFRICA TO DATE[50]

The overwhelming majority of investment in renewable energy in South Africa has occurred through the Renewable Independent Power Producer Procurement Programme (REIPPPP), established in 2011, which auctions required new renewable electricity capacity in a series of 'bid windows', in which winning projects are awarded long-term power purchase agreements (20 years), which up to now, have been guaranteed by government.

So far, most of the new capacity from the first five bid rounds and one small projects round (1,2,3,3.5,4) is in operation, including 18 MW of landfill gas, 52 MW of biomass generation, 80 MW of small hydro, 600 MW of CSP, 2 371 MW of PV and 3 466 MW of wind power. The outcome of bid window 5 has been announced, which consists of 1 000 MW of PV and 1 600 MW of wind, and the capacity which will be auctioned in bid window 6 was doubled from 2 600 MW to 5 200 MW in a recent announcement by President Ramaphosa.

South Africa is accelerating greater private investment in generation capacity. In 2021, government announced the raising of the licensing threshold to 100 MW under Schedule 2 of the Electricity Regulatory Act. This has unlocked a pipeline of more than 80 confirmed private sector projects with a combined capacity of over 6 000 MW. These reforms have fundamentally changed the electricity generation landscape. The recent removal of the licensing threshold for embedded generation, paves the way for investment in larger, utility-scale projects that will rapidly add new renewable energy generation capacity to the grid.

50 Data sourced from http://redis.energy.gov.za/power-producers/.

4.2.1.4 REQUIRED JUST ENERGY TRANSITION FOR MPUMALANGA COAL COMMUNITIES

Without active intervention, coal-dependent regions will suffer significant social and economic impacts from South Africa's energy transition and specifically the phasedown over the next three decades of its coal value chain. In addition, these areas, and in particular Mpumalanga, are currently impoverished and suffer negative environmental impacts from coal mining and combustion, including air and water pollution and the coal mining-related destruction of high-value agricultural land. A just transition is an opportunity to address both current development challenges and impacts from a coal phasedown.

Decarbonisation of the electricity system, involving the retirement of Eskom's coal fleet and reduced operating hours, and hence a reduction in coal use for electricity generation, will be coupled with reduced coal use in other key demand sectors, notably coal-to-liquids. The impacts of the transition will be concentrated in Mpumalanga Province, which produces 83% of the country's coal and where 12 out of 15 of Eskom's coal-fired power plants are found, in two districts (Gert Sibande and Nkangala).[51] This means that 85% of South Africa's coal mining jobs can be found in Mpumalanga Province.[52]

The Provincial economy is heavily dependent on coal for employment, the municipal rates base, and community development activities. The Province grapples with in-migration, high levels of poverty, air and water pollution and degraded land, and high vulnerability to climate impacts. Mpumalanga has levels of unemployment above the national average, with especially high youth unemployment overall and for women in particular.[53] Almost half of the province's population lives below the lower-bound poverty line[54] and there are low levels of educational attainment and skills. The coal sector provides direct jobs to almost 90 000 people in mines and power plants in the Province, and there are indirect jobs for people who provide goods and services to the coal sector, which supports a significant portion of induced jobs and other economic activity.[55] In addition to the above contributions, coal is an input into key industries in the region, including synthetic fuels,

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51 South Africa produces approximately 250 Mt of coal per year, with approximately 70 Mt exported. Eskom uses approximately 110 Mt and Sasol approximately 40 Mt. In the past, coal exports were of a significantly higher grade than Eskom's average grade; however, the differential in calorific value has shrunk, as the demand for coal exports has shifted to Asia. Nonetheless, Eskom typically uses higher- ash coal than is exported.

52 Quantec, cited in Makgetla and Patel, 2021.

53 Statistics South Africa (StatsSA): 58.7% in 2021 and 66.5% for young women. See also Mpumalanga's Phase 1 Transition Strategy (Mpumalanga Provincial Government 2021). Labour-sending areas also face above-average levels of unemployment, namely the Eastern Cape. In 2022, Mpumalanga, the Eastern Cape, KwaZulu-Natal (KZN), and Limpopo all had unemployment rates over 50% using the expanded definition (StatsSA 2022). Available at https://www.statssa.gov.za/publications/P0211/Presentation%20QLFS%20Q1%202022.pdf.

54 In 2019, 47.3% or approximately 2.1 million of Mpumalanga population lived below the lower-bound poverty line of ZAR810 per month (MPG 2021).

55 See the Sector Jobs Resilience Plan (SJRP) for the coal value chain, as well as Makgetla and Patel (2021), for a discussion of value chain employment.

petrochemicals, and steel. These are demand sectors that will also face reductions in their coal use in the coming years in response to global trends, and which are large employers.[56] The entire value chain (from mining and electricity production to end-use sectors) employed almost 200 000 people in 2020.[57]

Over the next 15 years, Eskom expects to decommission and repurpose 22 GW of coal-fired power plants in the Mpumalanga Province, as shown in Table 13.

Table 13. Eskom's planned coal power plant closures to 2035

Power station	Closure date	Local municipality	District municipality	Associated mines
Grootvlei	2026-2027	Dipaleseng	Gert Sibande	Multiple
Hendrina	2023-2025	Steve Tshwete	Nkangala	Multiple
Komati	2022	Steve Tshwete	Nkangala	Multiple
Camden	2023-2025	Msukaligwa	Gert Sibande	Multiple
Arnot	2026-2029	Steve Tshwete	Nkangala	Multiple
Kriel	2026-2030	Emalahleni	Nkangala	Kriel
Tutuka	2030	Lekwa	Gert Sibande	New Denmark
Duvha	2031-2034	Emalahleni	Nkangala	MMS
Matla	2030-2034	Emalahleni	Nkangala	Matla

The total impact of an ambitious NDC trajectory for coal plant closures and reduced operations will be a considerable decline in the country's coal demand for electricity generation by 2030: from 113 Mt in 2021 to 55-60 Mt in 2030.[58] In the upstream sector, three types of direct employment impact will need to be addressed over the period to 2030:

- Downscaling of coal plants and stagnant exports means that young workers are not entering the coal mining workforce as they would have otherwise as new jobs do not materialise. Between 4 500 -7 500 new jobs will not materialise;
- Older workers typically exit the sector before official retirement age. Over the decade, almost 18 500 older workers will leave coal mining, and many will require social support; and
- There will be between 3 000 and 9 000 additional job losses due to decreasing coal demand over the period 2020-2030, especially from 2025 onwards.[56]

56 NBI (National Business Initiative), 2022; see also the "Green Hydrogen" section. Coal plants, mines, and coal-using industries in the KZN, Limpopo, and Free State Provinces will also require just transition interventions, for the most part, post 2030.

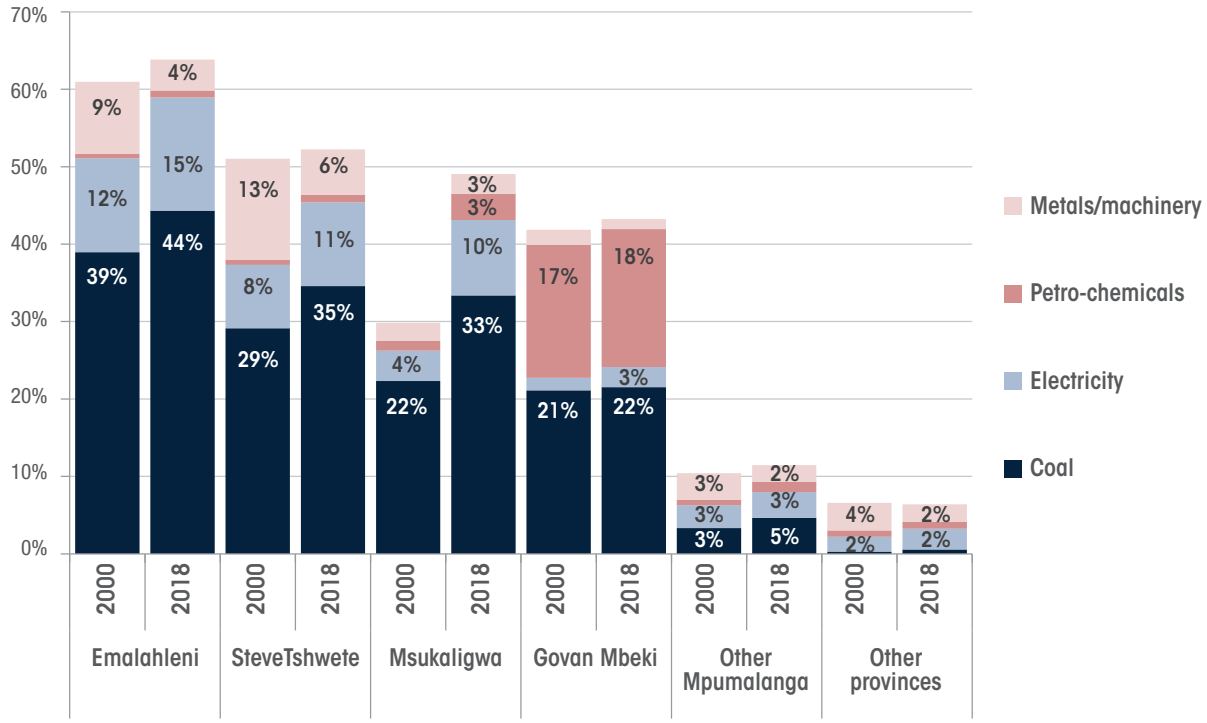
57 Makgetla and Patel (2021), based on Quantec.

58 JETP-IP Secretariat's analysis – see Annexure B for information on methodology and assumptions.

59 Analysis based on modelling that is consistent with the low NDC range in 2030 and applies the methodology in Schers and Burton to decompose workforce impacts; assumes no reduction in coal exports, which would exacerbate these impacts.

Besides direct employment effects, major impacts will be felt in local municipalities which depend on coal for economic activity. Over 70% of South Africa's total value added from coal comes from just four towns - eMalahleni (Witbank), Steve Tshwete (Middelburg), Govan Mbeki and Msukaligwa (Ermelo).[60]

Figure 5. Gross value added in the coal value chain as percentage of total in coal towns, 2000 and 2018



Source: *Makgetla and Patel, 2021.*

In Steve Tshwete, 35% of the municipal economy is associated with coal mining and in eMalahleni this is 44%. Coal employment accounts for 26% of jobs in Emalahleni, 17% in Steve Tshwete, 14% in Msukaligwa, and 11% in Govan Mbeki local municipalities.[61] The loss of relatively higher-wage jobs (with pensions and unionisation benefits) and the economic activity associated with the coal value chain, would have significant negative impacts on these four municipalities and thus requires focused attention on just transition planning. An important issue is to maintain basic social and community services which often rely on coal economy contributions through donations, payments, and tax revenues.

Furthermore, municipal sustainability, finances and service delivery are at risk. Eskom coal plants and mines provide water, electricity, and waste services to associated communities and support many community-related activities. As economic activity declines, this will reduce the rates base and increase demand for municipal support for households, putting further strain on municipal budgets and capacity.[62]

60 Patel et al., 2020; Makgetla, 2021.
61 TIPS, 2020.
62 This is an important consideration at the municipal level that requires further analysis.

Finally, many decades of coal mining and use have undermined the health of the population and polluted soil and water. Air pollution non-compliance has been the subject of legal challenge. Degraded land, as well as subsidence and dumps, limits alternative uses for land. Alongside water shortages and quality challenges, this hampers economic diversification and livelihood opportunities.[63] There are almost 800 derelict and ownerless mines which are a major cause of acid mine drainage, while un-remediated mines can attract informal mining, with associated challenges. Considerable and ongoing challenges with mine rehabilitation may be exacerbated by coal downscaling.

Major currently existing structural impediments to a just transition in Mpumalanga include:

- High unemployment and lack of appropriate skills for workers, communities, and youth to transition to new sectors and build local livelihoods.
- Poor infrastructure (such as transport infrastructure, digital and energy access) and environmental degradation constrains economic diversification opportunities. Resolving infrastructural constraints is key to attracting private sector investment.
- The existing financial ecosystem does not address just transition projects: early stage, small-scale (less than ZAR100 million), higher risk, or novel technology-based projects, due to structural limitations in the finance sector and limited availability of grant financing, emphasising the need to crowd in new external grant and concessional financing.[64]

Mpumalanga also has important advantages that can support the just transition, including:

- An existing industrial base and experienced workforce;
- Excellent wind and solar resources, and proximity to electricity load centres, with extensive transport and transmission infrastructure that can be used to support new initiatives in clean energy and other sectors;
- Provincial and local planning initiatives (such as Provincial stakeholder forums on Just Transition and the Climate Change Forum) and institutional capacity to deliver transition projects including Provincial entities such as the Mpumalanga Green Economy Cluster, as well as Eskom and private sector initiatives;

63 MPG, 2021; Dabrowksi and de Klerk, 2013; and Esterhuyse and Buschke, 2021; mining-related issues were also raised at the Presidential Climate Commission's (PCC) stakeholder engagements in Mpumalanga, in publications by civil society groups working with communities such as groundWork and in the National Mine Closure Strategy and JET Framework by the Department of Mineral Resources and Energy (DMRE).

64 S. Lowitt, 2021, "Finance and The Just Transition," Working Paper for PCC, TIPS.

- Emerging lessons from Eskom's repurposing initiatives at Komati;
- Strong civil society presence and active community engagement;
- Natural capital such as mining lands, that if repurposed, could support new employment and investments in a range of productive sectors (clean energy and high-value agriculture, housing[65]) while also building green tourism for generations to come.

Without careful planning and implementation, and given the high rates of unemployment, poverty, and inequality, the loss of employment and economic activity associated with the coal value chain will have significant negative impacts.[66] At the same time, the coal value chain and its associated negative impacts limit the potential for economic diversification into new sectors and constrain investment in new clean sectors.

Addressing structural constraints to enable economic diversification is a key goal of the thematic areas outlined below. The programmes outlined below must be implemented and funded in tandem, as the comprehensive package of interventions will support a place-based and just energy transition.

65 Gaylor Montmasson-Clair, Lauren Hermanus, Mohamed Patel, and Peta Wolpe, 2022, Beyond Coal: Opportunities to Diversify the Economies of Emalahleni and Steve Tshwete Local Municipalities, TIPS/Just Urban Transitions.

66 National Employment Vulnerability Assessment (NEVA); Sector Jobs Resilience Plan; Inputs to the PCC.

4.2.2 CATALYTIC ELECTRICITY SECTOR INVESTMENTS REQUIRED IN INFRASTRUCTURE

Support will be required to decommission and repower and repurpose coal plants, to remediate and repurpose associated coal mining infrastructure, to invest in the transmission grid, to invest in new generation and storage capacity, and to update the distribution networks.

The catalytic investment needs, for which implementing institutions are ready to execute over the next five years are set out below and summarised in Table 14 as follows: Investment in decommissioning; investment in new generation capacity; investment in the transmission grid and Eskom's distribution network infrastructure.[67]

Table 14. National infrastructure investment requirements for the South African electricity sector, 2023-2027, and 2023-2035.

ZAR billions	2023-2027	2023-2035	Notes on who would invest
Coal plant decommissioning	4.1	19.3	Eskom – These Eskom estimates are based on the cost of decommissioning of plants set to retire over these time frames, and are additional to the investment costs of repowering and repurposing projects contained in Eskom's project pipeline.
Transmission	131.8	373.2	Eskom-owned and operated.
Distribution	13.8	127.5	This investment requirement covers both Eskom and Municipal distribution systems, but EXCLUDES the current maintenance backlog in Municipal distributors. (see Section 4.6).
New Solar photovoltaic (PV)	233.2	418.5	This includes utility scale PV AND distributed PV. Most investment is expected to come from the private sector, with some investment from Eskom in its repowering and repurposing programme.
New Wind	241.7	874.3	Apart from an extension of Eskom's Sere Windfarm and additions through its JET repowering and repurposing programme, this will be built and operated by the private sector.
New Batteries	23.1	44.2	Eskom has just awarded a contract to deliver phase 1 of a battery storage project. Other battery capacity may be built by Eskom or the private sector.
TOTAL	**647.7**	**1 857**	
New open cycle gas turbine (OCGT) / combined cycle gas turbine (CCGT)	15	169.7	Eskom, local authorities, and/or the private sector. Not included in the JET IP.

[67] The investment required in municipal distribution infrastructure is set out in Section 4.6.

4.2.2.1 INVESTMENT IN DECOMMISSIONING

In alignment with energy policy, Eskom plans to close seven coal plants by the end of 2030 and two more by 2035, out of a total of 15. Coal plant-decommissioning costs reflect what Eskom has currently provided for in its planning. These costs exclude the costs of repurposing or repowering retired plants and other infrastructure investments.

4.2.2.2 INVESTMENT IN NEW GENERATION CAPACITY

The retirement of coal plants, the existing supply deficit, as well as growth in electricity demand, will necessitate considerable investment in new generation capacity by the country – which will include Eskom, local authorities who own and operate electricity distribution systems, by the private sector, and others. In addition, rapid investment in new capacity will also address the current electricity supply crisis. New renewable electricity and other required capacity will be procured through the existing REIPPP programme from the private sector, via bilateral contracts or other market mechanism (in terms of the reforms announced by the President recently in connection with addressing the electricity crisis, and the institutional reforms proposed in the Electricity Regulation Act Amendment Bill), or in the form of commercial, industrial, and residential embedded generation.

Both the current supply crisis and the need to meet climate change mitigation objectives and compliance challenges, in relation to air pollution regulations, necessitates the addition to the electricity system of around 50 GW of new renewable electricity capacity to the grid, plus the associated gas/battery/storage capacity to ensure security of supply and grid stability. The IRP 2019, which is in the process of being updated by the DMRE, envisages the addition of around 30 GW of renewable electricity capacity by 2030, including 2.5 GW of imported hydro capacity from the region.[68] In the absence of the latter, more renewable electricity capacity will be required within this timeframe, and the current status of the electricity system requires rapid addition of new capacity.

Thus, over the 2023-2027 period, to resolve the electricity supply crisis and to keep pace with investment requirements to meet South Africa's NDC targets and long-term decarbonisation objectives, it will be necessary to add around 6 GW of new renewable electricity capacity to the grid each year, as well as the required gas/storage capacity. This is a no-regrets option; apart from relieving the current pressure on the existing coal plants, the short lead times for wind and solar PV plants imply considerable flexibility in capacity additions. The changes recently announced by

[68] The IRP 2019 proposed that this power be sourced from the Grand Inga hydroelectric scheme in the Democratic Republic of Congo, which would also require the strengthening of the long-distance transmission corridor. The contracting of hydroelectricity from the region at this scale, by 2030, and at the price assumed in the IRP is no longer considered plausible (https://issafrica.org/iss-today/can-tshisekedi-really-revive-grand-inga), and will also potentially pose energy security risks.

President Ramaphosa to the electricity regulatory environment, and specifically, further changes to Schedule 2 of the Electricity Regulation Act, also offer an opportunity for embedded generation at scale as well as for contracting electricity supply directly from renewable electricity generators, onsite or via the grid.

Adding capacity at this rate, however, will require considerable strengthening and extension of the transmission grid. In the short-term, there is potential to connect more than 6 GW of new capacity in Mpumalanga,[69] including repowering Eskom's retiring coal plants, and under Eskom's recently announced land lease programme, and this can be extended to 12.3 GW by 2027 in the northern area with investment in 27 additional transformers.

4.2.2.3 INVESTMENT IN THE TRANSMISSION GRID AND DISTRIBUTION NETWORK

Large-scale and rapid investment in renewable energy, particularly in the Northern and Eastern Cape, will require unprecedented annual levels of investment in the transmission grid, since the grid was primarily designed to move electricity from a very concentrated area in Mpumalanga to the rest of the country, due to the geographic concentration of coal resources. Renewable energy resources however are widely distributed throughout the country, and especially in the Northern, Western and Eastern Cape provinces, with considerable opportunities in other provinces.

Similarly, large-scale investment will be required in distribution grids to facilitate the connection of new REIPPPP utility-scale projects, to enable large-scale distributed generation, to further electrify households, communities, and businesses and provide for offtake agreements between large and small generators and consumers via smart grids, including tackling the backlog of investment in the distribution sector, and to enable new technologies such as electric vehicles to be deployed in an optimal manner. Part of the distribution system is owned and operated by Eskom and part owned and operated by municipalities throughout the country. The scale of investment required in backlog maintenance, upgrade and modernisation of the municipal distribution infrastructure networks is discussed in Section 4.6.

In common with other countries, large-scale integration of renewable electricity capacity into the grid poses challenges that require investment in additional grid infrastructure. The long-term decarbonisation of the South African electricity system, and of the economy in general, will require the rate at which renewable electricity plant is added to the grid to increase even faster in the 2030s and 2040s. Rapidly increasing the transmission grid's capacity to accommodate additional renewable electricity plant around the country is therefore also a no-regrets investment. The lead

[69] From Eskom's Generation Connection Capacity Assessment 2024.

times required for the development of new transmission corridors, and/or the strengthening of existing corridors, which include challenges such as securing servitudes over long distances, means that the associated projects should be initiated as soon as possible. If this transmission investment is not expedited, there is a very real danger that the regional capacity of the transmission grid will be the main bottleneck both to the expansion of the electricity system and its decarbonisation.

Eskom's Transmission Development Plan (2022-2031)[70] (TDP) proposes a series of investments to strengthen and extend the transmission grid over the period 2022-2031, to connect the additional capacity envisioned in the IRP. The TDP's updated[71] version of the IRP expansion plan envisages 20 GW of renewable electricity capacity by 2028 and 30 GW by the end of 2030, whereas the amount of renewable energy required to achieve an outcome in 2030 towards the lower end of the NDC target range would require around 50 GW of renewable electricity capacity by 2030. Eskom has indicated that to achieve its strategic objectives, the investments specified in the current TDP will need to be accelerated and expanded, and a revision of the plan is therefore anticipated.

4.2.2.4 REQUIRED AGGREGATE INVESTMENT IN ELECTRICITY INFRASTRUCTURE

The investment requirements for the electricity sector for an ambitious just transition are presented in Table 14. These are modelled estimates and would require further elaboration at a project level. The investment requirements in the table are consistent with a national GHG emissions level of 375 $MtCO_2$-eq in 2030, which is towards the lower end of South Africa's NDC target range for 2030. The GHG emissions pathway, underpinning this outcome, is both fair and ambitious in terms of the Paris Agreement and is consistent with South Africa's NDC target range in 2030, and with a long-term pathway to net zero CO_2 emissions around 2050, considering South Africa's national circumstances and development imperatives.

Eskom has already done detailed project-level costing for some of the investment requirements in the table, and these are included in Annexure B. Eskom's project pipeline consists of 141 projects and comprises a subset of the required investments across the sector reported in the table below, comprising ZAR5 billion for 950 MW of battery storage, ZAR35 billion for 2550 MW of PV, ZAR13 billion for 600 MW of wind power, and ZAR131 billion for transmission infrastructure. The total cost of these projects is estimated to be ZAR42 billion in the 2023–2027 period and ZAR191 billion in the 2023-35 period.

Most of the investments in PV and battery storage form part of Eskom's repowering / repurposing of retiring coal plants. The project pipeline is also included in the Annexure B. Since the estimates

[70] Available at https://www.eskom.co.za/wp-content/uploads/2022/03/TDP2022-2031Rev1.pdf.
[71] Updated to take into account delays in procuring the new capacity specified in the IRP.

by Eskom and others of the new renewable electricity plant capacity which will need to be connected to the grid are significantly higher than the IRP 2019, an updated TDP will require considerably more investment in the following five-year period. Since Eskom is currently being restructured into three entities, corresponding investments will be made by the three entities with due regard to the resolution of Eskom's current debt crisis.

Around ZAR648 billion (US$43 billion) will be required in investment in the 2023–2027 period and ZAR1.86 trillion (US$124 billion) in the 2023-2035 period, across the sector, including new generation plant and transmission and distribution infrastructure, and decommissioning of coal plants.

Most generation investment will likely come from the private sector or other non-state entities, including some investments from community- and worker-owned trusts,[72] via the REIPPPP or its successor, via bilateral contracts, and / or via commercial, industrial, and residential embedded generation, whereas transmission and distribution infrastructure will most likely be invested in by Eskom and local authorities.[73] The investment requirements in the table for wind and solar PV include both utility-scale and distributed generation. It is not possible, at this stage, to disaggregate these over the relevant period. Where there is more granular detail, this is provided in the Annexure B.

[72] These could include local community trusts or other forms of ownership. It is also possible that local authorities may invest in their own capacity.

[73] Currently, as part of the legacy of apartheid planning, half of the distribution system is operated by Eskom and the other half by local authorities. Current policy is to maintain public ownership of both transmission and distribution.

4.2.3 REQUIRED JUST TRANSITION INVESTMENT IN MPUMALANGA COAL COMMUNITIES

The priority areas outlined below seek to ensure sustainable, long-term regional transitions in coal-dependent Mpumalanga. Transition outcomes should contribute to economic resilience in communities, restoration of the environment, creation of better jobs, and ensuring human capacity and capabilities. To achieve a just transition will require major investments in the enabling conditions that permit and encourage a wide variety of investments across multiple sectors.

There are four interdependent priority areas:

- Repurposing coal power plants and coal mining lands;
- Economic diversification;
- Transition of workers and communities; and
- Enabling conditions for the transition.

While designed specifically for South Africa, these areas draw on international best practices and experiences in supporting just transitions in coal regions around the globe.[74] They also respond to government-identified priority interventions in the DMRE's JET Framework and to current work addressing coal phase down and achieving just transition outcomes.[75]

The investment needs for just transition initiatives in Mpumalanga are summarised in Table 15.

[74] Elizabeth Ruppert Bulmer, Kevwe Pela, Andreas Eberhard-Ruiz, and Jimena Montoya, 2022, Global Perspective on Coal Jobs and Managing Labor Transition out of Coal: Key Issues and Policy Responses, Washington, DC: World Bank, https://openknowledge.worldbank.org/handle/10986/37118; Sandeep Pai, Mary Margaret Aller, Kira O'Hare, Ian Barlow, Hugh Searight, Rahul Madhusudanan, and Mike Ward, 2021, Understanding Just Transitions in Coal-Dependent Communities, Washington DC: CSIS (Center for Strategic and International Studies) and CIF (Climate Investment Funds), https://www.climateinvestmentfunds.org/cif_enc/sites/cif_enc/files/knowledge-documents/understanding_jt_coal_dependent_communities.pdf; World Bank Group, 2018, Managing Coal Mine Closure: Achieving a Just Transition for All. Washington, DC: World Bank, https://openknowledge.worldbank.org/handle/10986/31020.

[75] Multiple studies summarised in PCC's (2022) Framework for a Just Transition in South Africa include the Congress of South African Trade Unions (COSATU) Blueprint; the Life After Coal Open Agenda https://lifeaftercoal.org.za/about/just-transition/open-agenda; and work by TIPS, Stellenbosch University, the University of Cape Town (UCT), amongst others, as described in the introduction to the JT section above.

The investment needs for just transition initiatives in Mpumalanga are summarised in Table 15.

Table 15. Summary of JET IP investment needs for Mpumalanga coal communities, 2023–2027

Investment needs	Description	ZAR billion
Repurposing coal plants	Social investment to support local communities and supply chain developments for new energy technologies	3.4
Repurposing coal mining land	Remediating and repurposing coal mining land for new public and private use	13
Improving infrastructure for development	Infrastructure upgrades in roads, water, digital, energy access, education, and training facilities, to attract investors and improve lives	12.3
Diversifying local economies	Creating and supporting small-scale livelihood opportunities in surrounding communities and nurturing new economic pathways for coal mining regions through new investments and support for incubators, accelerators, and early-stage ventures	24
Caring for the coal workforce	Managing workforce transitions through reskilling, support for mobility, retraining, redeployment, placement, and temporary income support	5.6
Investing in youth and preparing future generations for the transition	Tackling youth unemployment through education, soft skills training, work experience opportunities, and placements	0.75
Planning for success	Conducting a comprehensive assessment of coal asset closures to support provincial and municipal preparedness	0.3
Instituting policies for post-mining redevelopment	Promoting policy alignment and ensuring financing for responsible mine closures and pathways for post-mining rehabilitation and repurposing	0.05
Building capacity for success	Providing budget support to relevant government agencies; budget support for establishing a local secretariat; along with technical assistance and project funding linked to demonstrations, pilots, incubators, and accelerators.	1
TOTAL		**60.4**

The Just Transition investments in each priority area outlined below will need to be phased as follows:

PHASE 1 (YEARS 1–3):

- Secure an immediate impact with kick-start/demonstration projects in communities where coal power plants and related mine activities are set to close first. This may necessitate establishing a project preparation facility to work with organisations whose projects require commercialisation support. In addition, targeted capacity-building initiatives will be launched with local and regional authorities and their agencies to ensure readiness for implementation, with monitoring and evaluation of the first phase rollout.
- Build local skills intelligence to identify new employment and livelihood opportunities (demand analysis), skills that workers and community members possess (supply side), skill gaps, and upskilling / reskilling needs and opportunities. Build capacity for provision of training and start implementation of skills development programmes.
- Design mobility schemes for workers and their families who voluntarily choose to leave employment in the coal community and relocate elsewhere. Baseline studies, preferences surveys, and other instruments would be deployed early to identify worker preferences for a post-coal life.
- Complete in the relevant stages, feasibility studies for infrastructure related to the closing or decommissioning of coal power plants, closing, and repurposing of mines (derelict or abandoned); environmental and social assessments as required by law. This will include community and stakeholder engagement on activities, such as land use planning and future use scenarios. Catalytic mine land-repurposing projects at well-developed stages of development will commence.
- Identify sources of finance for ongoing social infrastructure where such privately funded structures and services will decline due to the transition (for example, hospitals, clinics, schools, digital infrastructure which is currently funded by mining companies).

PHASE 2 (YEAR 4 ONWARDS):

- Execute major infrastructure works related to the closure, decommissioning, and repurposing of coal power plants and mining lands; scale up reskilling, retraining, and outplacement programmes; provide large support schemes to indirect workers; and develop SMMEs. A mid-term review – with surveys, focus groups, and interviews amongst all impacted local stakeholders will be needed to assess the just transition effectiveness of interventions.

Figure 6. Just Energy Transition Priority Areas

	Repurposing coal plants & mining lands	Economic Diversification
Phase I Pre-closure planning 1.5 years	• Review legislation pertaining to reclamation and repurposing • Assess abandoned mine and coal plant assets to be closed and decommissioned • Develop land use repurposing strategies • Prepare special spatial plans for future use scenarios • Community consultations on future use scenarios • Review and possibly amend health, safety and environment and technical standards for closure and decommissioning • Begin private sector mobilisation	• Review existing national and regional development plans, strategies and policies • Perform interviews and focus group discussions in coal communities on the 'future without coal' vision • Identify most promising sectors • Design SMME support programme • Work with stakeholders to identify a pipeline of pilot projects for early transition implementation • Develop monitoring and evaluation (M&E) system that involves local actors in implementation oversight • Call for proposals to implement pipeline
Phase 2 Coal mine and powerplant closure 3+ years	• Repurposing works commence • Apply careful monitoring mechanism for environmental legacy issues	• Roll out of economic diversification programmes
Phase3 Regional transformation 10+ years	• Repurposing and on-going mobilisation of private investment through public-private partnership	• On-going economic diversification programmes

	Workers and Communities	Enabling conditions
	• Assess worker profiles and user-needs of both direct and indirect coal value chain workforce • Review social protection programmes in view of identification of gaps • Develop pre-layoff plan, including income support, active labor market policies and institutional capacity building of service delivery agencies • If schedule of closures in place, work upstream with first 5 year closures to discuss plans and map priorities • Design youth education, placement and employment programme and public employment schemes	• Reform laws, policies and regulations relevant to a Just Transition (labour, environment, energy, mining) • Establish timeline for mine and coal plant closures • Map stakeholders and develop stakeholder engagement strategies • Identify (from existing) fiduciary agency for JET IP programme management and implementation • Establish Special Purpose Entity to manage repurposing • Analyse fiscal analysis of revenue loss due to sector wind-down (national and local effects) • Identify complementary funding sources programmes
	• Provide social assistance (including temporary income support) to workers • Active market policies for workforce transition, including re-skilling, education, and mobility incentives • Early retirement benefits	• Coordinate JET IP implementation through institutional arrangements, including budget oversight M&E system at work
	• Provide longer term education to help preparing workers for future jobs	• Coordinate closure and decommissioning activities amongst relevant actors • Hand over mining lands and coal assets for repurposing

ENERGY SYSTEM

PRIORITY AREA 1: REPURPOSING COAL POWER PLANTS AND COAL MINING LAND

1.1: REPURPOSING COAL PLANTS

The capital investments required for decommissioning and re-powering the targeted coal plants is set out in the investment packages in Section 4.2.2 above and Table 39. The estimated costs of the just transition components of repurposing the coal plants are based on those prepared to date for Komati and scaled for the larger facilities.

- JET IP: Social investments to support local communities and supply chain developments for new energy technologies
- Financing instruments: Grants and concessional financing
- Expected result: Power plants will be closed and repurposed according to international industry best practices.

1.2: REPURPOSING COAL MINING LAND

Current potential for new economic and social development is impeded by the environmental liabilities of improperly closed or abandoned coal mines, with far-reaching impacts on communities (for example, increased water and food insecurity). The objective of these investments is to ensure appropriate remediation and repurposing for new public and private uses with respect to three distinct categories of coal mining lands: (i) abandoned mines; (ii) closed mines; and (iii) operating coal mining lands. The first investment focus will be on a few selected ownerless mines that can act as 'proof-of-concept', followed by coal mining areas set to close in the near term alongside coal plant closures.

- JETP IP: Pilot mine closure and repurposing with a view to redevelopment of land for future public and private use.
- Financing instruments: Grants, in combination with project, concessional, and private financing.
- Expected result: Land repurposed and new investments identified and catalysed.

PRIORITY AREA 2: ECONOMIC DIVERSIFICATION

2.1: IMPROVING INFRASTRUCTURE FOR DEVELOPMENT[76]

As concluded in recent research, an important factor that facilitates successful economic diversification away from coal in coal-dependent regions is enhanced connectivity, whether transport or digital infrastructure. Quite simply, attracting new business investments and professional talent to the declining coal regions of South Africa requires appropriate market and digital connectivity, supported equally by underlying investments in infrastructure such as water, electricity, housing, and other core services. The objective of investments here is to ensure that the necessary infrastructure foundation is in place to attract and retain new businesses and talent and enable new investments in emerging productive sectors.

- JET IP: Improve and strengthen necessary infrastructure for economic trade and development. This will include extensive provincial road rehabilitation and maintenance, expanded digital connectivity, investment in water treatment facilities, irrigation improvements, ecological infrastructure, access to modern energy services, informal settlement upgrading and sustainable housing.
- Financing instruments: Loans for public infrastructure, loans and grants for public employment and energy access.
- Expected results: Increase in trade and people flows, long-term investment attraction.

2.2: DIVERSIFYING LOCAL ECONOMIES

Many current enterprises will be impacted by coal closures (including trucking, rail-related services, accommodation, food, caring, and others). The objective of this investment subcomponent is to bring enterprise supply and demand together for economic diversification away from coal.

To address supply, a series of interventions is proposed to assist current businesses pivot towards greener opportunities in new productive sectors, to work with new emerging SMMEs and to strategically use public employment initiatives that can lead on to and/or interface with sustained private or self-employment for job seekers.[77]

To address demand, a series of interventions is required to identify areas of growth in local markets, based on actual potential, and nurture their development. Support may include incubators, accelerators, and early-stage ventures to create next-generation opportunities and entrepreneurs.

[76] Current investment estimates cover water treatment and sanitation, estimates for road infrastructure rehabilitation, along with the expansion of digital infrastructure and digital connectivity.

[77] This could include, for example, the Social Employment, Waste Innovation, Waste Innovation Enterprise Finance, Waste Technology Innovation Support, the Ecological Infrastructure Fund, and municipal maintenance / upgrading public employment programmes, amongst others that may be identified as needed in Mpumalanga.

Productive sectors to consider include climate-smart mining and minerals beneficiation, biodiversity, agriculture, water projects, tourism, circular economy, and manufacturing (including centres of excellence, industrial parks, and projects).[78] Additionally, provide support for small scale, local livelihood opportunities in surrounding communities.

- JET IP: Support for analysis on informal enterprise impacts (the hustle economy) and risks, support for a wide range of innovative projects and new markets based on diversification strategies under development and identified projects. Create the supply through support to SMME development and training.
- Financing instruments: Grants and concessional loans for public, private, and local community-led initiatives with pilot projects/proofs-of-concept social employment opportunities and scaling initiatives; support for enterprise development training; and seed funding for micro enterprises.
- Expected results: New industries, businesses, skills, employment, and livelihoods.

PRIORITY AREA 3: WORKERS AND COMMUNITIES

3.1: CARING FOR THE COAL WORKFORCE

There will be a range of coal industry workers affected (directly and indirectly) by the closure of mines, coal power plants, and supporting firms. Needs for transition will be handled differently for each group according to national labour laws and provisions made by respective employers. The objective will be to manage the direct and indirect workforce transition through redeployment, reskilling, retraining, support for mobility/relocation, placement support, and temporary income support including short-term assistance.[79]

- JET IP: Implement the recommendations of the Sector Jobs Resilience Plan (SJRP)[80] for the coal value chain, in addition to the short-term transition assistance required by law. Surveys of those affected will identify their preferences, opportunities, and constraints. Enhanced retirement and retrenchment packages (including health packages) and income support mechanisms should be designed and delivered to ensure adequate social protection for affected workers. Redeployments through the Public Employment Programmes including placement of contractors in proposed in the 'Working for Mine Rehabilitation' programme and through public employment schemes. Mobility re-skilling, enterprise development where appropriate.

78 DMRE, 2021.

79 South Africa has an extensive social support system, including social grants, unemployment insurance, etc. However, existing measures are not sufficient to address regional structural changes and value chain vulnerabilities at the scale facing the country in the energy transition. How current social safety nets can be enhanced and targeted at vulnerable groups is a key area requiring further analysis, policy development, and financial innovation to address.

80 https://www.tips.org.za/images/TIPS_for_DEFF-dtic_-_SJRP_for_the_coal_value_chain_final_May_2020.pdf.

- Financing instruments: Grants for reskilling, retraining, surveys, and planning. Concessional financing for retrenchments, mobility, short-term assistance, redeployments, placement support, and enterprise development.
- Expected results: Coal industry workers' livelihoods protected. Resources allocated by Sector Education and Training Authorities (SETAs) for reskilling and retraining of coal value chain workers.

3.2: INVESTING IN YOUTH AND PREPARING FUTURE GENERATIONS FOR TRANSITION

Over half the youth in Mpumalanga communities are unemployed and the coal value chain decline will further narrow employment opportunities as the sector downscales. The objective is to address present-day youth unemployment in coal mining communities and mitigate further declines for future generations. Interventions range from targeted education and soft-skills training; opportunities for work experience including public employment initiatives and placement schemes; and a dedicated set of funds for youth-implemented transition projects. These interventions would be complemented by support to youth-focused networking and experience-sharing platforms for coal sector transition, lifting the South African experience to the global stage.

- JET IP: Focus on three interrelated areas of human capital development: (i) education and soft-skills training linked to direct work experience; (ii) active involvement in transition pilot project implementation; and (iii) networks and platforms to enhance the voice and agency of youth as well as enable their contribution to policy.[81]
- Financing instrument: Grants.
- Expected Result: New-generation skills and employment linked to indicators in the projects supported.

[81] Responding to the youth engagements held by PCC, as well as the Youth Climate Action Plan, 2021 (https://saiia.org.za/wp-content/uploads/2021/10/The-South-African-Youth-Climate-Action-Plan-2021.pdf), including the proposal for youth climate councils to support climate governance and democratic participation.

PRIORITY AREA 4: ENABLING CONDITIONS FOR A JUST TRANSITION

4.1: PLANNING FOR SUCCESS

There is currently uncertainty for stakeholders, including local government and communities, about the timelines of coal closures. The objective is to undertake a comprehensive assessment of coal power plant closures and potential related mine closures, including related details of available financial provisions, social and labour plans, rehabilitation, and social transition plans. The resulting plan will enable assessment and management of the socioeconomic impacts of coal phase down. This will support provincial and municipal preparedness, planning for post-mining land use, and economic diversification.

The draft National Mine Closure Strategy (2021)[82] and the Just Energy Transition Framework both indicate the importance of an integrated approach to mine closure planning and post-mining use.

- JET IP: Work with DMRE and other stakeholders to develop a plan and timeline for coal mine closures.
- Financing instruments: Grants.
- Expected results: Integrated plan and timeline that aligns with the ambitious trajectory of the NDC.

4.2: INSTITUTING POLICIES FOR POST-MINING REDEVELOPMENT

Complex requirements across departments and levels of government have made formal mine closure challenging. The DMRE draft National Mine Closure Strategy elicited calls from civil society for rehabilitation and proper closure of mining areas, and for alignment in implementing mine closure policies across government. The objective is to enable policy alignment and ensure financing for responsible mine closures and pathways for post-mining rehabilitation and repurposing.

- JET IP: Support DMRE and DFFE to assess available resources in rehabilitation funds and develop a financing model for rehabilitation of derelict, ownerless, abandoned and closing mines. Support policy alignment to address planning, regulatory, and financial barriers to successful mine closure. This includes finalising national and regional closure strategies that simplify implementation and close existing loopholes to ensure just transitions.
- Finance instrument: Grants.
- Expected results: Contradictions and loopholes identified and addressed. National and regional mine closure strategies finalised.

[82] DMRE, 2021, "National Mine Closure Strategy," https://www.gov.za/sites/default/files/gcis_document/202105/44607gen446.pdf; and DMRE, 2021, Just Energy Transition (JET) Framework. The JET Framework notes that a sector-wide assessment is needed for the purposes of JET planning.

4.3: BUILDING CAPACITY FOR SUCCESS

Implementation of the IP will require significant coordination and monitoring skills to ensure its success. In addition, municipal and provincial government and structures may require additional resources to support implementation effectiveness. This sub-priority area will ensure sufficient resources are made available to: (i) establish the institutional mechanisms to support implementation of the Mpumalanga IP priority areas; (ii) coordinate with mining companies, municipalities, workers, and communities to ensure the Mpumalanga IP priority areas are aligned with integrated development plans; (iii) host regional and local Just Transition forums to raise awareness of the programmes that are in place. In addition, the JET IP may support a small number of demonstration projects to catalyse stakeholders around the just transition agenda in South Africa.

- JET IP: Perform stakeholder engagement and outreach in a consistent manner; build capacity for integration of the District Development Model; the Integrated Development Plans; Local Economic Development plans; and the Social and Labour Plans as a way of ensuring integration, funding the municipalities during the transition, and ensuring continuity of service delivery in affected towns.
- Finance required: Budget support to relevant government agencies; budget support for institutional mechanisms; and technical assistance linked to demonstration, pilots, incubators, and accelerators.
- Expected results: Municipal and District plans positioned to manage the transition.

4.2.4 REQUIRED JUST TRANSITION INVESTMENTS IN THE ELECTRICITY SECTOR

While a significant portion of just transition investments in the short term will support coal communities in Mpumalanga, there are also key interventions needed in the electricity sector more broadly, to promote the goals of the National Just Transition Framework and which will take place across multiple locations/sites outside of Mpumalanga. Their implementation will contribute to achieving a socially just, inclusive, and jobs-rich future through maximising the development potential of the power sector infrastructure investments, contributing to industrial development and innovation (including expanded manufacturing[83]), and restorative and distributive justice for vulnerable households and workers.

The investment needs for this aspect of a just transition are summarised in Table 16.

Table 16. Summary of Electricity Sector Just Transition Investments

Investment Package	Description	2023–2027 ZAR billion
Manufacturing and localising the clean energy value chain	Expanding capacity in the clean energy value chain, including renewable energy, battery storage, transformers, lines, components, and associated value chains	1.60
Piloting social ownership models	Testing diverse models for the social ownership of electricity generation and building capacity in communities to participate effectively	1.65
TOTAL		**3.25**

4.2.4.1 INVESTMENT IN THE CLEAN ENERGY VALUE CHAIN

Insufficient local manufacturing capacity in renewable energy and associated inputs reduces the potential for job creation in the value chain, while the growth potential of private procurement is not being captured. The cost of capital is a key constraint. Manufacturing of key components – including renewable energy localisation, battery storage, transformers, lines, components, and expansion of associated value chains such as critical minerals – can support industrialisation, job creation, and inclusive ownership, and enable infrastructure rollout to proceed smoothly.[84]

- JET IP: Finance to enable increased local manufacturing of key components.
- Types of financing: Grants, concessional and commercial loans.
- Expected results: Increase in local manufacturing and job creation.

[83] A key investment in a just transition will be in skills and training and the expansion of the local manufacturing capacity to support these priorities. The South African Renewable Energy Masterplan (2022) indicates that local manufacturing can contribute ZAR420 billion to the country's GDP and create 36,500 new direct jobs by 2030 through investments to meet the IRP 2019's renewable energy capacity, indicating potentially far greater positive benefits for a low NDC-compatible renewable energy rollout.

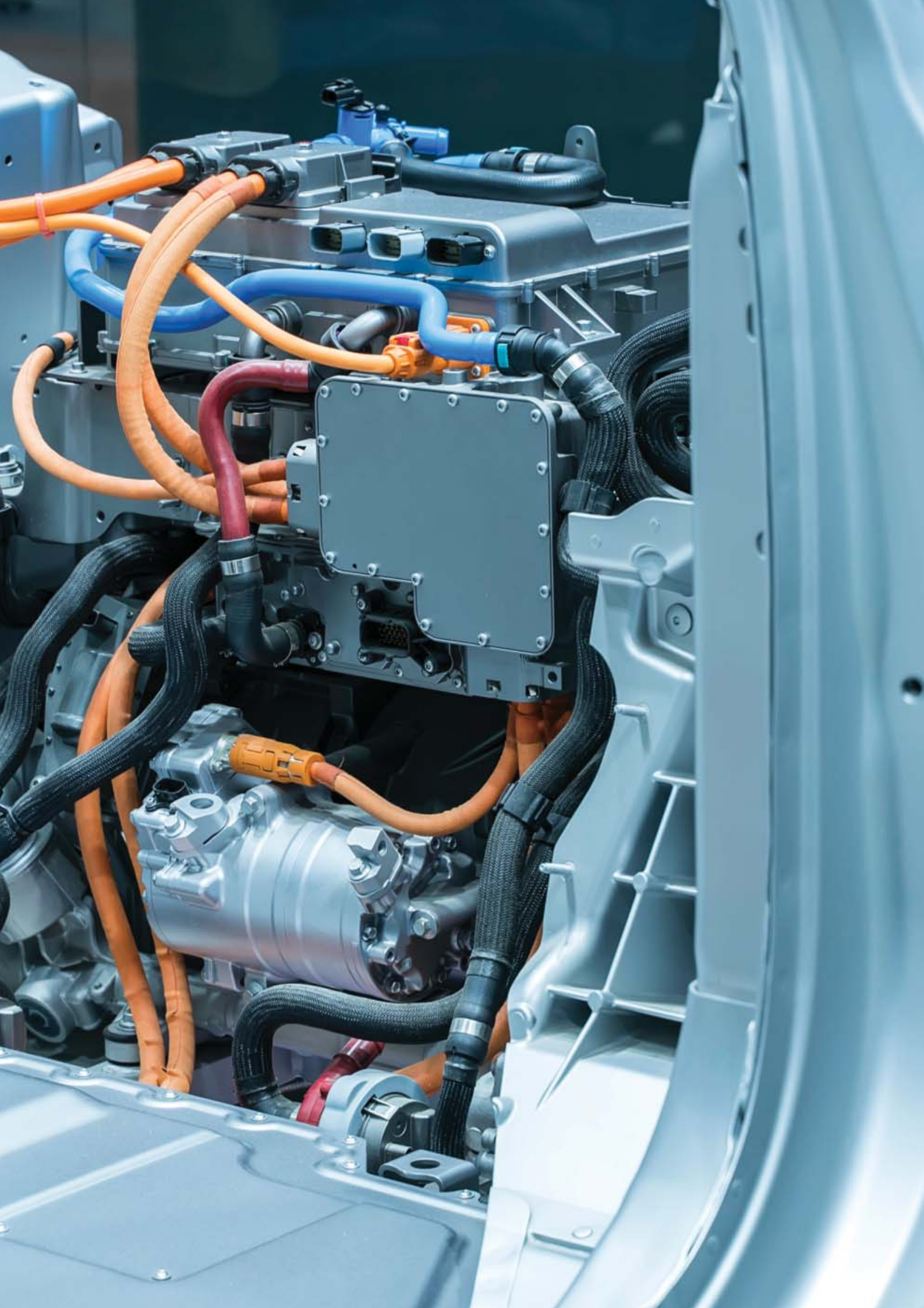
[84] Battery storage and minerals investment needs are captured in the NEV section 4.3 to avoid double-counting.

4.2.4.2 PILOTING ALTERNATIVE MODELS OF ELECTRICITY GENERATION OWNERSHIP

Alternate forms of ownership of electricity generation assets have the potential to contribute to ensuring that growth in new low-carbon sectors is inclusive and brings benefits for vulnerable groups. These include community ownership of embedded generation infrastructure, share options for workers in renewable plants, cooperative forms of ownership, and schemes to ensure that the benefits of utility-scale renewable infrastructure provide energy access to people living in adjacent areas.

This initiative will enable innovation and learning in the development of diverse ownership models, with the purpose of advancing inclusivity and benefits to vulnerable groups. It will involve: research to identify and assess diverse models, financing modalities, institutional and other barriers; capacity development support and community engagement; support for testing a community of practice in community/social ownership (recognising the diversity of models, with advantages and disadvantages and emerging lessons); testing of scalability in differing social and geographic circumstances; options for community participation in utility-scale renewable energy projects; options for household/ cooperative/community ownership; and related options for small-scale enterprises.

- JET IP: Grants and concessional financing to support research on diverse ownership models and financing options; development of feasibility studies; and identification, implementation, and monitoring of two or three pilot projects, including support for participants to enhance their capacity.
- Outcomes: Viable models for diverse ownership of new electricity generation assets; potential for enhanced energy access and income generating benefits for vulnerable households.
- Types of financing: Grants. Concessional and commercial loans.
- Expected results: Community ownership in renewable energy increased; sustainable models identified.



4.3 NEW ENERGY VEHICLES SECTOR

4.3.1 CONTEXT

The South African automotive manufacturing sector is a major GDP and jobs contributor, constituting ZAR259,7 billion or 5.7% of SA GDP in 2020; 17.3% of manufacturing output; and employing 508 957 people. But it is under threat of obsolescence from the technology transition from Internal Combustion Engines (ICE) to New Energy Vehicles (NEVs). More than 60% of South Africa's production is exported to other markets, with 77.1% (2021) of exports destined for the UK and the EU which are introducing legislation to bar the sale of ICE vehicles, rapidly accelerating towards NEV only and net zero markets, placing the sustainability and competitiveness of local manufacturing at risk.

There are significant interdependencies between the automotive manufacturing sector and transport sector decarbonisation. The rapid global transition to NEVs presents both an existential challenge and a significant opportunity for the South African automotive industry. The majority of South African production is for internal combustion engines (ICE) vehicles, with some Hybrid EV (HEV) production. The UK and the EU are also considering the introduction of a cross-border carbon tax on imports, further challenging the industry which, due to relatively carbon-intensive electricity, could be subject to higher taxes on vehicles exported to those markets. This further requires the decarbonisation of South African automotive production towards green manufacturing.

Globally, the transport sector is one of the largest consumers of fossil fuels and a significant contributor to GHG emissions but is rapidly transitioning to NEVs, with 17 countries already having passed 20% penetration of new vehicle sales being electric, supported by fiscal subsidies.

The South African transport sector represents the third highest emissions contributor (57 Mt of CO_2 per annum or 10,8% of national GHG emissions) to South Africa's carbon emissions profile; and is an important focus for emissions reduction interventions to achieve the NDC targets. Of these emissions, road transport is responsible for 91.2%, which is the decarbonisation focus of this Section of the JET IP.

The South African transport sector faces key challenges which inhibit inclusive economic development and incur significant environmental, health, and safety externalities: An unequal and inefficient public transport sector; low use of rail for the transport of freight; and ageing infrastructure with a high maintenance backlog. Many of the core elements of a transport transition – including

electrification, integrated public transport systems, urban densification, and shifting freight from road to rail – have the potential to address both the socio-economic and environmental ambitions of the country, as espoused in the NDP.[85]

The manufacture and assembly of components and vehicles contributes 4-5% of South African GDP (with economic multiplier). In 2021, the local automotive manufacturing sector generated sales of approximately ZAR309 billion, making it the fourth largest manufacturing sector in the country by sales. The industry paid ZAR32 billion in formal wages in 2021 and it supports an ecosystem of ancillary industries and indirect jobs in three provinces, namely: Eastern Cape, KwaZulu-Natal, and Gauteng (26% of manufacturing employment in the Eastern Cape; 41% of manufacturing employment in Nelson Mandela Bay; 27% in Buffalo City; 13% in Tshwane; and 9% in eThekwini). It supports total employment of 508,957, far exceeding the coal mining sector. The export of vehicles and components from South Africa accounts for approximately 15% of all export revenue. In 2019 and 2020 the automotive industry accounted for US$4 billion and US$1.1 billion greenfield investment in the country, respectively. South Africa's automotive sector ranks 21st in global vehicle production, supplying both export and domestic markets, but faces key challenges in the energy transition in its ability to:

- finance the technology pivot to NEV manufacturing platforms and capability;
- remain globally competitive in NEV production due to lower barriers of entry for the new NEV manufacturers;
- decarbonise South Africa's industry in line with Net Zero and to meet global Original Equipment Manufacturer (OEM) and market requirements;
- finance the domestic NEV adoption and the rollout of battery-charging infrastructure, as well as the investment support and incentives for middle-income affordability; and
- finance the recapitalisation of mid-tier to smaller suppliers of ICE-specific components to produce NEV technologies.

Although the passenger EV market remains small (less than 1 004 units sold in 2021), the commercial sector NEV-related initiatives and developments are growing off a low base, despite being nascent. Industry bodies and programmes – such as the national uYilo eMobility Programme (aiming to enable, facilitate, and mobilise electric vehicle mobility in South Africa),[86] the Electric Vehicle Industry Association (EVIA) (aiming to facilitate the greater deployment of e-mobility in South Africa), and Green Cape which tracks and reports on EV-related companies and projects – are assisting with driving the transition. The Green Cape Finance Accelerator (CFA) programme, co-funded by the UK government, has seen close to US$179 million in applications for low-carbon transport solutions in 2022.

85 RSA. (2011). National Development Plan 2030 - Our Future-Make It Work.

The bus, mini-bus taxi (MBT), and light commercial vehicle (LCV) segments are witnessing increasing efforts and commitments to deploy EVs and build manufacturing capacity across their value chains.[87,88,89] Investments in the local lithium-ion battery value chain are also being explored for both stationary and mobile applications.[90,91]

Despite clear policy direction towards a decarbonised and sustainable sector, implementation plans and technical resources for an integrated sector transition need further development and resources. Given South Africa's ICE vehicle exports market relative to global competitors, it is evident that the country is a global player in the automotive sector but that preserving such market share, and associated employment, through the energy transition and NEV adoption will be challenging and will require a deliberate investment support programme. The role that the South African automotive sector can play in the transition of transport sectors in other African countries should also not be underestimated, given the rise in exports on the continent.

Long lead-times and investment cycles by OEMs mean that decisions need to be made soon to mitigate South Africa's exposure to these risks and the country will therefore, need to rapidly establish conditions for the deployment of as many locally produced NEVs as possible. This may require a review of the existing South African Automotive Masterplan (SAAM), 2021–2035.

The NEV element of the JET IP is focused on supply chain localisation, the manufacturing of NEVs and local markets, along with support for the adoption of NEVs and the alignment of infrastructure investments to projects, in order to provide both sector stability and new growth through green product manufacturing. It also demonstrates that incentivising the accelerated NEV adoption in South Africa will contribute to the decarbonisation of the logistics sector and the transition of the automotive manufacturing industry. South Africa's JET pathway for the transport sector thus requires that synergies be clarified between private sector investments, government spending, and incentive programmes, to prioritise and sequence JETP IP financing for the acceleration in local NEV manufacturing and local NEV use. Success will require national coordination and cross-sectoral collaboration.

86 uYilo, 2022, "Projects," https://www.uyilo.org.za/projects-uyilo/.

87 https://www.businessinsider.co.za/golden-arrow-solar-power-and-new-electric-buses-made-locally-2022-7.

88 GreenCape, 2022, 2022 Electric Vehicles Market Intelligence Report, https://www.westerncape.gov.za/110green/files/atoms/files/EV_MIR_29_3_22_FINAL.pdf.

89 https://www.eng.sun.ac.za/news/first-electric-minibus-taxi-is-coming-to-south-africa/.

90 Gaylor Montmasson-Clair, Anthony Dane, and Lesego Moshikaro, 2020, Harnessing Electric Vehicles for Industrial Development in South Africa. TIPS Research Report for Department of Trade, Industry and Competition and the National Association of Automobile Manufacturers of South Africa, Pretoria: TIPS.

91 The Megamillion Energy Company, 2022, https://www.tmec.africa/project.

4.3.2 FOCUS AND SCOPE

Without a deliberate and coordinated local effort, South Africa's transport sector will be on a trajectory that is inconsistent with NDC by 2030 and net zero by 2050. Table 17 summarises what is included and excluded from the scope of the NEV investment plan. The focus is on battery electric vehicles (BEVs). Fuel-cell electric vehicles (FCEVs) are discussed with reference to GH_2 in Section 4.4.

Table 17: Scope of the NEV (BEV) applications

Subsector	Scope
Private passenger (cars)	Included
Public passenger (buses)	Included
Public passenger (MBTs)	Included
Government fleets	Included
Commercial vehicles – light	Included
Commercial vehicles – heavy	Partially included in the analysis, but is not included in the investment plan. Not categorised as a potential 'early adopter'; there remains significant uncertainty regarding optimal technologies (BEV, FCEV, green fuel ICE); and FCEV applications are considered in Section 4.4 GH_2
Industrial NEVs	Excluded: Limited scale (low relative contribution to transport emissions); BEVs currently being deployed with a good business case (such as underground mining); limited potential for additionality; some opportunities for fast tracking
Rail	Excluded: Limited potential to convert diesel trains to electric; priority focus is on improving current rail services to attract more cargo to South Africa's existing electrified rail network; industrial locomotive applications limited
Air transport	Excluded: Hard-to-abate sector with limited mitigation opportunities in the short term; BEVs not expected to play a significant role
Maritime transport	Excluded: Hard-to-abate sector with limited mitigation opportunities in the short term; BEVs not expected to play a significant role

The Political Declaration includes EVs as a priority for the JET IP. In addition to this technology shift focus, other mitigation measures could attract concessional finance and deliver significant just transition outcomes in the form of reduced transport costs for the poor, improved access to economic opportunities and services, and improved mobility services (quicker, safer, and more comfortable). A just transition needs to ensure that decarbonisation is undertaken in a way that contributes to such changes. In the case of transport, this includes a reduced need for motorised transport services through improved urban design, improving access, and reducing transport costs for poor and vulnerable people.

The NEV investment plan focuses on the automotive industrial sector, with respect to a just transition (preserving and potentially growing the automotive sector's contribution to the economy and mitigating some of the negative

92 NBI-BCG, forthcoming, Just Transition and Climate Pathways Study for South Africa: Decarbonising South Africa's Transport Sector.

transition impacts on the liquid fuel sector, including alleviating any job losses). There are also other parts of transport decarbonisation that are relevant in a just transition (Table 18) and should be considered for investments targeting transport decarbonisation.

Table 18. Just transition considerations relevant to transport decarbonisation

Sector / subsector	Just Transition Considerations
Electricity sector	Increased electric vehicle adoption will stimulate the growth of the electricity sector, potentially supporting higher numbers of jobs and other economic benefits. EV charging-related investments in the grid could enable greater energy access and security. At a point where dual flow or vehicle-to-grid (V2G)[93] becomes a reality, EVs will enable greater deployment of variable renewable power in the system. The EV-charging infrastructure, linked to off-grid or microgrid systems, will also add utility to these systems and provide additional mobility options to remote communities.
Liquid fuel sector	A just transition to NEVs is embedded in the just transition of the country's petrochemicals sector. NEVs will reduce the demand for liquid fuels. While the decrease in petrol / diesel consumption will lead to a reduction in government revenue, this will be compensated by a decrease in the imports of crude, petrol, and diesel (in the short term). However, the closure of refineries will lead to an increase in the imports of kerosene / jet fuel and other hydrocarbon products.[94] Jobs and economic activity associated with the downstream value chain (wholesale and retail) will be most at risk. Ports and import facilities will need to be modified / upgraded to handle a changed liquid fuel import product mix and increased volumes. Local production of GH_2, along with lower- and zero-carbon fuels, could mitigate negative EV-related impacts on the liquid fuel value chain.
Mining and materials sector	Fuel-cell electric vehicles (FCEVs) and the development of a green hydrogen economy will increase the demand for Platinum Group Metals (PGMs), but BEVs will reduce the demand for PGMs used in auto catalysts in ICEs (which account for 39% of the global platinum demand). BEVs, the expansion of the electricity system, and the green hydrogen economy will increase the demand for energy transition minerals, such as copper, cobalt, manganese, and lithium. South Africa will benefit from an increase in the demand for manganese and other precursor minerals; as such, it may need to import certain minerals, which are available in the region. Projects are underway to produce higher-purity minerals. The electricity system expansion and the local GH_2-related production will significantly increase the demand for iron and steel, cement, and construction services.
Health sector	Improved air quality will lead to a reduction in health expenditure and an increase in labour productivity.
Other sectors and passengers	Lower transport costs will benefit energy-intensive sectors and increase the disposable income of all South Africans, but these aspects will benefit the wealthy more, unless coupled with efforts to broaden access and ensure a just transition. To avoid a regressive impact, there needs to be a focus on swaying entry-level buyers (upper-middle-income households) to purchase EVs, instead of ICE vehicles, and on electrifying public transport to extend the benefits of e-mobility to low-income and lower middle-income households. Enhancing the competitiveness of freight rail will have positive knock-on impacts on inland prices and export competitiveness, while increasing the demand for cement and steel, with positive short-term impacts on the construction sector.

[93] V2G allows electric vehicle batteries to discharge power back into the grid when needed, making the batteries an energy storage resource in addition to a mobility device.

[94] Anthony Dane, Dave Wright, and Gaylor Montmasson-Clair, 2019, Exploring the Policy Impacts of a Transition to Electric Vehicles in South Africa. https://www.tips.org.za/research-archive/sustainable-growth/green-economy/item/download/1736_f8c5c661120534142e46b3fec6d5a810.

4.3.3 THE VALUE PROPOSITION FOR SOUTH AFRICA'S TRANSITION TO NEVS

4.3.3.1 ECONOMIC GROWTH AND INVESTMENT

The automotive sector is a significant source of foreign earnings, contributing to the balance of payments for the economy. Aligning domestic and export market transitions will enable greater investment, reskilling of workers, and economic growth. This aligns well with governments phased approach for transitioning the automotive sector and creating jobs. The economic benefits will also be a product of tradeoffs between a considerable loss of fuel and road-related taxes and a stable inflationary environment due to the decoupling from oil prices.

A transition to NEVs will further support the reduction of USD-denominated fuel imports, which is in line with government policy, as road users switch to ZAR-based wind and solar electrical energy. The impact on jobs is indeterminate in the context of the fuel sector, whilst there are fears of jobs losses, the responsibility must be shared by the private sector and government. Private sector fuel companies from developed nations must contribute significantly to the just transitions of developing countries as an appropriate mitigation plan for the liquid fuels transition. This can include supporting skills development and investing in energy delivery products and services, for example, charging devices and investing in biofuels or synthetic fuels refineries.

4.3.3.2 JUST TRANSITION

Sustaining the economic benefits and jobs associated with the automotive manufacturing sector is a priority. In 2020, the automotive industry had an estimated 186,536 direct jobs, 118,837 indirect jobs, and 203,583 induced jobs, thereby contributing to a total of 508,957 jobs to South Africa's economy.[95] The impact of the NEV transition on automotive manufacturing, associated supply chains, and socioeconomic metrics such as jobs, skills, and income has been researched by various parties. Industry and government are preparing for the introduction of NEVs, with global OEMs evaluating investment support available from both traditional and new automotive manufacturing countries. Early commitments by global OEMs for the local production and assembly of NEVs are critical to ensuring the retention of key automotive export markets and critical jobs in the sector. The impact of the NEV transition on the petroleum industry supply chain (import facilities, refineries, transportation, wholesale, retail, and related suppliers) is uncertain, but plans being devised for just transition mitigation measures need to be developed.

[95] Source: Industrial Development Corporation (IDC)

4.3.3.3 DECARBONISATION

Even if using the current carbon-intensive Eskom electricity for charging, the NEV efficiency gains and inherently lower carbon footprint will significantly contribute to decarbonising the transport sector. As such, the outlined transition targets in the JET IP are forecasted to achieve a reduction consistent with the lower range of the NDC targets.

The adoption of NEVs will support South Africa's ambitions and those of its largest trading partners (UK and Europe), which have set targets of banning ICE vehicles by 2030 and 2035, respectively, and protect South Africa's current motor vehicle exports to these markets. Regionally, the ability of South Africa to produce NEVs and export to the rest of Africa will support the decarbonisation plans of many African countries.

4.3.3.4 GREEN / SUSTAINABLE MANUFACTURING

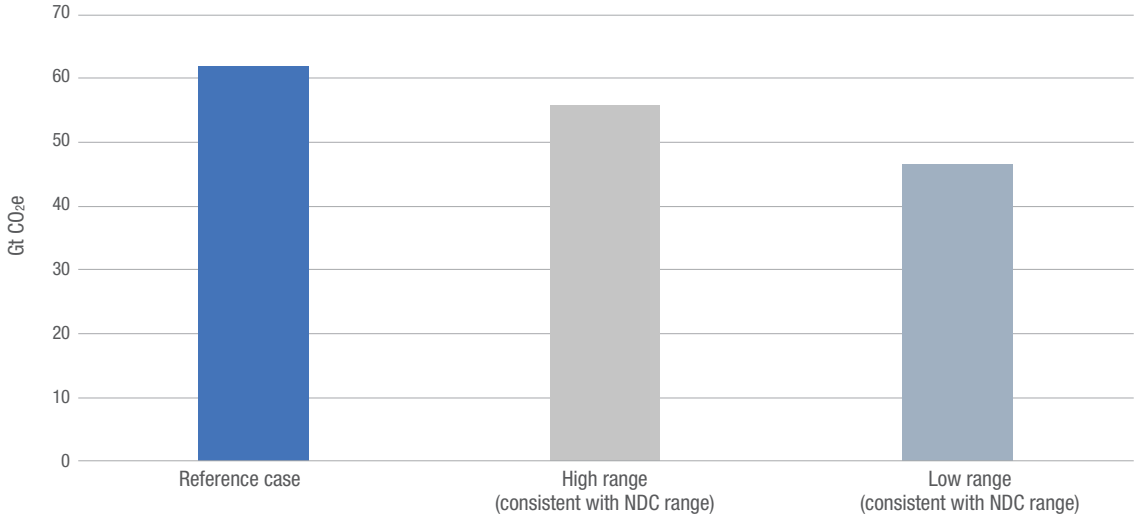
NEVs (and the associated value chain comprising the component manufacturing, extraction, and beneficiation of the battery minerals value chains) will be an integral part of the broader green economy, thereby impacting local investment in technology and skills innovation.

Special Economic Zones (SEZs) can be used as anchors or hubs and present high implementable value propositions for tying together the strings for sustainable manufacturing.

The carbon intensity of batteries will require the sustainable management of the battery value chain and potentially see the regional production of batteries for mobility and stationary applications. However, given the high cost of the investment required, significant grant and concessionary funds will be required for South Africa to participate in the battery value chain.

To meet road transport emissions reductions consistent with South Africa's NDC (Figure 7), a high-level approximation was modelled of how an NEV deployment in the different segments of transportation could contribute, as shown in Table 19. Additional mitigation options, notably demand-side measures and modal shifts, will also play a part in meeting the transport component of the NDC.

Figure 7. Road transport's GHG emissions consistent with South Africa's NDC by 2030



The NDC does not specify a target for the transport sector. The above range provides a reference point which is representative of transport decarbonisation pathways consistent with the NDC range; it is based on the modelling that determined a range of least-cost scenarios for decarbonisation across the economy. As such, it is contingent on measures being implemented in other sectors of the economy.

4.3.4 NEV PENETRATION POTENTIAL

While policy and regulatory measures for unlocking the NEV penetration continue to receive attention by the South African government, the NEV sector investment approach for the JET IP has considered short-term catalytic interventions for the next three to five years as well as medium-term trends to 2030. The approach considered what level of domestic NEV penetration is possible within the segments included in this analysis. Modelling was conducted to assess the GHG implications and investment requirements associated with the following scenarios:

- **Scenario 1:** price parity[96] in 2027 – this could be achieved through various measures, depending on the segment, including tariff reforms, lower costs of capital, incentives, and subsidies, amongst others.
- **Scenario 2:** delayed transition – this could occur due to policies and existing barriers stifling the market's ability to deploy NEVs.
- **Scenario 3:** ambitious local vehicle deployment associated with the planned local manufacturing – this assesses the possible extent to which the current NEV project and investment pipeline translate into a local deployment of NEVs, excluding exported vehicles (See Table 19 and Table 20).
- **Scenario 4:** conservative local vehicle deployment is associated with the planned local manufacturing (see Table 19 and Table 20).
- **Scenario 5:** one million NEVs are on South Africa's roads by 2030 – this is informed by research and expert opinion suggesting that this would be an ambitious, but feasible, penetration level.

This top-down approach serves to evaluate the potential of NEVs for decarbonising transport within the short term and the requirements (see Table 19), but also to sense check and understand the contribution of the bottom-up plan for producing vehicles for the export and the local markets. The bottom-up approach identifies existing and potential projects, using market and available information, as presented in Table 19. Thirdly, the figures are aligned with the investment themes identified and the NEV segments likely to have the most material impact are presented in Table 17.

The investment plan is focused on the local automotive value chain production as a key requirement of a just transition. It will contribute to achieving South Africa's NDC and net-zero ambitions, as well as provide further support that will be needed to achieve the levels of decarbonisation associated with Scenario 1.

[96] The capital cost premium on NEVs, relative to ICE, is one key factor limiting the uptake of NEVs. While not the only factor, the model used this lever to explore the potential of fast-tracking deployment and assessing the GHG emissions implications, as well as the "funding" that would be required to cover this premium.

The plan is in line with the NEV Roadmap of the Department of Trade, Industry and Competition (DTIC) that includes the following phases:

- **Phase 1:** Focus on the assembly of NEVs primarily for export, while preparing for local sales; and finalise the NEV components for local manufacture and pilot projects.
- **Phase 2:** Growing the domestic consumption market by expanding the local NEV component manufacturing sector. This will help facilitate the shift to full electrification.
- **Phase 3:** Focus primarily on the domestic market for NEVs, especially BEVs and fuel-cell technologies.

The JET IP is aligned with DTIC's NEV roadmap and provides a holistic support package for the industry (mainstream and infant). The phased approach by government will create an enabling environment for NEV production and address resource mobilisation, focusing on at-risk exports.

The current policy tools may be augmented, subject to budgetary constraints and additional proposed tax incentives.

To accelerate this plan, and fast track deployment of locally produced NEVs in the South African market, the country needs additional support.

The scenarios assume NEV penetration based on either fast-tracking purchase price parity through measures such as vehicle subsidies (Scenario 1), assuming a range of locally produced vehicle deployment on South Africa's roads (Scenarios 3 and 4) or exogenously assuming a total of 1 million NEVs on the roads by 2030 (Scenario 5). The GHG emission pathways for the road sub-sector are shown in Figure 8 and the abatement impacts and investment requirements per NEV penetration scenario are shown in Table 19.

All scenarios are potentially consistent with the upper and lower bounds of the NDC target, recognising that technology shifts (to NEVs) represent one of several measures to reduce road transport emissions, and that the NDC does not have sector-specific targets. On their own, Scenarios 1 and 5 can potentially achieve the high range consistent with the NDC target (55.7 $GtCO_2e$) but not with the low range (46.4 $GtCO_2e$). This highlights that other long-term measures (notably demand-side measures and modal shifts) need to be implemented, in conjunction with measures to increase NEV deployment.

Figure 8. GHG emission pathways for the road transport subsector, per scenario

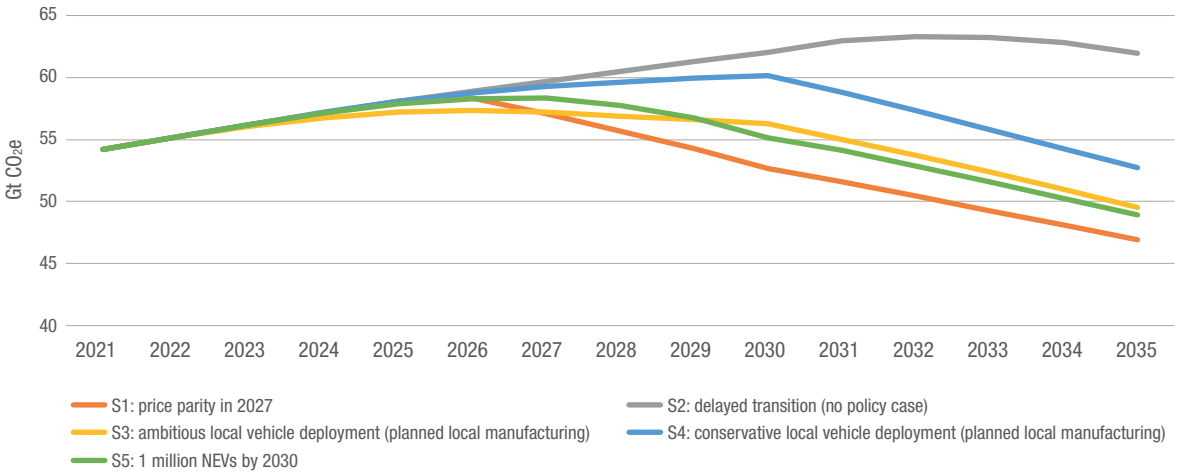


Table 19. GHG impacts and investment requirements per NEV penetration scenario

Scenarios*	$GtCO_2e$ (road)		Abatement ($GtCO_2e$)**		Number of NEVs ('000)		Investment required ZAR million
	2030	2035	2030	2035	2030	2035	2030
S1: price parity in 2027	52.68	46.91	9.36	15.08	1 790	4 534	70 369
S3: ambitious local vehicle deployment (planned local manufacturing)	56.25	49.54	5.79	12.45	1 474	4 195	78 715
S4: conservative local vehicle deployment (planned local manufacturing)	60.19	52.72	1.85	9.27	161	2 958	0 180
S5: 1 million NEVs by 2030****	55.16	48.90	6.88	13.09	1 003	3 833	41 199

* This includes scenarios exploring the NEV penetration relative to the delayed transition (Scenario 2).

** relative to the delayed transition scenario (no policy case).

*** This includes marginal costs on the vehicles (the NEV purchase price premium relative to ICE vehicles per year up to 2030 multiplied by the number of NEV sales per year) and the charging infrastructure costs for the given NEV penetration (this includes the cost of private chargers, per segment, and 30% of the cost associated with deploying the necessary number of public charging stations. 30% is what the industry suggests is needed to fast-track investments and ensure adequate coverage including in areas where public charging stations are not likely to be profitable. The remaining investment will be made by the private sector in response to the market).

**** This pathway is synonymous with achieving NEV purchase price parity in 2030.

Scenario 1 is associated with 26% of all vehicle sales up to 2030 (63% of sales in 2030) (see Table 19 and Annexure D) requiring a total investment of ZAR74.2 billion over the period to fast-track purchase price parity and ensure adequate coverage charging infrastructure including public charging (DC and AC) aligned with global benchmarks of 1 station per 20 BEVs on the road. This is comparable to the TIPS estimates that the annual cost of purchase price subsidies will need to

reach ZAR12.4 billion to reach 20% of new private passenger sales by 2030. They further estimate that the complete transition of the MBT sector to BEVs will require a subsidy of about ZAR21.2 billion (time period not provided).[97]

Policies and measures still need to be developed. Options include tariff and incentive reforms, ICE sales bans, passenger transport incentives (for example, subsidies, adjustments to the Taxi Recapitalisation Programme, conditional bus operator subsidies and licences, and public procurement programmes), and project development vouchers (CAPEX vouchers for major implementations per category). and various other measures to be explored, in parallel, to reduce the upfront capital cost of NEVs and address other barriers.

Public policies should not discriminate between technologies, which all have a role to play. Moreover, a trial-and-error approach, leveraging pilots as well as phased mechanisms, would be sensible in the short term. This would enable government and relevant stakeholders to tailor support packages in line with market responses as well as address any drawbacks or shortcomings.[98] These packages should be considered, together with supporting measures, in related sectors, notably electricity, automotive, and liquid fuels. Importantly, the rollout of NEVs needs to be done in tandem with an investment in adequate infrastructure (electricity grid and/or hydrogen network). In all cases, strong partnerships are needed, as well an iterative approach, to ensure appropriateness within the South African context.

NBI-BCG suggests that the total cost of ownership (TCO) price parity could be achieved as early as 2023 for private passenger cars, 2025 for MBTs, and 2023 for LCVs, with the removal of import tariffs on BEVs. But the uptake will not be a function of price alone. The limited experience in deploying NEVs in the country and the uncertainties regarding the market uptake of NEVs need to be considered. Adequate charging infrastructure will be important in addressing some of these uncertainties. While public charging infrastructure can be rolled out by private developers where there is a profit to be made, investment is needed for unprofitable charging networks to ensure adequate coverage, including poorer areas. Fast-tracking these investments to address range anxiety, for example, requires funding to incentivise investments ahead of market requirements. The estimates of the total investment required for the public charging infrastructure by 2050 range from ZAR100–184 billion. These estimates exclude some of the 'soft costs' such as the need for grid connection advisors, which will likely increase as the easy-to-implement sites (on private land) get exhausted and the more complicated installations on public land are needed.

97 TIPS, 2022, "Towards an Inclusive Rollout of Electric Vehicles in South Africa," Policy Brief 3/2022.

98 Gaylor Montmasson-Clair, Anthony Dane, and Lesego Moshikaro, 2020, Harnessing Electric Vehicles for Industrial Development in South Africa. TIPS Research Report for Department of Trade, Industry and Competition and the National Association of Automobile Manufacturers of South Africa, Pretoria: TIPS.

4.3.5 REQUIRED NEV SECTOR INVESTMENTS

Table 20 shows a snapshot of NEV projects and investments targeted over the next three to five years, based on market intelligence and local project initiatives.

Based on the above analysis, a summarised investment proposal has been developed for the JET IP's support of the growth of South Africa's NEV sector. The planned investments are in the following focus areas:

- **Just Manufacturing Transition:** Supply chain investments to support the retention and growth of jobs for the automotive sector, as it transitions to NEV. Such jobs include assembly and component supply chain jobs in existing and new products. This segment also has strong linkages to the energy sector for localising energy storage inputs, such as batteries and fuel cells.
- **Public Transport (Public Buses and Taxis):** This is an area where both the national government and local (city) governments could advance procurement and incentives. It includes the private fleets providing passenger services to local government (for example, Golden Arrow and Putco); and MBTs that are a large component of the transport sector and the largest private transport sector in South Africa, serving lower-income households.
- **Mobility emissions abatement:** This area addresses the decarbonisation of the NEV market segments for goods and services logistics, private transport, and government fleets.
- **Early Adoption and Innovation:** Supporting investments in early adoption projects for NEV and developing local supply chain and innovation ecosystem may also entail collaborations and partnerships with international research institutions and sharing intellectual property and patents.
- **Charging and renewable infrastructure:** Amongst others, this area is seen as cutting across all the funding programmes.
- **Technical assistance:** Considering the integrated nature of pivoting the automotive sector where projects are not standalone or greenfield developments, a robust sector transition framework is needed. It should incorporate accurate studies to guide policy transformation and implementation to ensure just and sustainable outcomes.

A vibrant vehicle manufacturing sector is critical to a sustainable South African economy and jobs but depends on an integrated domestic and export demand pivot to NEVs. Without investment stimulus, domestic demand will lag significantly behind export demand to the detriment of an integrated manufacturing sector. Therefore, early domestic NEV demand is critical to both sustaining a vibrant vehicle manufacturing industry and achieving emissions reduction targets.

The retention of jobs in the current vehicle value chain and the retraining / upskilling of labour for the new NEV production lines will be vital to enabling a just transition. A just transition within the context of a sustainable automotive and transport sector must preserve current levels of economic activity by transitioning to NEV production and growing such new capacity to, at the minimum, offset those activities facing technical obsolescence and job losses. Enhancing local content and manufacturing, research and development, mineral beneficiation (new energy minerals), and local business development offers further growth opportunities for South Africa.

The just manufacturing transition is based on a few credible assumptions, as set out below:

(i) The industry typically invests close to ZAR11.5 billion per annum,[99] and for NEVs, the investment is anticipated to be significantly higher (more than 40%). As such, it would need grant support of up to 50% of the capital investment.

(ii) It can be assumed that each OEM will have at least 1 NEV in production within the next 5 years, given that most OEMs export to the USA, UK, and EU markets.

(iii) The emphasis on green manufacturing for NEVs will add another layer of investment that will require grants and concessionary finance support. For example, Ford has invested in renewable infrastructure, with other OEMs expected to follow suit.

(iv) South Africa's fiscal constraints will limit and strain the current Automotive Investment Scheme (AIS) policy tool that will be required to support the transport decarbonisation transition.

(v) Newer OEMs have indicated that they will produce NEVs in South Africa for both the local and export markets.

Table 20. Proposed JET IP NEV investment programmes, 2023–2027

Funding Programmes	Description	ZAR billion
Industrial development and innovation	Supply chain investments for the NEV value chain, including existing automotive component supply chain and the energy storage value chain for both mobility and stationary applications	41.4
Public Transport	Support investments in public transport such as buses, taxis, and fleets; Funding the charging infrastructure and energy storage (including associated infrastructure); Supply chain investments in the local assembly	6.1
Mobility emissions abatement	Decarbonising the NEV market segments for goods and services logistics, private transport, and government fleets; Charging infrastructure and energy storage (including associated infrastructure)	6.8
Early adoption and Innovation	Supporting investments in early adoption projects for NEV and the development of a local supply chain and innovation ecosystem – the support will also include the sharing of intellectual property, patents, and technology partnerships between IPG and South African institutions, innovators, and entrepreneurs; Charging infrastructure and energy storage (including associated infrastructure)	1.8
Technical assistance	Sector research and planning to accurately assess integration and interdependencies; market opportunities and timing; detailed socioeconomic and techno-economic studies to support investment planning, just transition planning, reskilling programmes; and R&D support	1.6
NEV deployment support	Funding to reduce the NEV purchase price (to fast-track price parity to 2027) and the private cost of charging infrastructure, and to facilitate the fast-tracking of the public charging infrastructure deployment (scenario 1).**	70.4
TOTAL		**128.1**

* Associated infrastructure includes structural investments for public transport hubs, security related Investments, electrical distribution investments at a municipal and town level; the funding pool at an instrument level will consist of guarantees, grants, concessionary funding, risk capital, government incentives, tax rebates and credits, and the reduction of or zero-rating of import tariffs, as appropriate;

\# Infrastructure is defined as investments that provide an enabling environment for the adoption of NEVs. It can range from infrastructure for research and innovation, business support, and decarbonisation to electricity infrastructure and critical inputs for the NEV transition such as components and battery cell component manufacturing and assembly. The battery cell manufacturing has been split equally amongst manufacturing, decarbonising, and innovation programmes.

** The full investment requirement for public charging infrastructure by 2050 is likely to exceed ZAR184 billion. This does not include investments in grid capacity and any local electricity generation capacity.


H2
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HYDROGEN

4.4 GREEN HYDROGEN SECTOR

4.4.1 INTRODUCTION

The green hydrogen (GH_2) economy presents new opportunities for South Africa. It can enable the transition of key carbon-based and international trade-exposed sectors, protect the competitiveness of downstream industries, allow and enhance exports, boost GDP, support domestic decarbonisation, and create jobs. Internationally, GH_2 and its derivatives are increasingly seen as an important part of the solution to addressing GHG emissions in hard-to-abate sectors, including the transport industry, petrochemical industry, iron and steel industry, cement industry, and in the longer term, the power sectors. According to the International Energy Agency (IEA), for the world to limit global warming to below 1.5°C, GH_2 will need to account for 10–20% of the global energy mix.

It is evident from the recent exponential increase in electrolyser sales and project investments that commercialisation of this industry is well under way. However, there is still a need for significant investment in technology commercialisation, supporting infrastructure, and supply chain development to build competitive business cases and scale up. GH_2 production costs will need to be progressively decreased to become competitive with the cost of grey hydrogen. To decrease these costs, additional cheap renewable electricity is required. It is thus important that South Africa develops a supporting policy and an investment framework to allow for the rapid installation of renewable electricity capacity for GH_2.

To reach climate targets in line with the Paris Agreement, these investments must be initiated at speed. GH_2 is critical to decarbonising the economy, with the potential to remove 10–15% of South Africa's carbon emissions, while protecting and growing major downstream industrial sectors such as chemicals, cement, iron, and steel. The foundation to scale the GH_2 economy must, therefore, be established in South Africa by 2030 for GH_2 to become a globally competitive industry that supports the world's decarbonisation efforts and establishes new global energy trade routes.

Failure to develop the GH_2 sector carries significant social and economic risks associated with the global market in these value chains. The high carbon intensity of synthetic fuels (12% of national emissions) creates carbon border tax adjustment (CBAM) risks for the chemicals sector, where 90% of emissions from the petrochemicals and chemicals sector are caused by Sasol's Secunda and Sasolburg operations.[100] As in coal and power, the transition could have severe economic consequences, if not managed well, given the petrochemicals contribution to the country's GDP and employment. In 2019, the petrochemicals sector contributed approximately ZAR232 billion

[100] NBI, 2022, Decarbonizing South Africa's Petrochemicals and Chemicals Sector.

(6.22%) to GDP and accounted for approximately 169 000 direct and 693 000 indirect jobs, with a quarter of the direct jobs linked to Sasol (~28 000), AECI (~8 000) and Omnia (~3 500).[101] Furthermore, Secunda is a key element in the coal value chain. With proposed reductions of 9 Mt by 2030, there will be significant mining-related impacts. Other domestic sectors also rely on the development of GH_2 to support their transition and protect or grow exports, including iron and steel and potential green iron ore[102] exports. GH_2, therefore, offers a means to maintain existing competitive advantages in decarbonised sectors, while providing new export potential. There is a clear role for concessional finance to enable South Africa's industry to transition without job losses that would otherwise be caused by CBAM, while also contributing to energy supply security in end-markets.

Promoting a GH_2 export industry, including the platinum group metals (PGMs), electrolyser and fuel cells components, green iron ore and steel, and derivatives such as green ammonia and sustainable aviation fuels, can increase GDP by 3.7% by 2050, translating to an increase in absolute GDP of almost ZAR400 billion.[103] Furthermore, GH_2 has important economy-wide linkages that can create new decent jobs. This includes higher renewable energy rollout and associated manufacturing; the manufacturing of electrolysers for domestic use and exports; growth and maintenance in the mining of PMGs; jobs in transport, storage, and distribution of products; along with the operation, maintenance, and servicing of equipment. In scenarios with GH_2 exports and associated industries, up to 1.8 million more jobs could be created economy-wide by 2050 than in scenarios without GH_2 exports and use.[104] Thus, GH_2 and its derivatives have a key role in South Africa's just transition. It is estimated that 6–10 Mt per annum (Mtpa) of demand for local production could be in play by 2050, creating a market worth more than US$20 billion. This has the potential to create more than 650 000 job years in construction and more than 50 000 permanent jobs in operations and maintenance.[105]

In building the infrastructure necessary to capture this opportunity, the investment required is estimated to be in the region of US$133 billion to fund more than 100 GW of dedicated renewable electricity capacity (both wind and solar) and more than 60 GW of electrolyser capacity.[106] This allocation of new renewable electricity capacity will need to be either included in the updated IRP or as part of an associated energy plan for GH_2.

100 NBI, 2022, Decarbonizing South Africa's Petrochemicals and Chemicals Sector.
101 NBI, 2022, Fadiel Ahjum, Catrina Godinho, Jesse Burton, Bryce McCall, and Andrew Marquard, 2020, A Low-Carbon Transport Future for South Africa: Technical, Economic and Policy Considerations.
102 Hilton Trollip, Bryce McCall, and Chris Bataille, 2021, "How Green Primary Iron Production in South Africa Could Help Global Decarbonization," Climate Policy 22 (2): 236–47, doi.org/10.1080/14693062.2021.2024123.
103 NBI, 2022, Just Energy Transition Pathways.
104 World Bank, forthcoming, South Africa Energy Background Report.
105 DTIC, 2022, Green Hydrogen Commercialisation Strategy.
106 Ibid.

4.4.2 SOUTH AFRICA'S GH_2 VALUE PROPOSITION

South Africa has key structural competitive advantages in the production of GH_2 and its derivatives, including:

- High-quality, large-scale renewable energy potential, with its combination of wind and solar capacity factors being amongst the best in the world. This puts South Africa on par with countries such as Chile, Saudi Arabia, and Australia, which are also investing in the GH_2 opportunity.
- South Africa's central global geographical location enables exports to both Europe in the west and Japanese, South Korean, and other markets in the east.
- Sufficient land that is not in competition with agriculture or residential uses to meet this scale of renewables. In the renewable energy development zones alone, there is enough land to produce approximately 10 Mt of GH_2, with approximately 1.1 million hectares (MHa) required being about 20% of the Regional Economic Development Zones (REDZ) total land availability.
- The production of GH_2 also has synergies with water security, as desalination plants are only a fraction of the cost of the final product (less than US$0,01/kg of H_2 produced). Therefore, there is potential to overbuild desalination plants, allowing for the provision of fresh water to water-insecure communities. This also ensures that GH_2 does not compete with water security and the need for water in other sectors of the economy.
- South Africa has unique expertise in the beneficiation of GH_2 into e-fuels. The proprietary Fischer-Tropsch technology, used in Sasol's Coal-To-Liquids (CTL) facilities at Secunda, is a key asset and knowledge base for the sector's development. It creates the possibility for the local beneficiation of GH_2 into derivative CTLs, including e-Ammonia, e-Methanol, and sustainable aviation fuel. This is critical for power-to-liquid applications and can serve as a catalyst for large-scale local demand. It also helps to unlock export potential as export markets are expected to be driven by the trade of GH_2 derivatives.

These structural competitive advantages will be combined in a unique way to address South Africa's export market potential, stimulate domestic demand via the decarbonisation of local hard-to-abate sectors, and localise equipment manufacturing and mobility applications.

4.4.3 DEMAND DRIVE AND MARKET FOCUS

South Africa's GH_2 demand is made up of a range of local and export use cases that could anchor the demand for GH_2 production. This includes ammonia production, methanol production, use in refineries, green steel production, mobility applications such as heavy-duty road transport, rail, shipping, aviation, heat generation, and ultimately power generation. Ammonia and e-methanol production will be prioritised for the export market. Converting from grey hydrogen to GH_2 use in

refineries can also be leveraged as a quick win in the decarbonisation of the petrochemical sector and the production of sustainable aviation fuel. This transition from grey to GH_2 will be enabled by the development of the GH_2 certification.

By 2030, local demand is still expected to be limited, with approximately 0.2 Mtpa driven by sustainable aviation fuels, vehicle mobility, and green steel. Domestic demand will accelerate as price parity gets closer to fossil fuels. Co-located production projects (in the mining sector and green steel) will have accelerated commercial value due to lower infrastructure and supply chain dependencies, and hence lower costs. Domestic potential is estimated at 2–3 Mtpa by 2040, with the upside being as high as 6 Mtpa. This includes hydrogen demand in the Hydrogen Valley programme, which could reach up to 185 kt GH_2 by 2030.

Export market demand can be exploited by taking advantage of pricing subsidies, for example, the H_2 Global scheme. South Africa will have to secure a long-term global market share and competitive trade positions against competition from other exporters to anchor initial production and the supply infrastructure. Export potential is estimated at 2 Mtpa by 2040, with upside as high as 8 Mtpa in the longer term. If supply can scale in line with forecasts, export demand could reach up to approximately 0.7 Mtpa by as early as 2030. South Africa, together with other sub-Saharan countries, will need to advocate for guaranteed offtake volumes to take advantage of the diversity of the import requirements of REPowerEU, which may be further accelerated by dynamics in Europe that are driving demand for GH_2. The ambitions of REPowerEU are aimed at EU importing 10 Mtpa of GH_2 by 2030.

4.4.4 NATIONAL COORDINATION AND INFRASTRUCTURE PLANNING

For South Africa to realise its competitive advantage and successfully capture a share of the global export market, a local GH_2 ecosystem needs to be incubated. This requires significant investment into production and skills development, along with a complex and coordinated system of supporting infrastructure.

Broadly, three supply options can be considered in building the GH_2 industry, with tradeoffs amongst capacity factors, land availability, efficiency, cost, and supporting infrastructure. The first option is the co-location of the electrolyser (GH_2 production), the demand for GH_2, and renewable electricity generation at the same site. The second option is to locate the electrolyser and renewable electricity generation at the same site, but not at the same site as the GH_2 demand, which would require a pipeline to transport the hydrogen to where it is needed. The third option is to locate the electrolyser at the site where there is demand for GH_2, but wheel the renewable electricity over the transmission / distribution grid from a renewable electricity plant located elsewhere. This option should not compete with the electrical grid infrastructure for electricity generation. The optimal configuration across South Africa requires a coordinated infrastructure approach to build long-term national competitive advantage and accommodate forward-looking integrated infrastructure access, while also ensuring the provision of the required additional grid infrastructure.

These tradeoffs can have a significant impact on the cost and subsequent competitiveness of the GH_2 produced. To maximise competitiveness, South Africa needs to develop an optimal ecosystem of supply-demand hubs and

supporting infrastructure, including ports, storage, pipelines, grid infrastructure, and SEZs. This will require a nationally coordinated and collaborative approach between the private sector and government.

Getting this coordinated approach right will also unlock a large-scale infrastructure development programme, involving more than 100 GW of renewable electricity capacity and approximately 60 GW of electrolyser capacity over the next 30 years. Being able to build the required infrastructure development capacity and capabilities will be foundational to enabling the speed needed to capture the GH_2 opportunity and ensure the competitive localisation of value chains.

4.4.5 RECENT GREEN HYDROGEN INITIATIVES

Work is underway in South Africa to realise the ambition of the country becoming a global GH_2 major. The initiatives include:

- The Department of Science and Innovation (DSI) has developed a Hydrogen Society Roadmap and is launching a study to determine the critical skills needed for GH_2 industrialisation.
- The DTIC established a GH_2 Panel and commissioned a GH_2 commercialisation study aiming to take recommendations to Cabinet in 2022.
- Infrastructure South Africa (ISA) has recognised GH_2 as a priority opportunity for industrialisation and earmarked a new port at Boegoebaai as a potential strategic infrastructure project to enable exports from the Northern Cape in the longer term.
- South Africa and Germany have formed a bilateral relationship in recognition of South Africa's GH_2 potential. In its effort to source GH_2 and support South Africa's development, the German government, through KfW (Credit Institute for Reconstruction) and GIZ (German Agency for International Cooperation), is providing co-funding to selected GH_2 projects in South Africa in the form of grants, technical assistance, project development funds, and concessionary debt.
- South Africa's private sector has been swift to act on the GH_2 opportunity, with both local and multi-national players conducting feasibility studies and developing pilots. Anglo American has introduced the world's largest GH_2-powered truck in their Mogalakwena mine.
- There are a further 18 projects in development, with a total estimated feasibility cost of ZAR4.5 billion and ZAR163 billion required for capital expenditure.[107] This excludes the Boegoebaai port project – a potentially large-scale export programme with expected development costs of ZAR1 billion and a full run rate cost of ZAR150 billion over the project lifecycle; and excludes upgrades that may be required at the Ports of Ngqura, Saldhana Bay, and Richards Bay. These projects span a range of use cases and require significant capital deployment for the early incubation of South Africa's GH_2 ecosystem.

[107] IDC (2022).

4.4.6 CHALLENGES

The challenges associated with development of this new GH_2 industry include scaling up in time to address market needs, ensuring that regulations and policies are globally aligned, dealing with social risks, and sourcing the quantum and types of finance required for catalytic projects. These challenges necessitate national coordination, cross-sectoral collaboration, and international alliances to address the following factors:

- **Coordinated planning of supply-demand hubs.** This development of a national GH_2 infra-structure must be informed by both quantitative and qualitative modelling to identify the optimal supply locations to fulfil expected demand. A coordinated infrastructure development plan (for shared infrastructure such as pipelines, grid, ports, and rail) will have a significant impact on delivered costs and optimal utilisation of shared infrastructure assets. In addition to quantitative fundamentals, the analysis should consider co-location opportunities, scalability, existing infrastructure, and access to critical feedstocks such as water and sustainable sources of carbon. This would inform a comprehensive infrastructure and supply chain scaling plan. The development of such an infrastructure plan does not preclude or inhibit the development of 'no regret' pilot projects already underway. Coordinated planning and alignment need to take place at an intergovernmental level.
- **Access to innovative, low-cost green financing solutions.** South Africa's high cost of debt can inhibit the commercial viability and global competitiveness of the GH_2 projects, which have inherently high upfront capital costs and low-return expectations in the short run. Coordination among the public and private sectors and the international community will be required to develop catalytic blended finance instruments to unlock private sector funding. Mechanisms, such as contracts for difference or price subsidies (to bridge the affordability gap) and grant funding (to de-risk early-stage pilots), need to be sourced.
- **Establishment of a globally aligned policy and regulatory framework.** Well-defined targets and incentives can help create the policy certainty required for private sector investments. This can be complemented by developing internationally compatible 'guarantee of origin' schemes and clarifying 'green' requirements. Advocacy is important to ensure that key offtake markets have the policy support of the South African environment and the just transition. This can go further through securing offtake and technology-sharing agreements under bilateral arrangements with South Africa's key trading partners.
- **Building sustainable and long-term competitive advantage through skills development and localisation.** South Africa needs to ensure that it has the capabilities and capacity to deliver the GH_2 economy by implementing training programmes from grassroots level throughout the workforce. Public and private efforts will need to be aligned with scale interventions in upskilling and reskilling for both new job market entrants and existing employees. Localisation can be used to identify opportunities across the GH_2 value chain. These include building capabilities for low-cost and reliable access to renewable energy, harnessing engineering expertise in beneficiation processes, mobilising South Africa's PGM resources in the GH_2 technology value chains, and employing green industrialisation as a differentiator for industrial growth.
- **GH_2 pricing.** By 2030, the levelised cost of GH_2 across hubs is expected to be approximately US$4 per kg GH_2, which is still more expensive than grey hydrogen – at a green premium of US$2–2.5 per kg. Although learning curve projections support a reduction in the key price drivers (renewable electricity costs and electrolysers

costs), until this materialises, government support, grants, and concessionary funding will be needed to address the price premium and the cost of capital.

4.4.7 REQUIRED INVESTMENT IN GH_2 SECTOR DEVELOPMENT

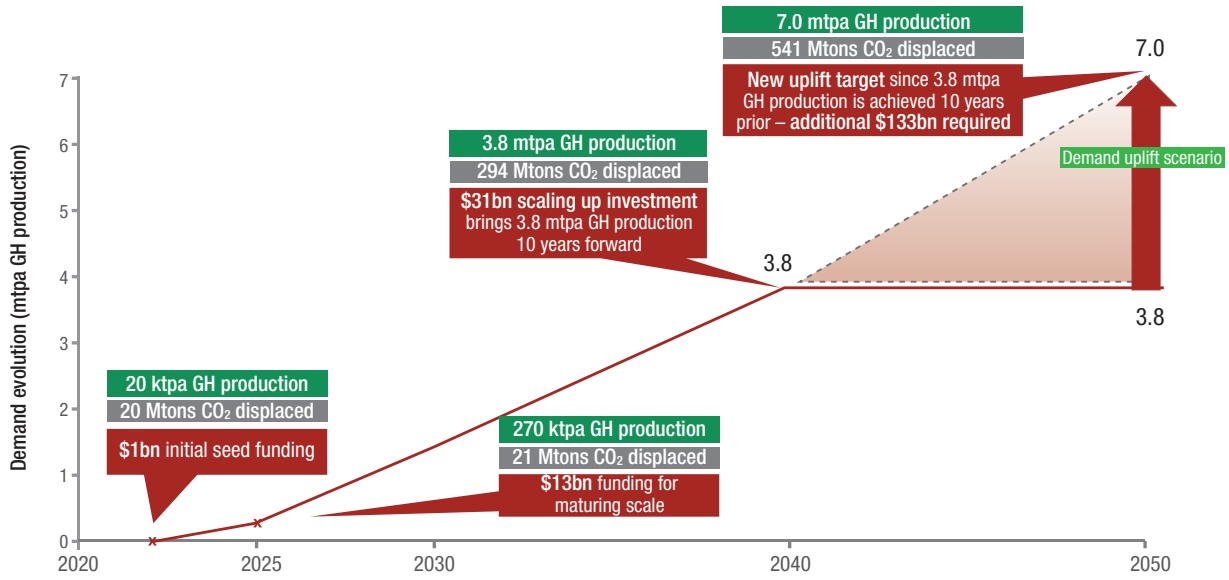
For the 2023–2027 period, investments are needed for the following areas:

- Financing for feasibility studies on catalytic projects and pilots along the GH_2 value chain that can serve as proof-of-concept. These have been identified in the GH_2 commercialisation action plan and include the production of GH_2 and derivatives for both export and domestic consumption, green steel production, and mobility programmes.
- Establishment of localised capacity for local electrolyser and fuel cell manufacturing facilities, noting the global supply bottleneck for these components and South Africa's PGM expertise. A feasibility study is underway to establish a local fuel-cell manufacturing facility, and a factory is being constructed to manufacture fuel-cell and electrolyser components. Projects need to be developed to establish local gigawatt-scale electrolyser capacity to enable a longer-term advantage for South Africa.
- Enablement of bi-lateral relationships with key off-take markets to align supportive policies and regulatory conditions, establish offtake agreements, and promote technology sharing.
- Establishment of off-take agreements and commitment towards specific off-take targets from projects.
- Financial support for implementation of the GH_2 national commercialisation action plan and infrastructure planning including:
  - Identification of the optimal supply-demand hub structure and related infrastructure planning; and
  - Alignment between local stakeholders and communication with international stakeholders on South Africa's GH_2 potential.
- Support for the research and skills development to enable GH_2 economy growth including:
  - Technical and vocational education and training (TVET) colleges on fuel-cell training;
  - Technical training programmes on key skills across the H_2 value chain; and
  - Incentivising of the private sector to reskill employees and invest in research and development for local capacity.
- Public awareness and engagement:
  - Raising public awareness of the new GH_2 industry; and
  - Addressing any concerns related to safety, job losses, and the just transition.

- Implementation of the South African Renewable Energy Master Plan (SAREM), updating of the Integrated Energy Plan (IEP), the Integrated Resource Plan (IRP), and energy planning for GH_2, which will entail a scale-up of renewable electricity generation at unprecedented speed with aligned capability building.

The planned scaling up of the investment required is shown in Figure 9. The Green Hydrogen Panel estimates that US$1 billion investment could expedite GH_2 exports of 20 Ktpa. Within three to five years, several GH_2 projects – both for export and local markets – will come online, increasing the GH_2 scale to 270 Ktpa, requiring capital of US$13 billion displacing 21 Mt of CO_2. The target of 3.8 Mtpa by 2040 will require a total investment of US$164 billion by 2040. Between 2040 and 2050, South Africa can aggressively pursue deeper decarbonisation by seeking a GH_2 demand uplift to 7 Mtpa, which will displace 541 Mt CO_2 and require an additional investment of US$133 billion. The emissions, calculated from the investment date to the end of the decade (assuming three years of development and seven years of operations), could result in annual emissions reductions of between 18% and 20% of South Africa's annual carbon emissions. The summary of the GH_2 investments required is shown in Table 21.

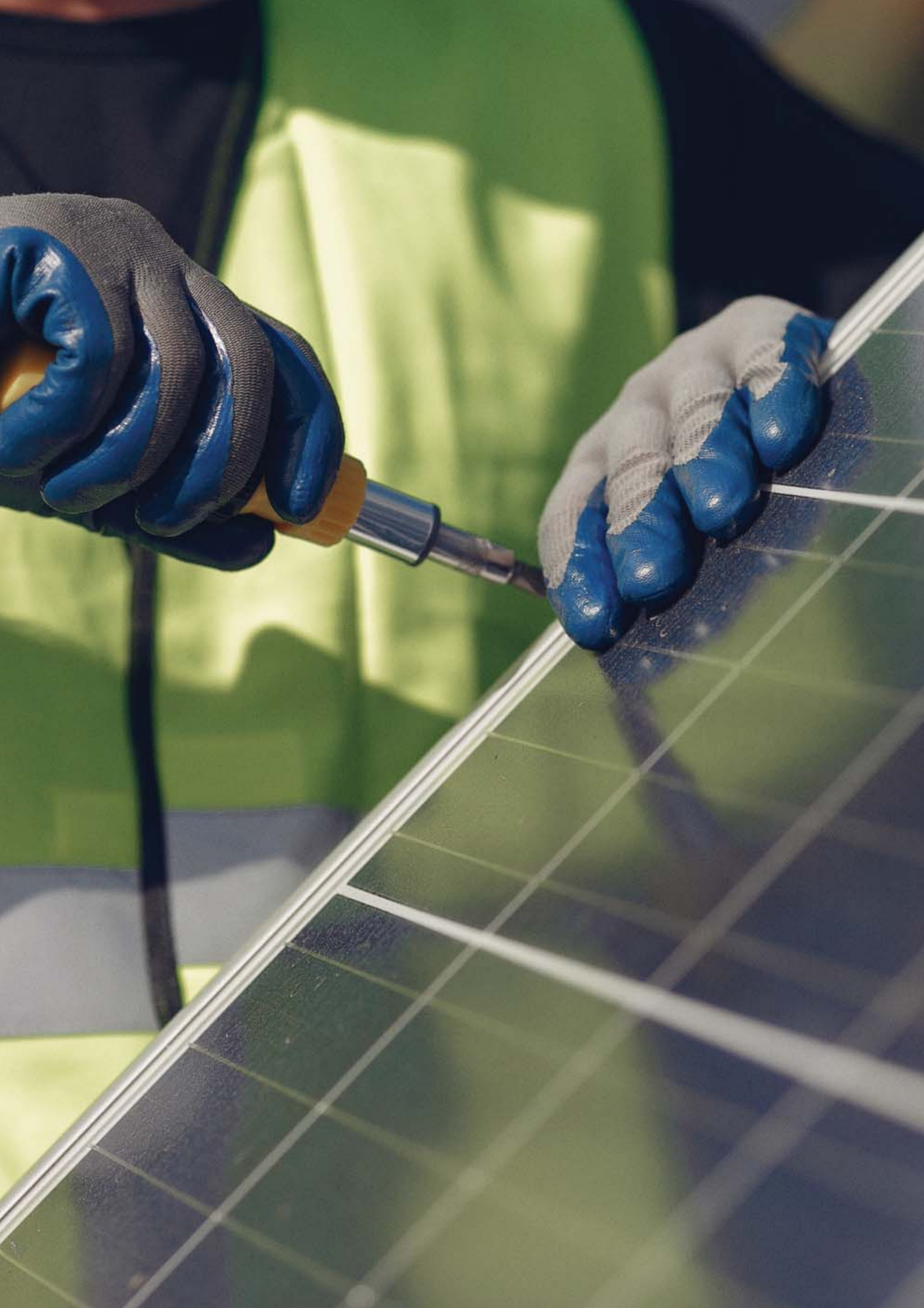
Figure 9. GH_2 investments scaling up



Source: *Green Hydrogen Panel, 2022, Green Hydrogen Commercialisation Strategy, May 2022.*

Table 21. Green hydrogen sector – Summary of JET IP investments

Investment needs 2023-2027	Description	ZAR billion
Early-stage project development: 18 private sector projects in development.	**Project Feasibility costs**	
	Aviation Fuel	0.10
	e-methanol	0.12
	Fuel Cell	0.16
	GH and Green Ammonia	3.70
	Green Steel	0.20
	Hydrogen Mobility	0.10
	Infrastructure	0.13
	Total	**4.51**
	Capital costs (for above projects)	
	Aviation Fuel	8.00
	e-methanol	12.00
	Fuel Cell	1.40
	GH and Green Ammonia	109.30
	Green Steel	13.20
	Hydrogen Mobility	6.60
	Infrastructure	13.00
	Total	**163.50**
Port Development	Port project development	1
	Port infrastructure capital	150
TOTAL		**319.01**



4.5 SKILLS FOR A JUST ENERGY TRANSITION

4.5.1 CONTEXT

The Framework for a Just Transition in South Africa[108] indicates that to align economic, social, and mitigation, and adaptation measures, it must be translated into an implementation plan with detailed employment and skills strategies. Four dimensions of skills development are identified, all of which are crucial to justice within the energy transition:

- **Reskilling and upskilling:** This area is focused on existing adult workers so that they are better equipped to navigate the transition. It involves a skills analysis to identify demand, setting up substantive short- and longer-term training programmes, the recognition of prior learning, the promotion of just energy transition labour market policies, the creation of new job opportunities, especially with lower levels of foundational skills, digital innovation, and more.
- **Aligning the skills development system with the anticipated labour force needs of the future:** This area is focused on green jobs to support a just transition. It involves sophisticated anticipatory skills development and labour market intelligence to respond to demand, as well as strengthening skills system innovations across the JET value chains and its associated ecosystem. This does not refer to a narrow band of technical skills only. It also requires in-depth engagement and collaboration with industry, the provision of bursaries, the upskilling of trainers and lecturers, and a flexible approach to skills development from both demand and supply perspectives. A number of initiatives are currently being piloted through the Presidential Youth Employment Initiative and its Demand-Led Skills Programme which is in early-stage roll-out.
- **Ensuring foundational skills throughout the education system:** This area is required to improve the adaptative capacity of the broader workforce. It involves curriculum transformation and teacher capacity development in the schooling and post-schooling systems (especially TVET educators' competencies), the restructuring of employer-provider relations, along with the expansion and diversification of learning pathways.
- **Addressing gender, inequality, and social exclusion:** This is required in both the provision of education and training opportunities as well as access to employment. Particular attention will be given to transitioning women, youth, and other vulnerable groups from education and training into decent work, including equal access to promotions to management and leadership roles.

Importantly, skills development for the JET is a key enabling factor and should be given impetus by mechanisms that can successfully and proactively bridge the skills system, its planning and

[108] PCC (Presidential Climate Commission), 2022.

implementation mechanisms, and the JET sectors, which include electricity, NEVs, and GH_2. It is important to start identifying the skills required and build a skills development roadmap, as it can take between five and 10 years to 'ready' the skills system for new value chains and competences. This means that the skills system needs to be preparing ahead of the energy transitions and technological developments. Lecturers need to be trained, curricula need to be developed and tested, and work placements need to be set up.

Due to the cross-cutting nature of skills interventions needed for JET, it will be challenging to establish strong coordination and planning mechanisms. The complexity is exacerbated by the need to unpack skills in extended and connected value chains, including the coal value chain,[109] renewable energy value chains,[110] the GH_2 value chain,[111] the value chains associated with vehicles,[112] and interlinked value chains such as platinum mining and manufacture.[113]

Skills identification, anticipation, planning, and implementation for JET requires both national level strategic support and local level alignment with emerging priorities and opportunities. Furthermore, enabling structures to support the smoother articulation between skills development and their use to access and create employment and livelihood opportunities is a priority.

The White Paper on Post-School Education and Training,[114] which has informed several skills strategies and plans in South Africa sets the vision for greater integration within the post-schooling sector (universities, TVET Colleges, Community Colleges, Sector Education and Training Authorities [SETAs), the National Skills Fund [NSF), amongst others) to support accessible quality education and enable sustainable livelihoods.

The intersection of complex extended value chains and the need to work across the education and training ecosystem requires that many departments within government and many stakeholders in civil society, business, and labour will need to work together to plan and implement a just transition, along with the cultivation of the skills needed. Key relevant departments within government include the Department of Higher Education and Training (DHET), the SETAs, DSI, DTIC, and DFFE – all of whom have made commitments to developing skills for sustainable development and the future of work.

109 Neva Makgetla and Muhammed Patel, 2021, The Coal Value Chain in South Africa, TIPS.
110 Naima Rassool et al., forthcoming, Assessment of Local Skills for the South African Renewable Energy Value Chain. Green Cape.
111 DSI, 2021, Hydrogen Society Roadmap for South Africa 2021.
112 Gaylor Montmasson-Clair, Anthony Dane, and Lesego Moshikaro, 2020, Harnessing Electric Vehicles for Industrial Development in South Africa, TIPS and Change Pathways.
113 DTIC, 2020, The South African Steel and Metal Fabrication Master Plan 1.0: Support for the Steel Value Chain.
114 DHET, 2013, White Paper on Post-School Education and Training.

4.5.2 INVESTMENT FOR JUST ENERGY TRANSITION SKILLS

Consultations conducted for this JET IP suggest that although multiple initiatives have been set up in South Africa to address skills needs for a just transition, they remain underfunded, sector specific, and will need to be scaled-up and coordinated to make significant contributions to the transition strategies and related skills needs of employers, workers, and communities.

The following integrated and systemic areas of work have emerged both from research in the field and recent consultations:

- The formation of a national-level strategic 'skills hub or platform' to inform, anticipate, coordinate, and integrate skills needs and plans for a just energy transition in South Africa. Such a hub/platform for 'Just Energy Transition and the Future of Work' would focus on foresight and integrating the skills intelligence work of DHET, NSF, and the SETAs. DSI is currently developing the forward-looking 'Future of Work' initiative and maximising national connections and collaborations for skills for the JET. The hub/platform would build on the existing university chairs' focus on skills research and newer initiatives in this field, such as the project funded by the Global Energy Alliance for People and Planet (GEAPP) through PCC and an International Labour Organisation (ILO) study involving Wits University. It would thus support cross-sectoral and proactive national-level strategic planning for skills relevant to the economic diversification and sustainable economies required to ensure just transitions. It will also focus on the development of integrated learning pathways that support the progression of young learners, community members, and workers requiring upskilling and reskilling in the context of energy transitions.
- The development of new models for place-based skills planning, provision, and integration with value chains impacted by energy transitions or offering linked opportunities for employment and livelihoods in these localities. Drawing inspiration from focused economic development zones, focused Skills Development Zones (SDZs), sometimes call 'Centres of Specialisation', would be piloted, with the intention that they can be scaled and replicated across different contexts as appropriate. This work would be led by local TVET colleges collaborating with other institutions and local stakeholders, including the private sector. By integrating work opportunities in locally relevant value chains and skills development, greater support can be created for work-integrated learning and transitions from learning into work and livelihood creation.

  These SDZs would support the capacity development of lecturers and trainers, new course and curriculum development based on local demand and opportunities, better-quality learning, and ultimately enhance the employability of graduates. Furthermore, they would maximise linkages across types of skills development providers, including work-integrated learning and formal learning programmes, the strengthening of employer-provider relations, and the relevance of programmes. Examples include an SDZ focused on the coal transition in

Mpumalanga; an SDZ focused on vehicle manufacture transitioning in the Eastern Cape; and an SDZ focused on the hydrogen economy in Gauteng, with a possible satellite in the Northern Cape.

- The development of relevant transition-related skills and associated employment and livelihood opportunities will be catalysed by the development of a national skills hub / platform and local-level SDZs (described above). This work would need to be complementary to, and supportive of, the existing work on education and training in South Africa. Significantly, the 'hub/platform' would play a role in directing relevant portions of the ZAR20 billion, raised through the skills levy and available for education and training through the SETAs, towards value chains identified through national-level skills intelligence and local-level demand. It would also leverage funds from the NSF for priority upskilling and reskilling programmes, post-schooling education and training budgets allocated to TVET specialisation, as well as higher education research and teaching streams. This will be done in collaboration with DHET, DSI, and university funding streams to ensure an adequate high, medium, and low skills mix for JET, as well as a wider education system impact.

  The overall revenue available for Post School Education and Training (PSET) in 2019–2020 was ZAR130.3 billion. Much of this revenue was for public universities (ZAR93.2 billion) which catered for just over 1 million students, followed by the skills levy institutions (ZAR18.3 billion) which catered for 238 428 workers and unemployed persons in SETAs' supported learning programmes (internships, learnerships, apprenticeships and skills development programmes), and TVET colleges (ZAR16.7 billion) which catered for over 670 000 students. Community Education and Training (CET) colleges had the lowest share of total revenue and the least number of students enrolled in 2019–2020.[115]

Table 22. Skills development focus areas

Focus Area	Leads	Key stakeholders
Enable collaborative planning through a dedicated **skills hub / platform for 'Just Energy Transition and the Future of Work'** that is focused on the coal, renewable energy, GH_2, existing vehicle, and NEV value chains to map South Africa's skills supply in relation to current and future demand.	DHET and DSI	DTIC, Industry, SETAs, Academia, Labour, Civil society organisations, and Presidency
Establish, optimise, and scale **SDZs / centres of specialisation** for greater alignment of skills supply and workplace demand, thereby creating pathways for work-integrated learning and new livelihood skills located in Mpumalanga (coal), Gauteng and Northern Cape (GH_2), along with Eastern Cape (vehicles).	DHET and SETAs	DSI, DTIC, Industry, and TVET management
Using skills intelligence and localised SDZs to leverage and **strategically allocate available PSET funding** to support a just energy transition.	DHET and SETAs	DTIC, DSI, Industry, Universities and TVET management

[115] Mamphokhu Khuluvhe and Edzani Netshifhefhe, 2021, Funding and Expenditure Trends in Post School Education and Training, Department of Higher Education and Training (DHET).

The skills investment priorities for the 2023–2027 period are set out in Table 23.

Table 23. Skills investment priorities, 2023–2027

Focus Area, 2023–2027	ZAR billion
Skills hub / platform for 'Just Energy Transition and the Future of Work' (high-level coordination)	0.05
Pilot SDZs in Mpumalanga, Eastern Cape, and Northern Cape – Establishment of three SDZs – Train the trainers and curriculum development – Catalytic funding in the new JET skills programmes	 1 0.1 0.5
Targeted to mobilise allocations to the JET from the existing public and private post-school education and training (PSET) funding per annum	1
TOTAL	**2.65**

4.6 MUNICIPAL JUST ENERGY TRANSITION

4.6.1 CONTEXT

Metropolitan and local municipalities play a constitutionally mandated role in the national electricity system, service provision and the just energy transition, particularly the 187 municipal licensed distribution utilities. As South Africa's electricity regulation landscape changes, they (together with district governments) are repositioning themselves to play a new, more dynamic role. To achieve this JET-aligned shift, critical investments and other support are required for local energy policy and planning, modernised distribution grid operation and governance, appropriate ancillary services, publicly owned renewable electricity generation and procurement, appropriate local large and distributed embedded generation, and strategic off-grid renewable generation. To enable the JET, local electricity investments must also enable the uptake in NEVs, particularly for public transport, and facilitate an equitable grid community that responds to energy poverty and supports local economic development.

Municipal electricity services and readiness for the JET varies widely. Several metropolitan municipalities lead the charge, having set local decarbonisation targets, and issued pilots and power procurement tenders. Active local municipalities and districts are also driving context-appropriate and localised sustainable energy solutions to support people and businesses. Small-scale embedded generation regulations are in place in at least 56 municipalities, with 3 280 registered installations (most under 10 kW) (2020 figures)[116] and there are seven municipalities allowing wheeling.[117] Municipalities are supported and represented in JET matters by the South African Local Government Association (SALGA) and the Association of Municipal Electricity Utilities (AMEU).

In addition to national transfers and local electricity revenues, municipalities can also access concessional finance (currently, notably through the DBSA), commercial finance, and donor funding. Still, significant financing challenges persist, compounded in many municipalities by constrained levels of state capability. There is a need for integrated planning support to direct and institutionalise progressive transformation and shape local transitions. In 2020/2021, the Auditor General South Africa reported that clean audit outcomes represented less than a fifth of the local government budget, with 27 municipalities maintaining clean audits and 14 achieving clean audits for the first time that year.[118]

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116 Sustainable Energy Africa and SALGA, 2021, Energy Efficiency and Renewable Energy Actions.

117 Brian Kamanzi and Lauren Hermanus, 2022, Unpacking Energy Wheeling for Municipal Electricity Systems, Cape Town, https://justurbantransitions.com/our_publications/unpacking-energy-wheeling-for-municipal-electricity-systems/.

118 Auditor General South Africa, 2021 Consolidated General Report on Local Government Audit Outcomes MFMA 2020–2021, https://www.agsa.co.za/Portals/0/Reports/MFMA/2020-21/MFMA2020-21%20Media-release%2015%20June%20final%20approved.pdf?ver=2022-06-15-105855-130.

A combination of targeted (direct support for specific municipalities) and centralised (available across municipalities) facilities is necessary.[119] There are two clear high-impact JET outcomes for municipalities:

- Ensuring that functional distribution grids are fit for purpose to accommodate the increasing penetration of renewable electricity generation at different scales, as well as connect and serve all residential, public, commercial, and industrial energy users; and
- Facilitating an appropriate, well-managed, and adequately financed service delivery model to ensure equitable access for the entire grid community and all local energy users, including low-income and energy-poor households, and SMMEs, who may or may not currently benefit from the Free Basic Electricity (FBE) allocation.

4.6.2 CHALLENGES

Currently, these two municipal JET outcomes face several interconnected technical, financial, and socioeconomic challenges. A summary of systemic challenges and points of intervention is captured in Table 24.

Table 24. Summary of priority technical, financial, and economic challenges[120]

Challenge	High-level description of the challenge	Opportunities
Distribution grid management	Municipal distribution grids are ageing, not adequately maintained, and require maintenance. Additionally, adequately resourced local grid planning and grid investments and smart upgrades are required to enable grid stability, optimal grid control, safety, feed-in, and appropriate storage.	• Improve grid maintenance, especially in key urban centres. • Prioritise grid enhancement (reinforcement, upgrades, and smart technologies) projects that enable embedded renewable electricity generation. • Improve and augment grid extension under the Integrated National Electrification Programme (INEP). • Facilitate municipal investments in energy storage. • Raise awareness for energy users / 'grid community' to enable safe and sustainable small-scale embedded generation (SSEG) uptake.
Demand management	There is a lack of optimal installation and use of integrated smart metering and billing, as well as limited understanding and capacity to manage and shape evolving demand profiles, resulting from the increasing penetration of embedded generation and storage, as well as electrification of transport.	• Smart grid investment (fault detection, metering, related) (costs not determined) • Built environment interventions, including energy efficiency opportunities that are already identified[121] • Case studies and knowledge sharing of good practice.

[119] There is a significant ecosystem of research supporting these insights. A summary of current insights is included in Lauren Hermanus, Louise Scholtz, and Karin Kritzinger, 2022, Understanding South African Just Urban Transitions: Goals, Challenges and Responses for Transforming Local Electricity Systems, Cape Town, https://justurbantransitions.com/our_publications/understanding-south-african-just-urban-transitions-goals-challenges-and-responses-for-transforming-local-electricity-systems/.

[120] Lauren Hermanus, Louise Scholtz, and Karin Kritzinger, 2022, Understanding South African Just Urban Transitions: Goals, Challenges and Responses for Transforming Local Electricity Systems, Cape Town, https://justurbantransitions.com/our_publications/understanding-south-african-just-urban-transitions-goals-challenges-and-responses-for-transforming-local-electricity-systems/.

[121] More than 200 municipalities have participated in the Department of Mineral Resources and Energy's (DMRE) Energy Efficiency and Demand Side Management grant programme. Funding for the 45 municipalities combines both national and donor funding.

Challenge	High-level description of the challenge	Opportunities
Standalone systems	Standalone systems or solar PV mini-grids are a potential solution to electrification in non-electrified areas, both for certain informal settlements and new formal housing developments, but these require a better understanding of ownership, governance and other issues.	• Pilot projects to stimulate suppressed demand using alternative access such as mini-grids and solar geysers (social ownership models can be tested in these pilots). • Case studies and knowledge sharing of good practice.
Municipal revenues	Electricity costs constitute a significant and increasing share of total municipal expenditure (21,7% in 2020/21) and revenues (26%). Currently, inappropriate national assumptions as to the real cost (underestimated) to deliver the service, tariffs, and subsidies lead to insufficient funding for electricity and suboptimal financial incentives for all actors – municipalities and electricity users. A reconfiguration is required of the municipal financial model and the role of electricity revenues, tariff structures and subsidisation.	• There is a particular need for collective engagement and planning (workshops and others) regarding the municipal fiscal model, the electricity utility business model (including electricity cost recovery, free basic electricity, and subsidisation). • Research / modelling is required to better understand and facilitate engagement on the dynamics of costs and subsidies in local electricity systems connected to municipal fiscal interventions. • Assistance is required to access just transition and climate funding (donor, concessional, and commercial), including broad state capacity and capability building. • Municipal debt owed to Eskom at ZAR35 billion needs a short-term and long-term systemic intervention.
Electricity tariffs	Electricity tariffs do not currently support municipalities' accommodation of SSEG or other embedded renewable electricity and associated offtake agreements, nor do they enable equitable service delivery. The redesign of tariffs and municipal financial models is required to incentivise optimal actions for different grid users, support more progressive system outcomes, and adequately resource the system over the long term.	• National coordination is required to resolve tariff structuring challenges through NERSA and enable implementation within municipalities and Eskom's distribution. • Awareness raising for energy users / `grid community' to enable smooth implementation of new tariffs. • A solution is required to under-resourcing for equitable / low-use / income households in the short, medium, and long terms. • Research is required to inform the development of granular pricing models for municipal distribution utilities. • Additional resources are required to assist especially smaller municipalities, with the setting of appropriate tariffs (work already undertaken by SALGA, Sustainable Energy Africa, and GreenCape).
System costs	Most municipalities do not understand the costs of delivering electricity services within the current and transition contexts, which makes planning for the transition and the structuring of revenues impossible. Eskom's increasing costs also have a direct impact on municipal budgets and local economic development planning.	• Cost-of-supply studies need to be rolled out to more municipalities (constraints are finance and capacity). • Cost-of-supply studies should include a scenario in which FBE is increased to 100 kWh. • Research / modelling is needed to better understand and facilitate engagement on the dynamics of costs and subsidies in local electricity systems connected to municipal fiscal interventions.

Challenge	High-level description of the challenge	Opportunities
Local economic development	Global demand for green energy inputs is growing. It is outpacing the municipal response and amplifying the risk of customer defection. There are opportunities to use municipal procurement to support local companies in energy value chains, but this opportunity is not well understood.	• Research, capacity building, and holistic support for SMMEs in local electricity value chains • Links to energy procurement: pilot local content requirements. • Case studies and knowledge sharing of good practice.
Skills	The JET will demand new skills and additional capacity to ensure its myriad aspects are sufficiently planned and implemented.	• Skills need assessments are needed for local JETs. • Extra capacity and capacity building are required to implement cost-of-supply studies; tariff designs; technical support, capacity, and funding for electricity planning (distribution and generation); the JET planning at a local scale; energy investment and procurement; as well as general institutional support.
Energy – direct investment and procurement	Guidelines are unclear for municipal direct investment and ownership of electricity generation assets, as well as procurement of electricity supply. Actions and investments to support regulatory and process clarity are essential. Within this evolving context, several early movers and pilots need significant support across various financial, technical, and legal aspects, which should feed into system-wide learning and iterative development of the regulatory landscape.	• Holistic support is required for municipal electricity generation and storage investment, ownership, and operation of pilot projects. • Case studies and knowledge sharing of good practice are needed. • Centralised support is required to implement the government's regulatory procurement framework, developed by the National Treasury with municipal and Treasury stakeholders.

Source: *Hermanus, Scholtz, and Kritzinger, 2022, Understanding South African Just Urban Transitions.*

4.6.3 CATALYTIC MUNICIPAL INVESTMENTS FOR JET

Supporting enhanced municipal JET readiness through direct JET funding to municipalities and relevant supporting-role players would have a significant enabling impact on public / social and private renewable energy investment, contribute substantively to emissions reductions and local air quality improvements, and improve energy access for people and businesses. Targeted investments are required to address these challenges. These are (i) infrastructure, (ii) operations, (iii) capability and capacity, and (iv) knowledge generation. A list of priority funding interventions is set out in Table 25.

Funding is most urgently required to address the municipal distribution grid maintenance backlog estimated at ZAR200 billion.[122] Further work is needed to assess, at granular level, the scale of need in each municipality and the degree of readiness for the requisite investments. What is clear is that, in their current state, the distribution grids are a barrier to embedded renewable electricity generation as well as adequate equitable sustainable energy access. Infrastructure age, disrepair, vulnerability to damage from extreme weather events, and load shedding contribute to this problem. The South African Institution of Civil Engineering (SAICE) Infrastructure Report Card rated the national distribution infrastructure as Level D, that is, 'at risk of failure'.[123] Municipalities face unique funding and governance hurdles. Funding is a significant barrier for two reasons. First, there are no national conditional capital grants that can be used on maintenance. Second, the current annual national maintenance budget across all municipal infrastructures (not just electricity) is only ZAR27 billion. In addition to the maintenance backlog, additional investments in grid modernisation are needed to expand, reinforce, and enhance the distribution grid and integrated equipment and systems (such as smart metering and billing systems). These upgrades are critical for enabling the rapid increase in renewable electricity generation and ensuring offtake, given the greater share of this generation embedded in distribution networks nationally over time, as well as wheeling agreements involving generation connected to Eskom or municipal grids.

Enabling universal electricity access requires a whole-system approach. It requires a full understanding of the cost of service and the overall economic value of the grid to all users by applying an appropriate and progressive tariff regime and adjusting the municipal financial model to accommodate the reality of a changing electricity system and associated revenues. Electricity access rates stood at 84.4% in 2020, with municipalities and Eskom playing critical roles in facilitating access.[124] Addressing the electrification backlog, through a combination of grid extensions and off-grid systems (where appropriate), has been provisionally costed at approximately ZAR45 billion.[125] Currently, the INEP provides funding for on- and off-grid connections – ZAR2 billion

[122] This estimate was developed by the Public Affairs Research Institute (PARI), in consultation with government stakeholders, and requires further investigation.

[123] SAICE, 2017, SAICE 2017 Infrastructure Report Card for South Africa.

[124] World Bank, 2022, "Access to Electricity (% of Population) – South Africa," The World Bank Data.

[125] This estimate has been developed by PARI, in consultation with government stakeholders, and it is in line with other similar crude estimates in unpublished government documents. However, it needs considerable additional work to properly scope.

in the 2020–2021 financial year, projected to increase to ZAR4 billion for 2024–2025. Additional funding is, however, required to accelerate universal energy access in rural municipalities and urban peripheries. In terms of enabling a basic level of electricity use, the FBE policy provides for a monthly allocation of 50 kWh for qualifying households (paid for through national transfers). Some municipalities provide a higher level of access (internally funded). Given the developmental dividend associated with electricity access and persistent energy poverty even where connections exist, a universal increase to 100 kWh per month has been proposed for each of the approximately 10.1 million qualifying households.[126] This is estimated to cost the national fiscus ZAR32 billion in 2023–2024, ZAR36 billion in 2024–2025, and ZAR41 billion in 2025–2026.[127]

Underpinning these two issues is a broad need for robust state capacity and the capability to navigate the transition in the context of enduring structural poverty (including energy poverty), inequality, and unemployment. This combination of both capacity and capability is sector-specific (that is, focused on the components of electricity service delivery) and broad. Local electricity systems are interdependent with other systems – governance, risk management, budgeting, procurement, planning, regulation, and other service delivery (notably water and sanitation and waste management). Municipalities have a critical role in the built environment and integrated transport planning. This means that municipalities must play a key role in enabling NEVs by unlocking the charging infrastructure, particularly by facilitating the conversion of public transport to NEVs.

[126] Tracy Ledger, 2021, Broken Promises: Electricity Access for Low-Income Households: Good Policy Intentions, Bad Trade-Offs and Unintended Consequences, PARI, https://pari.org.za/broken-promises-good-intentions-bad-trade-offs-and-unintended-consequences/#:~:text=Broken Promises %7C New research from the EnergySociety programme,-By Public Affairs&text=A new report on electricity,attention from an energy perspect.

[127] This estimate has been developed by PARI and requires further investigation.

Table 25. Catalytic investment requirements for South Africa's municipal-scale electricity service delivery, 2023–2027

Funding Programmes	Description	ZAR billion
Infrastructure: Distribution Maintenance	Address the municipal distribution grid maintenance backlog through capital investments and capability enhancements.	200
Infrastructure: Distribution modernisation for NEVs	Strengthen the municipal grid for NEVs. [NEV-charging infrastructure investment needs are calculated in the JET IP in Section 4.4.] [Distribution networks modernisation to support increased penetration of embedded renewable electricity generation is calculated in the JET IP together with the Eskom distribution upgrades for this purpose in Section 4.2 at R13,5bn. This estimate may vary once detailed studies have been done to determine municipal-specific requirements]	73
Infrastructure: Electrification backlog	Extend the INEP to connect more households.	45
Operational: Demand-Side Management (DSM)	DSM investments in the built environment to extend existing plans. Limited support is available through DBSA's Revenue Enhancement Programme (ZAR21 million per year for three municipalities).	0.5
Operational: Energy Access design	Grant funding to analyse and test how increasing energy access could be partially covered from existing financial flows to municipalities, together with modelling impacts on electricity and broad municipal finance, and pilot implementation. This will be connected to broader modelling designed to understand how subsidies (national and local) and tariffs can be better structured to unlock suppressed demand in low-use households.	0.1
Capability and capacity	Grant funding for institutional support and capacity building to undertake cost-of-supply studies, tariff designs, technical skills upgrades, electricity planning (distribution and generation), NEV planning, along with the local JET planning, energy investment, and procurement. Extra municipal and centralised/external capacity is required to enable implementation.	0.23
Knowledge generation: Collective planning	Collective scenario planning and policy implementation labs collaboratively across municipalities to support all aspects of the JET. Flexible funding is required for implementation aligned with local priorities and using local role players and skills.	0.03
Knowledge generation: Municipal revenue modelling	Research and modelling to understand the dynamics of subsidisation and local cross-subsidisation between grid/electricity users, as well as the impacts of alternative electricity revenue models on municipal finances. Flexible research facilities are needed for implementation aligned with local priorities and using local role players and skills.	0.2
TOTAL		**319.06**

FINANCING THE JET IP

5.1 INTRODUCTION

This section of the JET IP provides potential public and private investment partners, including the IPG partners, with a summary of South Africa's JET IP financing needs for the period 2023-2027, preferred use of funds and preferred funding instruments. It offers investment partners the opportunity to identify the different avenues and channels where they may contribute towards South Africa's initial JET IP portfolio, either by priority sector or within elements of the portfolio, to derive a systemic shift from a high- to a low-carbon energy system. The financing agreements that will emerge from engagements between investment partners and South Africa will need to align with South Africa's fiscal realities and demands and uphold the development and climate finance principles in the context of the country's commitment to a just energy transition.

5.2 BACKGROUND

National and sectoral policies, plans, and strategies, adopted over the past two decades, have committed South Africa to significant public expenditures and private investments towards a climate response. In keeping with decisions taken at UN and other international forums, especially the more recent COP26, there is increasing awareness that developing countries, deeply embedded in fossil fuels, require dedicated resources to enable the transition to low-energy emissions economies in the context of justice, poverty eradication, and sustainable development. South Africa's National Climate Change Response Policy (NCCRP) recognises that improved coordination is critical to creating a sustainable climate finance architecture for South Africa. New market-based instruments, as well as environment-related financial reforms in the private and public sectors, will be needed to fundamentally transform the country into a climate-resilient economy and society.

The South African Climate Finance Landscape 2020[128] report tracked annual climate finance totalling ZAR62.2 billion for 2017 and 2018. However, the financing and investments required to proceed towards a low-carbon and climate-resilient economy remain an important challenge for the country. South Africa's just energy transition over the next five years is estimated to cost approximately ZAR1.5 trillion.[129]

[128] Climate Policy Initiative, Bertha Centre, GreenCape.
[129] Costing and assumptions contained in Section 4 and Annexures B, C, and D.

The financing package under the JET IP must address the social costs associated with achieving the updated NDC targets and the broader climate response. In this context, the JET IP aims to improve the quality of livelihoods, particularly for those directly impacted by the transition, and ensure shared benefits, risks, and responsibilities from the transition. These are well articulated in the principles of restorative, procedural, and distributive justice, as set out in the Just Transition Framework approved by the South African Government in September 2022. The scope and sequencing of the transition, described in Section 4, combined with the most appropriate financing, offer opportunities for structuring new economic opportunities and just outcomes, particularly supporting the participation of women, youth, and affected communities.

5.3 STATE OF PUBLIC FINANCE AND CONTINGENT LIABILITIES

The trajectory of South Africa's public finance position and the restoration of Eskom's commercial viability are key factors in the sovereign's ability to create an enabling environment to attract domestic and foreign capital for the JET IP requirements.

5.3.1 PUBLIC FINANCES

The February 2022 Budget signalled government's intention to further stabilise public finances mainly supported by stronger than expected revenue collection. While global and domestic conditions remain major risks to the mid-term outlook, the fiscal strategy aimed at deficit reduction and priority spending has contributed to the achievement of fiscal goals that were set out in the 2021 Medium-Term Budget Policy Statement.[130]

The main fiscal priorities include:

- The stabilisation of the current debt position and the reduction of the burden it places on public finances and the South African economy;[131]
- The growth in expenditure on health, education, social protection, and local amenities; and
- The focus on public sector infrastructure investment over the next three years representing approximately 16% of main budget non-interest expenditure.

The following initiatives, amongst others, are expected to support the stabilisation of the fiscal debt position, whilst enabling the growth in infrastructure investment:

- Government's review of the Public-Private Partnership (PPP) policy framework will simplify approval and compliance requirements for the participation of private investors in the JET IP.

[130] National Treasury, 2022, "Chapter 1: Supporting the Recovery and Building the Future," 2022 Budget Review.
[131] National Treasury, 2022, "Chapter 3: Fiscal Policy," 2022 Budget Review.

- The increase in the carbon tax rate (in progressive phases) as announced in the February 2022 Budget signalled an intention to internalize the cost of emissions by companies.

However, being a relatively small and open economy, South Africa is exposed to global economic and geo-political trends, such as the current worsening global economic environment and ongoing war in Ukraine. These will influence capital flows and the exchange rate, with implications for inflation, interest rates and financial market volatility, with the poorest hit the hardest. How South Africa pursues long-term economic transformation, while meeting its climate change commitments and ensuring a resilient and inclusive recovery, will require the reallocation of capital, the mobilisation of new financial resources, and the strategic realignment of existing resources (public, private, and blended finance options) over the short, medium, and long terms.

5.3.2 CONTINGENT LIABILITIES

The total limit of guarantees authorised by government amounts to ZAR675.8 billion (14.7% of GDP) against which state-owned enterprises (SOEs) have borrowed ZAR300.4 billion (6.5 % of GDP).

By March 2021, Eskom had used ZAR281 billion of its ZAR350-billion government guarantee facility, with another ZAR7 billion committed. As Eskom redeems some of its maturing capital, it creates space within the limits of its facility. In addition, the Minister of Finance has approved a special dispensation to allow Eskom to access additional guarantee debt of ZAR42 billion in 2021–2022 and ZAR25 billion in 2022–2023. Government has also provided Eskom with equity support of ZAR31.7 billion in 2021–2022.[132]

Downsizing Eskom's debt and restoring the entity's commercial viability, including through setting cost-reflective electricity tariffs and restructuring the entity, will be key to South Africa's transition from reliance on coal to renewable energy. The restructuring of Eskom's ZAR396-billion debt, as part of a process to place the company on a sustainable footing, is being finalised by the National Treasury. A sustainable solution will be contingent on continued progress to reform the electricity sector and Eskom making progress on the turnaround plan and restructuring.

Strengthening Eskom's balance sheet is integral to a turnaround plan that includes improving operations to ensure a reliable supply of electricity; unbundling to emphasise transparency, agility, and operational excellence; reducing costs and optimising revenue; returning the entity to financial sustainability; and enhancing staff performance.

[132] National Treasury, 2022, "Chapter 8," 2022 Budget Review.

5.4 FINANCIAL SECTOR LANDSCAPE

South Africa has the most advanced and diverse economy on the African continent. The investment environment is fortified by stable institutions, an independent judiciary committed to upholding the rule of law, a robust legal sector, as well as a sophisticated and a well-regulated financial services sector with an extensive range of experienced local partners.

The country is a conducive destination for both foreign and local investment due to the following key factors: (i) deep and liquid capital markets; (ii) a robust financial governance framework; (iii) an independent central bank; (iv) a growing number of sustainable finance regulations; and (v) initiatives to facilitate private sector participation in JET.

5.4.1 DEEP AND LIQUID CAPITAL MARKETS

South Africa's financial markets are, by far, the most developed and liquid in Africa. According to the Absa Group's *Africa Financial Market Index,*[133] South Africa's high score is largely attributable to the market depth subcomponent, which includes market liquidity.[13] The depth of its financial market is evidenced by the size of the asset base of its financial institutions; the liquidity of the listed market; the active foreign exchange (FX) market; as well as the duration and maturity of the bond market.

5.4.2 ROBUST FINANCIAL GOVERNANCE FRAMEWORK

South Africa has a robust regulatory framework, which includes a separation of oversight responsibilities to align with global best practices. Since the implementation of the Twin Peaks' model in 2018, prudential regulation and supervision of banks, insurance companies, and market infrastructures are conducted by the Prudential Authority (PA), operating autonomously within the South African Reserve Bank's (SARB) administration.[135] The Financial Sector Conduct Authority (FSCA) is responsible for market conduct regulation and supervision of market participants and structures, as well as prudential supervision of pension schemes and investment funds.

Responsibilities for anti-money laundering (AML) and the combating of the financing of terrorism (CFT) are discharged through the Financial Intelligence Centre Act that mandates supervisory bodies' compliance with its requirements. Recently, Cabinet approved the submission of new amendment bills for AML and CFT to Parliament to address the concerns raised by the Financial Action Task Force (FATF).
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133 Absa Group, 2021, Absa Africa Financial Markets Index 2021.
134 IMF (International Monetary Fund), A Financial Sector Assessment Program Technical Note: Systemic Liquidity Management.
135 IMF, Country Report No. 22/39 South Africa Financial Sector Assessment Program.

5.4.3 INDEPENDENT CENTRAL BANK

The SARB has the independence to use any of the monetary policy instruments at its disposal to achieve its monetary policy goal. The SARB's main mandate is to protect the value of the currency in the interest of balanced and sustainable economic growth and to enhance and protect financial stability in South Africa.

Since joining the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) in 2019, the SARB has sought to increase the industry's focus on climate change risks.[136] These initiatives augment the risk management and reporting framework in South Africa, facilitate relevant disclosure for all stakeholders, and create demand for appropriate climate risk-mitigating programmes and projects.

5.4.4 SUSTAINABLE FINANCE REGULATIONS AND INITIATIVES

In addition to the SARB's climate risk efforts, there have been important initiatives aimed at improving the quality, comparability and accuracy of green/climate finance reporting and disclosure including the South African Green Finance Taxonomy published by National Treasury in March 2022 and the *Johannesburg Stock Exchange (JSE) Sustainability Disclosure Guidance* published in June 2022.

Most large South African financial institutions have published sustainability/climate-related policies and commitments in accordance with disclosure guidelines.

National Treasury has also established the Intergovernmental Sustainable Finance Working Group to ensure that the regulatory instruments to manage climate related risks to the financial sector are developed in a coordinated and coherent manner.

5.5 JET IP FINANCING NEEDS (2023–2027)

The financing needs for the JET IP over the next five years (2023–2027) are estimated to be approximately ZAR1.5 trillion (US$98.7 billion).[137]

Financing for such an ambitious programme cannot rely solely on public finances and will require that the most optimal financing instruments are applied across the widest range of private, public, local, and international sources of climate financing.

[136] IMF, Country Report No. 22/39 South Africa Financial Sector Assessment Program.
[137] The exchange rate used throughout the JET IP is 15:1.

The process of financing the JET IP, to which the IPG's JETP funding will contribute, is challenging. If successfully executed, it will fundamentally change the economic landscape of the country, ensure security of electricity supply, create employment in new energy and industrial sectors, and provide the necessary support to communities affected by the transition. The process will also need to offer solutions to the challenges associated with existing mechanisms for climate finance. These relate to delays in financing processes, complexity, and a fragmented project-based approach. It would also re-enforce the principles of country ownership and mutual accountability.

In order to uphold the development and climate finance principles and obligations due to developing countries, and support a transition that is inclusive and just, investments will not only be required in infrastructure, but also in retraining and skills development, social support, and inclusion, along with economic diversification that includes innovation and localisation, as set out in Table 26.

Table 26. Financing needs of the JET IP for the period 2023 – 2027

ZAR (US$) billions	Electricity	NEV	GH_2	Subtotal
Infrastructure	978	83	313	1 374
Planning and implementation capacity	2.14	2	5.5	9.9
Economic diversification and innovation	40.4	43	–	83.4
Social investment and inclusion	9.6	–	–	9.6
Skills development			2.7	2.7
Subtotal	1 030.4 (68.7)	128 (9)	319 (21)	
TOTAL				**1 480 (98.7)**

The amounts in Table 26 are indicative financing needs, clustered in a way to reflect a programmatic approach to the country's energy transition. In addition to the infrastructure build and the associated creation of jobs, the programmatic approach identifies transition aspects aligned with economic diversification and innovation that ensures the inclusion of communities in the growth of local economies in the renewable energy sector. For instance, included under social investment and inclusion are investments in social partnerships that several entities have been piloting across the country.

5.5.1 PRIORITISATION AND SEQUENCING OF INVESTMENTS

Section 4 of the JET IP proposes the prioritisation of investments over the next five years for each of the sectors – electricity, NEVs, and GH_2 – aligned with the categories contained in Table 26. The process of prioritisation and sequencing of investments will need to focus on:

- Investing in critical infrastructure to strengthen the transmission grid and municipal distribution infrastructure;
- Supporting reforms for decommissioning and repurposing coal assets;
- Planning for the social foundations that will be needed to prepare and support affected communities for the transition, particularly those in Mpumalanga, to ensure income security and skills needed for affected workers and youth to take up new economic opportunities. The preferred financing for the investment of ZAR60 billion to cover just transition priorities will require maximum concessional and grant funds. The ILO's guideline[138] for a just transition advises that adequate social protection systems (health care, income security, and social services, among others) need to be established, and that social protection must be integrated in policy measures and transition challenges. It further advises that employment guarantee schemes should be put in place; and
- Increasing the supply of renewable energy and lay the foundation for EV and GH_2 sector development.

As coal plants are decommissioned, capital investments totalling ZAR475 billion will be needed in renewable energy over the next five years. While this is expected to be largely driven by the private sector, the financing of new transmission lines to support the uptake in this renewable energy, estimated at ZAR132 billion, will largely require state asset investments. The unbundling of Eskom's transmission division into a transmission company, as a subsidiary of Eskom Holdings, will sustainably support this endeavour and establish predictable regulated revenue and a credit rating to raise competitively priced funding on capital markets.

At the same time, investments in municipal distribution infrastructure are a critical path factor for South Africa's just energy transition over the next five years, including in backlog maintenance of approximately ZAR245 billion. Investments will also be needed for the modernisation of local government technologies, tariffing, and energy management systems to support sustainable municipal finances and address energy poverty and access in the communities they serve.

[138] Guidelines for a just transition towards environmentally sustainable economies and societies for all.

5.6 FINANCING PRINCIPLES

The following principles guide the quality of finance that South Africa is seeking for the JET IP:

i. Finance should follow the principles for support to developing countries established under the UNFCCC whereby developed countries commit to provide finance, capacity building and technology transfer to developing countries to advance their climate response, taking account of their respective capabilities and their national circumstances and priorities.

ii. Finance should be additional to existing climate and development commitments, and not divert critical development assistance away from existing development funding.

iii. The composition of financing instruments should reflect South Africa's unique needs as reflected in the JET IP, taking account of the need for fiscal sustainability, and incorporate appropriate and equitable risk-sharing arrangements. The grant component should be reflective of the finance demands entailed in enabling a just and inclusive transition.

iv. Financing of the just transition components (relating particularly to impact on livelihoods, local government, and small businesses) should be mainstreamed into the design of all JET IP projects and programmes as an integral and essential feature of South Africa's climate response.

v. Any debt-related terms for the sovereign should be more attractive than South Africa's National Treasury could secure in the capital markets without unduly onerous reporting requirements.

vi. Finance flows from partner countries should be predictable and certain, to avoid delays and enable a sustained momentum of the broader investment plan.

vii. Finance flows should be channelled through the institutions which are best placed to manage them for the intended outcomes and in the most cost-efficient manner.

viii. Partnerships with the private sector should be supported to foster appropriate risk sharing arrangements, recognizing that private sector financial institutions equally need to decarbonise their portfolios and align with just transitions.

ix. Governance and safeguards must be in place to manage risks.

5.7 FUNDING INSTRUMENTS AND PREFERRED TERMS AND CONDITIONS

In accordance with the principle of 'common but differentiated responsibility and respective capabilities', developed countries are to provide financial resources to assist developing countries in implementing the objectives of the UNFCCC. Developed countries should also continue to take the lead in mobilising climate finance from a wide variety of sources, instruments, and channels, noting the significant role of public funds, through a variety of actions, including supporting country-driven strategies and taking into account the needs and priorities of developing countries. Such mobilisation of climate finance should represent a progression beyond previous efforts.

A variety of finance instruments are required to fund the JET IP, especially finance that is able to crowd-in as much funding as possible to address the JET IP priorities. In order to align with the financing principles, the financing modalities and instruments included in the IPG offer of US$8.5 billion, as well as future sources of financing, should be guided, where feasible, by the following preferred terms and conditions:

- Flexibility to allow funds to flow to either the sovereign, the implementing institution (including Eskom), local development finance institutions (DFIs), or the private sector, in line with the financing principles of (iii), (vi), and (viii); and
- More advantageous risk-sharing and cost arrangements, including:
    - Reducing currency risk: International lenders to consider providing a greater portion of loans denominated in local currency to reduce the significant currency risk and resultant burden of increased servicing and repayment costs in local currency in line with Financing Principles (iii) and (v);
    - Reducing or waiving arrangement and/or commitment fees: Lenders to consider reducing or waiving additional arrangement and commitments fees which further increases the cost of borrowing in line with Financing Principle (v);
    - Reducing the need for Government Guarantees to International Lenders: International lenders' to limit the need for government guarantees in respect of lending to SOEs and related projects, in line with Financing Principle (i) and (iii); and
    - Including allocation to social priorities for the "Just" component: Financing to include programmatic funding to the JET portfolio for skills development, social support for affected communities, and economic development opportunities in accordance with Financing Principles (iv) and (viii).

South Africa will consider various funding instruments to address the JET IP's scope of need including:

5.7.1 GRANTS

Grants are effective in strengthening the enabling environment for priority sectors and supporting critical non-revenue generating initiatives such as: policy development, capacity building, developing sector strategies, and feasibility studies. Grants are a critical source for financing just transition activities, such as skills training, income protection, social inclusion, amongst others.

Grant funding is also able to attract the participation of the private sector to invest in lower return, but high social impact programmes and projects.

South Africa will seek to increase the grant proportion of the IPG package (currently ZAR329.7 million) with future bilateral and multi-party partnerships. Philanthropic foundations will be an important source of grant funding for the JET IP.

5.7.2 CONCESSIONAL LOANS

In line with Financial Principle (v), direct lending to the sovereign for the JET IP should be on terms substantially more advantageous than market-related loans, mainly through interest rates lower than those available in the market, along with reasonable grace and repayment periods negotiated by mandated authorities. Concessional finance will need to be institution-specific to account for the different costs of capital and the respective credit ratings. Additionally, there will need to be flexibility to negotiate the terms related to general conditions, loan agreements, programme documents, and fees.

When strategically deployed, concessional financing is a catalytic source of funding by being able to mitigate real and perceived risks, lower the cost of financing, and attract additional private sector financing to scale up climate finance in critical sectors. This includes expanding the electricity infrastructure and accelerating the development of the EV and GH_2 sectors.

Consequently, the volume and availability of concession finance will be a critical factor in assisting South Africa to achieve its JET ambition.

5.7.3 BUDGETARY SUPPORT

Budget resources will need to be used in a targeted manner to signal fiscal support for the transition, address specific barriers, and provide support where other sources of financing may be more difficult to mobilise.

Addressing climate change through the budget will require the mainstream adoption of climate-resilient tools and approaches, as a wide cross-section of government spending is potentially

vulnerable to the impacts of climate change and/or is potentially contributing to GHG emissions. For this reason, mitigation and adaptation are best achieved by integrating climate change into regular public expenditure programmes.

5.7.4 BLENDED FINANCE

Blended finance is applied in the strategic use of development finance and philanthropic funds to mobilise private capital flows at scale. It has been used regularly in the past for PPPs – including in high-income countries – for large infrastructure projects.

It combines investors with different financial return expectations – from concessional to market rates – to access greater levels of capital than on a standalone basis. Concessional finance providers, such as climate finance sources or philanthropic foundations, can partner with DFIs and offer guarantees to reduce risks for private finance and enhance capital allocation to strategic sectors. Thus, they can supplement grants and development finance, as well as provide technical assistance, to facilitate investments for plugging finance gaps.[139]

Blended finance currently represents a small share of South Africa's climate finance supply and will need to be significantly expanded to fully unlock the potential of concessional funding, in alignment with Financing Principle (ii).

5.7.5 THEMATIC BOND ISSUANCE

Instruments such as green bonds, transition bonds, or resilience bonds are increasingly gaining prominence in supporting sector-specific activities. They offer long-term maturities and predictable returns at a slight discount to the market based on the defined impact metrics, making them particularly attractive to institutional investors, such as pension funds. There have been a variety of sustainability / climate-related instruments issued recently in South Africa to broaden the financing landscape and specifically cater for the risk / return / defined impact dynamics of the investment. The JSE has been leading innovation for listed bonds by introducing its Sustainability Segment – a first for Africa. It has also created a Transition Segment which is a platform to list Transition Debt Securities, for issuers to raise funds for climate or just transition-related purposes.

5.7.6 MARKET-RELATED FUNDING INSTRUMENTS

Market-related funding has the benefit of being able to be accessed at scale, and these forms of instruments have been commonly deployed to support clean energy projects. However, in alignment

[139] Centre for Strategic Philanthropy, University of Cambridge

with financing principles (i), (iii), and (viii), the predominant use of debt instruments for channelling climate finance to developing countries raises concerns over debt sustainability.

Preferred terms and conditions should be based on the precise risks and requests of South Africa, as a sovereign, to access international climate finance and other support from developed countries, including the private sector.

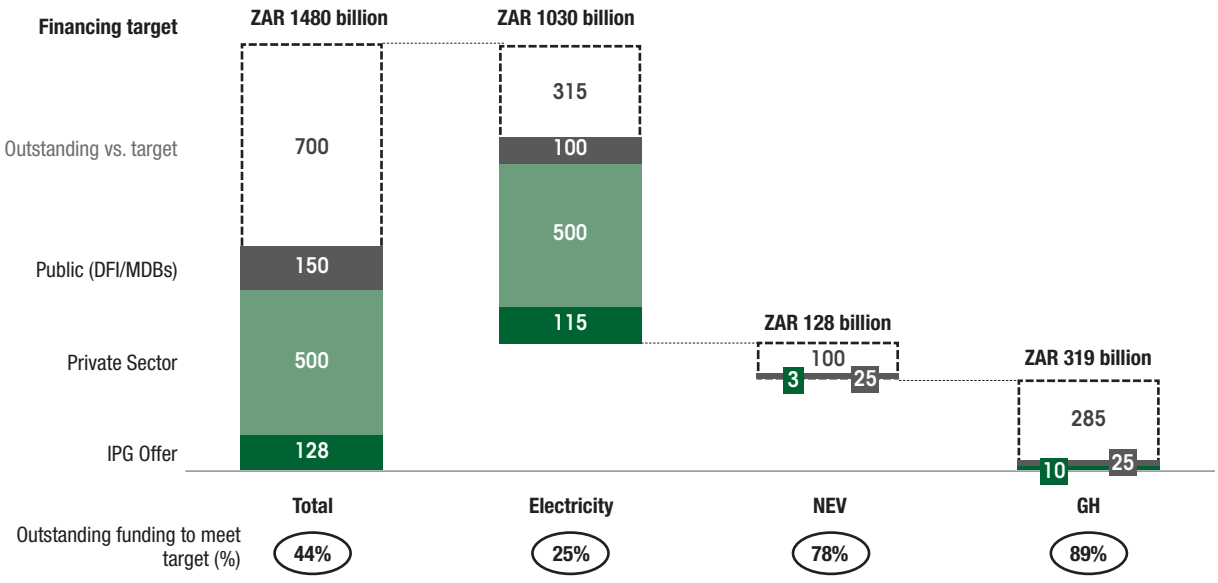
Other types of market instruments include risks-mitigation instruments, such as guarantees that can facilitate private sector participation; venture capital that provides capital and technical assistance to early-stage businesses, often in innovative technology-related sectors to accelerate growth and scale; along with equity as a source of subordinated, risk-sharing capital that can accelerate growth and enable addition leverage to flow into JET IP-related projects or businesses.

5.8 POTENTIAL SOURCES OF FINANCING

In addition to the IPG offer of an estimated US$8.5 billion, the participation of a wide range of public and private investors will need to be mobilised for the country's transition to renewable energy over the next five years and beyond. This will be done in a coordinated manner and underpinned by the JET IP.

The assessment of the current available funding sources indicates that there appears to be significant funding from the private sector to provide commercial debt funding for advancing renewable energy supply and more developed infrastructure requirements, as shown in Figure 10.

Figure 10. Projected funding needs and estimated availability, by source and sector



The South African Climate Finance Landscape 2020, covering the period 2017 and 2018, provides a useful benchmark of current funds (public and private) deployed towards climate outcomes, estimating the annual supply for South Africa to be at ZAR70 billion, which reflects a doubling over the last six years. According to South Africa's updated NDC, the country requires scaled-up access to climate finance from the international community of approximately US$8 billion per annum by 2030. Assuming that the momentum of the doubling of funding can be maintained, the additional financing target is estimated to be in the range of ZAR600–750 billion between 2023 and 2027.

5.8.1 SOUTH AFRICA'S DEVELOPMENT FINANCE INSTITUTIONS

Plans by South Africa's DFIs and the private sector to invest in the country's energy transition are at varying stages of finalisation, including access to international climate finance facilities.

Building on existing investments in renewable energy projects, the JET projects that IDC's involvement is valued at ZAR24.5 billion and pipeline projects are valued at ZAR12.3 billion.

In addition to its JET-related financing of US$5,4 billion (ZAR81 billion), the New Development Bank (NDB) has pledged a further US$3 billion (ZAR45 billion) over the next five years in co-financed investments for decommissioning coal-fired power stations, transmission lines investment, and green hydrogen.

5.8.2 PRIVATE SECTOR

The local private sector has indicated a strong appetite for investing in climate finance assets, in particular, new renewable energy supply. Many of the large local financial institutions have made significant public commitments to fund climate finance assets, which in aggregate, total approximately ZAR500 billion over the next three to five years. As part of these funding commitments, there is an expected 'just transition' contribution as a percentage of the project value, similar to the current REIPPP programme.

The remaining financing need is going to require a combination of investment and funding to deliver on the JET IP in a just and inclusive manner. The catalytic use of concessional and grant funding, as well as guarantees from government, DFIs (in addition to the IPG pledges), climate finance institutions, and philanthropies, will need to be deployed in a way that mobilises additional local and international private sector capital.

South Africa will need to pursue further funding from the IPG, as well as from new bilateral and multilateral funding sources.

5.9 JET IP PRIORITIES (2023–2027) AND ENTRY POINTS FOR INVESTORS

Depending on the nature of the project, the stage of market development, the type of intervention, among other considerations, one or more of the following sources and instruments can be applied to support the JET IP, as set out in Table 27.

Table 27. Priorities, types of instruments, and entry points for investors

Priority Investments	ZAR billion	Proposed Instrument					
		Concessional	Commercial	Budget	Grant	Guarantee	Venture Capital
Electricity							
Decommissioning of coal plants	4	Climate Finance (CF)	DFI	Government (Govt.)	–	–	–
Solar	233	–	Private (PVT)	–	–	–	–
Wind	242	–	PVT	–	–	–	–
Transmission grid strengthening	132	CF	DFI	Govt.	–	–	–
Distribution (Eskom & municipalities capacity)	333	CF	DFI	Govt.	–	–	–
Batteries	23	CF	DFI	Govt	–	–	–
Electricity Subtotal	**967**						
Just Energy Transition (Mpumalanga)							
Repurposing of coal plants	3.4	CF	DFI, PVT	Govt.	–	–	Venture Capital (VC)
Repurposing of coal mining land	13	CF	DFI	Govt.	DFI	–	–
Improvement of infra-structure for development	12	–	DFI	Govt.	–	–	–
Diversification of local economies	24	CF	DFI	–	CF, DFI	–	VC
Care for coal workers	6	CF	DFI	Govt.	CF, DFI	–	VC
Investment in youth and preparation of future generation for transition	0.7	–	–	Govt.	CF, DFI	–	–
Policies for post-mining redevelopment	0.05	–	–	–	CF, DFI	–	–
Plan and capacity for success	1.3	–	–	Govt.	CF, DFI	–	–
JET (Mpumalanga) Subtotal	**60**						

Priority Investments	ZAR billion	Proposed Instrument					
		Concessional	Commercial	Budget	Grant	Guarantee	Venture Capital
Just Energy Transition (Electricity Sector)							
Manufacturing and localisation of the clean energy value chain	1.6	CF	DFI	–	–	DFI, CF	VC
Piloting social ownership models	1.6	CF		Govt.	CF, DFI		
JET (Electricity Sector) Subtotal	**3.2**						
NEVs							
Value chain investments	41	–	PVT	–	–	–	VC
Fleets, chargers, storage, and local assembly	6	CF	DFI	Govt.	–	–	–
Goods and service logistics assembly	7	–	PVT	–	–	–	VC
Local supply chain and knowledge sharing	2	–	PVT	–	CF, DFI	–	VC
R & D market integration	2	–	–	Govt.	CF, DFI	–	–
Reduction of NEV purchase price and development of charging infrastructure	70						
NEVs Subtotal	**128**						
GH_2							
Feasibility	4.5	–	–	–	–	–	–
Capital cost	183	–	–	–	–	–	–
Project development	1	–	DFI, PVT, CF	Govt.	–	CF, DFI	–
Infrastructure	150	–	DFI, PVT, CF	Govt.	–	CF, DFI	–
GH_2 Subtotal	**60**						
TOTAL	**1 480**						

The JET IP includes capital deployment into both revenue- and non-revenue-generating initiatives that have critical interdependencies and social priorities for an inclusive and just transition. A systemic approach is, therefore, required to deliver on the desired environmental, social, and

economic returns. Consequently, in addition to the various funding sources and instruments, a mix of delivery methods will need to be considered to enable different types of investors to access initiatives that are aligned with their objectives, in terms of specific environmental, social, and economic returns. This will require rethinking and scaling up existing sources and instruments, as well as designing untested innovative solutions.

Existing modalities, involving project- or programme-based transactions between South African institutions and one or more of the sources of financing, will continue to play a role in delivering the JET IP, using various entry points. However, options that can increase efficiency and reduce transaction costs should also be considered, such as financing structures that will enable a variety of local and international investors to combine capital allocations under one governance and reporting framework.

As is clear from the needs identified under the JET IP, the demand of financing, particularly concessional financing, is far greater than supply. The scale of concessional capital that can be made available in response to the JET IP will need to look beyond the initial time period to meet the just energy transition's objectives over time. Solutions, commensurate with the scale of needs and extending beyond a project-by-project approach, will be necessary. Potential programmatic approaches could include, pending feasibility and further due diligence, an enhanced second phase of the JET Partnership and a country platform model, among others.

5.10 CONCLUSION

The quality of finance that South Africa seeks will need to be affordable, sustainable and enable the country to efficiently manage the decommissioning of coal-fired power stations, strengthening and expansion of the electricity transmission and distribution networks, satisfy the need for renewable energy, electrify transport, and establish the GH_2 industry. Furthermore, financial support will need to be coordinated, follow a programmatic approach, building the social foundations and enabling systemic change in impacted livelihoods, and be responsive to South Africa's energy transition-related needs.

Financing the JET is complex and challenging, but if executed successfully it would enable South Africa to fundamentally shift in the economic landscape of the country, to ensure security of electricity supply, to create employment in new energy and industrial sectors, to provide essential support and safety nets for affected communities as well as to build resilience to physical & transition risks, and social effects. Consequently, the JET IP offers various entry points for local and international capital providers to participate in a variety of programmes and projects, through various funding instruments.

IPG OFFER OF US$8.5 BILLION

6.1 INTRODUCTION

The Political Declaration on JETP in South Africa sets out a commitment to mobilise an initial amount of approximately US$8.5 billion from the IPG over the next three to five years, with a view to longer-term bilateral and multilateral engagements. More specifically, the partnership aims to provide a catalytic effect that accelerates the decarbonisation of South Africa's electricity system in a way that ensures a just transition to protects vulnerable workers and communities, especially coal miners, women, and youth affected by the move away from coal.

The breakdown of the US$8.5 billion package of grants, concessional and commercial funding from France, Germany, UK, US, and EU, is provided in Table 28. The offers align with the financing principles to varying degrees and contribute towards approximately 12% of the financing needed, primarily geared towards: the decommissioning of coal plants; funding alternative job opportunities in coal mining areas; and deployment of renewable energy, aligned to the priorities that are set out in Table 26 of Section 5.

Table 28. Sources and financing instruments of the IPG offer[140]

US$ millions	Grants / TA	Concessional Loans	Commercial Loans	Guarantees	Total (source)
CIF/ACT ($500m to leverage an additional $2.1bn)	50	2 555	0	0	**2 605**
European Union – EIB	35	1 000	0	0	**1 035**
France	2.5	1 000	0	0	**1 002.5**
Germany	198	770	0	0	**968**
United Kingdom	24	0	500	1 300	**1 824**
United States[141]	20.15	0	1 000	0	**1 020.15**
Total (instrument)	**329.7**	**5 325**	**1 500**	**1 300**	**8 455**

to the The sections below provide further information on the IPG offer, as summarised in Table 28 above, as presented to the South African government.

[140] The German, French, and EIB's offers were made in Euros. Using an exchange rate of 1:1 in Table 28, these offers are shown in US dollars. The offers will, therefore, fluctuate.

[140] U.S. International Development Finance Corporation (DFC) is able to finance eligible private sector-led opportunities – providing up to USD1 billion in debt, guarantees, and or/political risk insurance per project, as well as equity investments of up to 30 percent of a direct equity or a fund transaction in companies and funds. DFC's ability to project investments ultimately remains a function of the volume of private sector-led projects that meet DFC's financing, environmental, and social standards, and that seek financing from DFC.

6.2 CLIMATE INVESTMENT FUNDS FOR THE ACCELERATED COAL TRANSITION (CIF ACT)

In March 2021, the Climate Investment Funds (CIF) established the Accelerating Coal Transition (ACT) investment programme, and in October 2021, selected South Africa as one of the beneficiary countries, based on an independent assessment. South Africa was allocated up to US$500 million in concessional funding, to be channelled through the World Bank Group and African Development Bank (AfDB), based on a needs assessment, as presented in the form of the ACT Investment Plan (ACT-IP).

The programme offers a one-of-its-kind, holistic toolkit to tackle three critical challenges associated with a just energy transition: governance, people, and infrastructure and will focus on:

- Decommissioning Eskom's coal power plants at Camden, Hendrina, and Grootvlei, and repurposing the plants by installing renewable energy and energy storage capacity on a PPP basis while considering the economic, social, and environmental challenges of transition. Project activities will include specific measures to ensure that interventions to support job retention/transition support to workers, job creation especially in the clean energy sector, skills development, target women and other vulnerable groups.
- Mpumalanga Community Development Project to support the provincial and local governments and communities in the Mpumalanga province during the coal transition and prepare for a green economy through the following components: (i) community mobilisation and capacity building to enable them to take part in decision-making process over local investments in social economic infrastructure and income generating activities; (ii) strengthening governance mechanisms and institutional capacity to support provincial, municipal and local government authorities in the province; and (iii) investments in green community infrastructure schemes and income-generating opportunities.

The ACT-IP, led by the DFFE and Eskom, forms an integral part of South Africa's just energy transition and is currently being finalised with CIF and the partner banks. The US$500 million funding from CIF is expected to leverage US$2.6 billion in concessional loans.

6.3 EUROPEAN UNION – EUROPEAN INVESTMENT BANK

The EIB offer comprises US$35 million in grant facilities, and US$1 billion in two loans of US$500 million each.

Although the two loans are at an early stage of negotiations between the National Treasury and the EIB, US$500 million is provisionally earmarked by the EIB for decarbonisation initiatives in respect of freight logistics, including by the state-owned company Transnet. Several issues will need to inform the decision, including: terms and costs, alignment with the priorities set put in the JET IP, sequencing within a programmatic approach, and timing.

6.4 FRANCE

The offer from France, via the AFD,[142] comprises of grants totalling US$2.5 million and concessional loans totalling US$1 billion.

The grants are intended to contribute to: long-term strategic planning for the JET, advisory services, support for local authorities, and studies, such as the assessment of energy poverty.

The concessional loans are made up of three amounts:

- US$500 million support to Eskom for the implementation of its just energy transition roadmap;
- US$300 million in the form of budget support for implementation of the JET; and
- The remaining US$200 million is under discussion on how most impactfully these funds could be deployed for South Africa's economic diversification to a low carbon economy, including in the freight sector.

6.5 GERMANY

The offer from Germany comprises of grants and concessional loans through GIZ[143] and KfW,[144] respectively. The German offer provides grant funding of US$198 million for: studies and technical assistance on policy and regulatory reforms related to energy transition; support to local authorities to prepare for the transition; promotion of renewable energy, including green hydrogen; and the skilling and reskilling of the decarbonised energy workforce. Concessional loans from KfW include:

- US$350 million for financing of grid infrastructure, renewable energy generation and green hydrogen development;
- US$300 million to National Treasury for budget support;
- US$120 million for financing of sustainable municipal infrastructure, including *inter alia* grid infrastructure and renewable energy generation.

6.6 UNITED KINGDOM

The UK offer includes grants of US$24 million, partnerships between the British International Investment (BII), the Private Infrastructure Development Group (PIDG), and private sector totalling US$500 million, and two guarantee facilities totalling US$1.3 billion. The grants provide ongoing support for: research and development related to decarbonisation, green transportation, and energy storage feasibility studies.

142 French development agency.
143 German development agency.
144 German state-owned investment and development bank.

The two guarantee facilities will be offered through a partnership with the African Development Bank (AfDB), as follows:

- The first guarantee amount of US$300 million is part of the Room to Run (R2R) Guarantee that enables the AfDB to provide up to US$2 billion of additional lending over four years to African governments and businesses. For South Africa, the R2R Guarantee will enable the AfDB to invest US$300 million of new and additional funding for the JET IP, as agreed between the South African authorities and the AfDB.
- The second facility will entail the UK agreeing to guarantee AfDB lending of US$1 billion of additional loans to the South Africa government.

Important considerations when taking up the guarantee offer are the expected results related to: the amount of climate finance mobilised, including private finance; clean energy capacity installed (MW); greenhouse gas emissions reduced or avoided (tCO_2); number of people or social institutions with improved access to clean energy; number of people supported to better adapt to the effects of climate change; hectares of land that have received sustainable management practices. These results align with the JET IP.

6.7 UNITED STATES

The United States pledges grants from USTDA, USAID, Power Africa and the State Department totalling US$20.15 million for technical assistance, feasibility studies and pilot projects. In addition, DFC is able to finance eligible private sector-led opportunities, providing up to US$1 billion in debt, guarantees and/or political risk insurance (PRI) per project, as well as equity investments – up to 30% of direct equity or funds transaction – in companies and funds.

Table 29 estimates the allocation of the IPG offer across the sectors and JET priority programmes. These are likely to be adjusted following the finalisation of the negotiations related to concessional and commercial loans, and the guarantee facilities.

Table 29. Financing by sector and by the priorities to be supported by IPG funding

ZAR (US$) billion	Electricity	NEV	GH_2
JET IP Financing needs	1 030 (68.7)	128 (8.5)	319 (21.3)
IPG offer			
Infrastructure	6.9	0.2	0.5
Planning and implementation capacity	0.7		0.2
Skills development	0.012		
Economic diversification & innovation	0.022		
Social investment and inclusion	0.016		

Through the various sources, finance instruments and disbursement channels, the IPG partnership provides several opportunities to leverage the offer and crowd-in additional funding from multilateral development banks (MDBs), DFIs, the private sector, and philanthropic foundations. However, leveraging the offer will depend on the final terms and conditions so that the structure of the funding is most favourable to deploy. This is important because not all the funding is concessional, and only a small proportion is in the form of grants.

The partnership between South Africa and the IPG realises an important scale of initial financing which will be deployed as catalytic investments in the JET IP. For this reason, the JET IP's priority focus for investment in state-owned infrastructure is to upgrade the transmission grid and the distribution networks to enable them to take up the renewable energy that will be generated by the private sector in the coming five years. This critical network infrastructure investment will leverage large-scale private investment in renewable energy, supporting both energy security and decarbonisation. In parallel, it is particularly important to seek ways, with the IPG partners, to scale up grant funding in support of the just transition investments that need to be made in the communities and workforces affected by the transition to renewable energy generation.

South Africa will now work with the IPG partners to match the JET IP needs with the financial offers and determine the institutional channels that best allow for an impactful and catalytic response, ensuring access to finance is located closest to such need. The indicative allocation described in this section is based on the initial offer put forward by the IPG countries and its best fit with the JET IP priorities. It is essential to note that the JET IP priorities will ultimately determine the most appropriate use in consultation with the partners.

1 Paragraph 17 of the Political Declaration.

JET IP IMPLEMENTATION

South Africa's JET will be a long-term process of driving economic, social, and environmental change. It will involve multi-year, multi-sectoral, and multi-jurisdictional initiatives with many stakeholders. The implementation mechanism adopted for the first five-year JET IP must therefore lay solid foundations for a sustained, focussed, and visible effort across government, civil society and the private sector that is able to adapt as needed over time.

The cornerstones of the first five-year JET IP (2023–2027) Implementation Plan are:

- **Strong governance arrangements** for ensuring leadership, oversight, transparency, safeguards, and accountability at the various locations of JET IP delivery.
- **Robust management arrangements** for planning, budgeting, performance, reporting, and communications at various locations of JET IP delivery.
- **A Monitoring, Evaluation, and Learning Framework** for the measurement of success and continuous improvement; and
- **A Risk Management Framework** for identifying potential risks and implementing mitigation measures to reduce material risks to the JET IP.

These cornerstones will be developed into a full Implementation Plan, in collaboration with the IPG, as the financing agreements are being concluded and executed for each JET IP programme and project. Importantly, the Implementation Plan will be grounded in existing South African institutions and systems, and will adopt both local and global best practices in the identified disciplines.

7.1 JET IP GOVERNANCE AND MANAGEMENT

The governance and management of the JET IP will be designed to ensure:

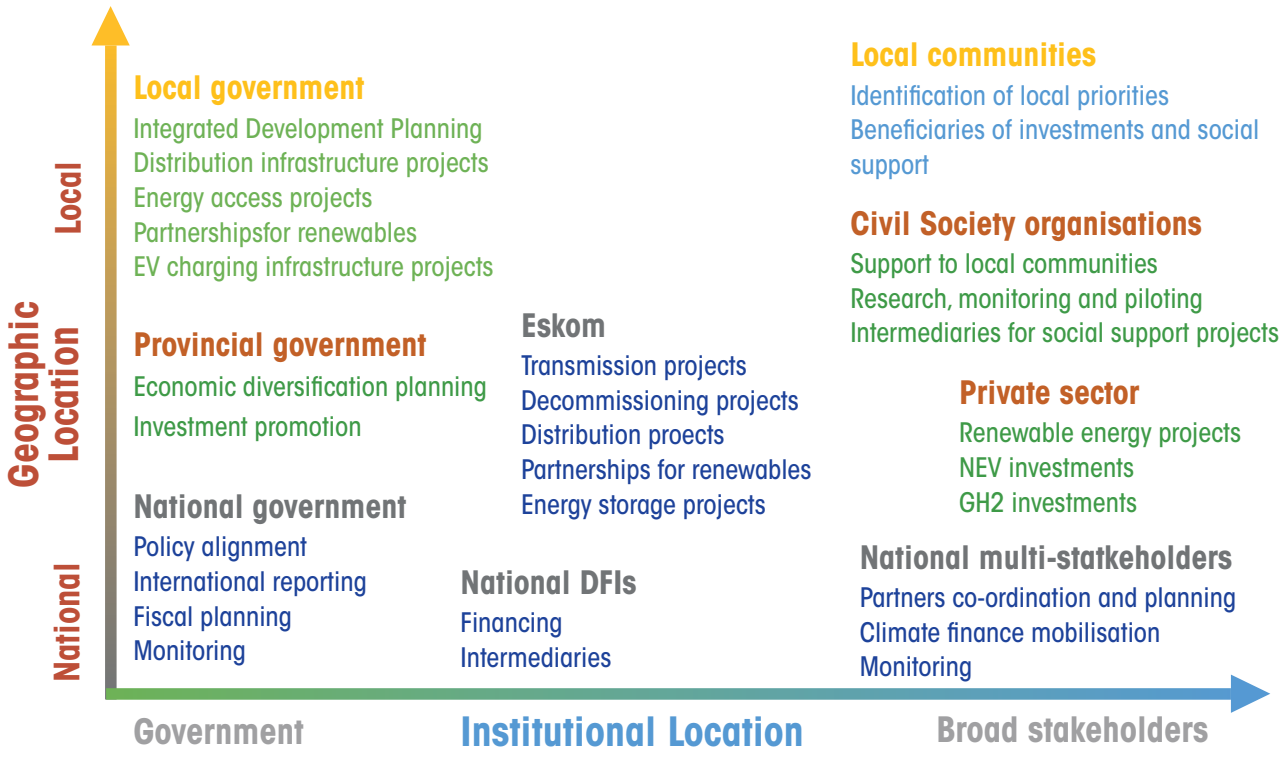
- **Leadership** that provides clear strategic direction, transparency, and integrity;
- **Accountability** by the implementing institutions to all partners in a transparent manner; and
- **Capacity** to plan for and attract ongoing JET funding from diverse sources, targeting appropriate financing instruments.

Two considerations will be integrated to achieve this desired quality of governance and management for the JET IP. They are founded on the understanding that social inclusivity and procedural justice are the cornerstones of distributive and restorative justice.

The first consideration is the **institutional location** of the governance and management of funds. This runs broadly along a continuum from government to multi-stakeholder institutions. The second consideration is the **geographic focus** of the implementing institutions, which runs broadly along a continuum from national to local.

Given the role of central government in representing South Africa in international partnerships, as well as the country's constitutional mandates of the national, provincial, and local spheres of government, the governance and management structures for JET IP will align with these spheres, enabling integration and avoiding duplication. South Africa also has a long history of active engagement with government by business, civil society, and labour organisations, providing a strong basis to build from this legacy for the JET IP. South Africa, therefore, plans for multiple stakeholders to play key roles in the delivery of the JET IP, as illustrated in Figure 12.

Figure 12. Range of South Africa's role players in the JET IP



In practice, this means that a multiplicity of implementing arrangements will need to be accommodated, with a focus on institutions that are duly mandated and managerially capacitated to execute, provided that sound governance is understood to be a precondition in all cases. Where institutional capacity building is required, specific interventions will be designed to address these needs.

The key features of the JET IP implementation arrangements will be as follows:

- There will be **national Ministerial oversight,** governance, and political coordination of the JET IP.
- There will be **national government oversight,** governance, and coordination of the country-wide JET IP planning with stakeholders. This will entail ongoing mobilisation of financing for JET IP, and ongoing accounting for nationally measured outcomes collated through JET IP Results Monitoring. This national JET IP coordination work could initially be led by a small unit in the Presidency or by a designated national Ministry.
- Within parameters set by the National Treasury and relevant legal mandates, opportunities will be encouraged for **institution-specific funding agreements** to be concluded directly between the providers of finance (for example, an MDB or international DFI) and the implementing institution of a programme or project (for example, Eskom, a province, or a municipality), subject to the respective parties' policies and due diligence. In each case, the implementing institution is contractually bound to the terms of that funding agreement, including its governance and monitoring provisions. These implementing institutions will be required to report into the national JET IP Results Monitoring system on defined high-level indicators.
- Where there are direct funding agreements between the providers of finance and the **National Treasury** these will be governed accordingly, and the National Treasury will disburse funds to the relevant implementing organ of state (national department, province, municipality, SOC, or DFI), either through annual budget votes or by project-specific transfers under National Treasury's control frameworks. The implementing institutions will be required to report into the national JET IP Results Monitoring system on defined high-level indicators.
- In instances where **national intermediary institutions** (for example, DBSA or IDC) manage the disbursement of funds by agreement with international providers of finance (for example MDBs or international DFIs) and thus oversee project execution by implementing institutions (for example, municipalities, private companies, or NGOs), the intermediary will have its own governance requirements. In this instance, the intermediary institution will be required to report into the national JET IP Results Monitoring system on defined high-level indicators.
- In specific geographic localities (for example, districts in Mpumalanga) where financing will be managed by various implementing institutions for both social support interventions and infrastructure projects, **community-level and trade union governance structures** will be appropriate for ongoing needs identification, the visibility of projects progress, monitoring, and

learning. **Social partners** can play strong intermediary roles in facilitating the effectiveness of this effort and should participate in the evaluation reviews of such roles as part of the national JET IP Results Monitoring system.

- **Private sector investors** in renewable energy infrastructure, just energy transition social support programmes, NEVs, and GH_2 will be part of the national effort to collate the results of their JET IP investments and report into the national JET IP Results Monitoring system on defined high-level indicators. It may be necessary for such reporting to become a compliance requirement.

Most of the implementing institutions will need to disaggregate large funding packages into customisable and locally managed projects where these are most appropriate.[145] South Africa's strong local Community Based Organisation (CBO) and NGO sectors can be supported to play project management roles in this regard, either directly or through intermediary DFIs, to integrate national- level accountability with funders and local-level accountability with local communities.

South Africa's approach to the governance and management arrangements for the implementation of the JET IP, as outlined here, is consistent with emerging global practices.[146] Whereas energy transitions of the past relied on national, top-down decision-making and implementation, most countries with decarbonisation programmes are now adopting hybrid governance structures where decision-making is shared between national and subnational arenas, with a diverse set of actors involved at each level.[147] Substantial decision-making and budget authority is being located at local level where municipalities bear the brunt of impacts (fiscal revenue losses and unemployment).[148] Deliberate efforts are being made to systematise inclusion, participatory decision-making, transparency, and accountability.[149] Given the different sources of financing coming to energy transition programmes (public, private, philanthropic, and capital markets), some countries are establishing dedicated institutions to manage fiduciary and operational responsibilities in transition programming.[150]

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145 PInternationally, the dedicated grant mechanism (DGM) is an example of a community-managed just transition fund, used mainly in natural resource management, and currently the subject of evaluations and learning reviews, which will be instructive.

146 Michael Stanley, John Strongman, Rachel Perks, Helen Ba Thanh Nguyen, Wendy Cunningham, Achim Schmillen, and Michael McCormick, 2018, Managing Coal Mine Closure: A Just Transition for All, Washington, DC: World Bank, https://openknowledge.worldbank.org/bitstream/handle/10986/31020/130659-REVISED-PUBLIC-Managing-Coal-Mine-Closure-Achieving-a-Just-Transition-for-All-November-2018-final.pdf?sequence=1&isAllowed=y.

147 The Czech Republic's RE:START programme made use of regional councils whose composition ranges across business, civil society, and the local government to convene annual planning exercises on their coal transition programming. The RE:START structure is widely recognised across EU member states and their coal regions as one of the pioneers of the contemporary hybrid governance model.

148 Coalitions of mayors of energy-producing municipalities have started forming over the last 5 years in US, Europe, Ukraine, and the Western Balkans.

145 The Appalachian Regional Commission (established 1967) has one of the most advanced models on non-state actor engagement. Silesia, Poland's most significant coal producing region, has recently piloted a successful regional observatory to systematically engage citizens in transition programme monitoring.

150 Last year, Greece adopted a Société Anonyme (S.A.) to handle all the programme coordination, financing, and implementation of their Master Plan for a Post-Lignite Future in Greece.

7.2 JET IP MONITORING, EVALUATION AND LEARNING FRAMEWORK

Given the importance of procedural justice to South Africa's JET, substantial attention will be given to establishing systems of participatory monitoring, evaluation, and learning. The JET IP represents an important opportunity for South African institutions, local communities, trade unions, civil society, businesses, and the international community to learn through the design, delivery, and review of the JET IP's investments in this deliberately focused and strategic energy transition. The JET IP Monitoring, Evaluation and Learning Framework will be designed for this purpose, linked to existing government monitoring and evaluation (M&E) systems, enhancing transparency, accountability, impact, and continual improvement.

All programmes and projects, funded through the JET IP, will have their own specific M&E frameworks for the measurement of outputs and outcomes in the normal course of delivering on funding agreements. The national JET IP Monitoring, Evaluation, and Learning Framework will not replicate or complicate these project-level M&E systems but will reflect them as part of the national framework, drawing data from these and other sources to measure high-level outcome indicators for the country-level JET IP Results Monitoring.

South Africa has a well-developed national monitoring and evaluation framework which is managed through the Department of Planning, Monitoring and Evaluation (DPME). It sets out guidance for monitoring and evaluating the diagnostic, design, implementation, and economic value of programmes and projects. Recent work has been done to develop guidance for evaluating just transition-related dimensions of national projects. This work will be taken forward to establish South Africa's JET IP Monitoring, Evaluation, and Learning Framework.

Substantial climate policy-relevant data sets have already been defined and collected by DFFE, DPME, StatsSA, the Carbon Disclosure Project (CDP), and a range of other government and non-government entities to monitor and evaluate the national climate policy implementation and fulfil South Africa's international reporting obligations as a Party to the UNFCCC and the Paris Agreement. The JET IP Monitoring, Evaluation, and Learning Framework will build on, contribute to, and draw from these sources. For the national high-level JETP IP Results Monitoring, the core reporting indicators per annum may include but not be limited to:

- South Africa's progress on implementing its NDC mitigation and adaptation targets;
- GHG emissions reduced or avoided (electricity, transport, and industrial sectors);
- GWs of renewable electricity capacity installed;
- GWhs of storage enabled;
- Kms of transmission infrastructure upgraded or extended;

- Kms of distribution infrastructure upgraded or extended;
- Number of grid-support infrastructure projects developed (transformers and substations);
- Number of coal power plants decommissioned;
- Hectares of coal mine land rehabilitated;
- Number of coal workers transitioned (retired, job numbers, and job types);
- Number of workers in all the priority sectors reskilled, upskilled, and / or retrained;
- Number of youth positioned for the new energy economy (trained, job numbers, job types);
- Number of EVs manufactured in South Africa;
- Number of electric MBTs in operation;
- Number of electric buses in operation;
- Progress towards local manufacturing – factories being built or similar;
- Million tonnes per annum of GH_2 production;
- Expenditure per JET IP programme and project;
- Additional investment leveraged for the JET IP; and
- JET IP's progress to planned schedule.

In addition, the JET IP Results Monitoring will conduct research studies and surveys to analyse the impacts of the JET IP investments on:

- Economic diversification,
- Policy reforms,
- New energy economy value chains,
- Household livelihoods in Mpumalanga's coal districts,
- Stakeholders' participation in JET forums, and
- Impact of the public finance expenditure.

Monitoring data will inform and improve decision-making, accountability, learning, innovation, and the management of change; as such, a variety of evaluation methodologies will be deployed.

7.3 JET IP RISK MANAGEMENT FRAMEWORK

An initial Risk Register for the JET IP as a whole demonstrates South Africa's commitment to rigorous implementation management, enabling the JET IP's national leadership to keep a close check on the effectiveness of mitigation interventions earmarked to reduce the levels of risk identified in key categories. Further work will be done to build out a comprehensive Risk Management Framework which can be cascaded to the JET IP's implementing institutions as appropriate. This will be used as a national risk monitoring tool, as the programmes and projects commence.

Table 30. JET IP National Risk Register

Risk	Risk Level	Mitigation measure	Residual Risk
Capacity risk: Implementing institutions may have limited experience or skills to implement activities.	High	Projects will be selected with reference to the capacity, knowledge, and sector-specific experience of the implementing institutions and their understanding of regulations and approval requirements. Technical assistance will be provided as necessary to build capacity and support implementation.	Low
Financial risk: This includes debt and credit worthiness, currency risk, and insufficient funding. The national debt position may worsen, leading to an adverse impact on the country's credit rating and undermining its potential to raise funds in the market on favourable terms. As such, there may be insufficient funding to meet the financing needs of the JET IP.	High	JET IP initiatives will follow strict guidelines from National Treasury to ensure debt and credit worthiness considerations have been incorp-orated in their financing. Risk-appropriate instruments will be deployed in a targeted manner to address specific barriers. Design considerations will be built-in to mobilise additional funding from a range of sources including DFIs, MDBs, climate finance, philanthropies, and the private sector, among others.	Medium
Implementation risk: Private sector projects are delayed by financing, pricing, technology factors, or challenges at local construction sites.	High	Given the multi-sectoral, multi-stakeholder and inter-dependent nature of the JET IP projects and programmes, government will establish mechanisms to monitor such developments and escalate intervention measures where required.	Medium
Policy risk: There may be delays in design and implementation of key reforms needed to provide certainty to the market and key players for their long-term participation in the JET IP's implementation.	High	Clear, long-term policy signals from government and relevant entities will be provided to ensure a predictable regulatory environment that facilitates participation of the private sector and other stakeholders.	Low
Regulatory risk: The risk that regulatory provisions, consistent with efficient licensing, approvals, and cost-reflective tariffs, are not unequivocally adopted by the energy regulator and other regulators, thereby creating uncertainty for investments by SOCs, government financiers, and the private sector.	High	The regulatory regime to support the energy sector policy reforms will be resolved to create long-term certainty for energy infrastructure investment.	Medium

Risk	Risk Level	Mitigation measure	Residual Risk
Social risk: Transition efforts will directly and indirectly affect the communities in the coal regions in the short and long terms. These effects must be proactively managed through systematic and real-time efforts.	High	A guideline on just transition financing, including eligibility, relevant entry points, and other key considerations will be provided by government to ensure the most effective and efficient use of available funds. Regular monitoring and coordination across government and implementing institutions, along with regular stakeholder consultations, will ensure that the right types of funds reach the right beneficiaries by addressing their specific needs, while reducing wastage.	Medium
Political risk: including uncertainty caused by national / provincial / local political processes and changes.	High	The JET IP and its associated policies will be integrated into the long-term country transition pathway planning, so potential short-term political instability does not shift its priorities and adversely affect its implementation timelines.	Medium
Corruption risk: given the multiplicity of entities involved and including potential state capture and misappropriation of funds that can drive funding away from its intended use resulting in theft, wastage of scarce domestic and international, public, and private capital.	High	Regular monitoring and oversight by a JET IP unit, transparency, tight localised governance structures, and clear safeguards around the use of the funds, along with the periodic reporting and evaluation of the JET IP's progress, will offer tight controls to ensure minimum wastage and prevent the misuse of funds.	Medium
Capital deployment risk: given that some of the funding offers may be dependent on third party intermediaries subject to their own deployment processes and/or project-by-project approval, there is a risk that the access to capital can be delayed or not accessible.	Medium	A JET IP unit will monitor the scale and pace of translation of capital commitments to capital deployed. It will ensure that the implementation plan and access to funding are aligned, l focussing on programmatic rather than project-level funding deployments.	Low
Technology risk: Lack of access to new technology from international markets, procurement delays to implementation, challenges with integrating technology to local conditions, knowledge, skills, capacity gaps in managing the installation, operation and maintenance of solutions in local markets, among others.	Medium	Government will ensure a supportive enabling environment, including predictable and smooth procurement guidelines and the strategic use of public and development finance, to enable technology transfer. Technical assistance and capacity building to expand technical and local capacity will be provided as necessary by the government and its partners. Additional infra-structure and performance guarantees will be provided on a case-by-case basis to facilitate technology transfer.	Low
Global economic risk: The volatility of inter-national markets, caused by unexpected events, such as a pandemic, war, or political unrest, may have adverse impacts on the availability of funds through public and private sources.	Medium	Regular monitoring of the JET IP will be carried out and a funding strategy adjusted in light of changing macroeconomic considerations.	Medium

Risk	Risk Level	Mitigation measure	Residual Risk
Private sector risk: A lack of predictable regulatory environment, a low level of awareness about provisions and programmes, a prevalence of real and perceived risk may discourage private sector engagement and participation in the implementation of the JET IP.	Medium	Clear policy signals by the government, the targeted use of limited public and concessional resources to mitigate real and perceived risks, the use of fit-for-purpose instruments, demonstration projects, public awareness campaigns, and ongoing consultations will be key components of the implementation process.	Low
Safeguards risk: in case of environmentally sensitive regions or sites, vulnerable communities, excluded groups may be impacted by implementation of one or more activities.	Medium	The JET IP implementation will follow the national government and implementing institutions' safeguards measures. Appropriate environmental management and social development measures will be incorporated into the design of projects and programmes. Technical assistance can be provided to upgrade and enhance domestic capacity to implement good practice safeguard measures.	Low
Public health risks: The recent Covid-19 pandemic has illuminated how such an event could be highly disruptive to implementation and undermine the availability of domestic and international financing, as funds are diverted to urgent needs.	Low	Based on lessons learned over the recent pandemic, the JET IP and its associated planning mechanisms will incorporate global health hazards safeguards, while designing scenario interventions. This will include securing long-term, predictable finance, on the best possible terms are locked in order to avoid disruption should availability be constrained in an uncertain market scenario.	Low

7.4 JET IP IMPLEMENTATION COORDINATION AND KEY MILESTONES

The governance, terms of reference and work plan for a dedicated JET IP unit or other appropriate institutional arrangement will be elaborated in due course. The core functions of such a capacity are likely to be (i) planning with stakeholders for updates to the JET IP; (ii) mobilising additional financing for the JET IP; (iii) monitoring and updating the national JET IP Risk Register; and (iv) managing the national Results Monitoring system and reporting to stakeholders.

Table 31 highlights headline activities that need to be completed to unlock the commencement of JET IP implementation for the five-year period 2023 and 2027.

Table 31. Indicative timelines of JET IP key milestones

	Activity	Responsibility	Dates
1	COP27 JET IP launch	South African government and IPG governments	November 2022
2	Arrangements for JET IP implementation	South African government	February 2023
3	JET IP monitoring begins	South African government	February 2023

GLOSSARY OF TERMS[151]

Adaptation	In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects.
Battery Energy Storage Systems (BESS)	An electrochemical device that charges (or collects energy) from the grid or a power plant and then discharges that energy at a later time to provide electricity or other grid services when needed.
Beneficiation	The transformation of a primary material (produced by mining and extraction processes) to a more finished product which has a higher value.
Biomass	Organic non-fossil material of biological origin constituting a renewable energy source.
Bush encroachment	The increase of woody plant densities so that the natural equilibrium of the woody plant layer (trees and shrubs) and herbaceous (grass and forb) layer densities is shifted unfavourably.
Blended finance	Strategic use of development finance and philanthropic funds to mobilise private capital flows at scale, by combining investors with different financial return expectations – from concessional to market rates – to access greater levels of capital than on a standalone basis.
Carbon Budget	Refers to either an assessment of carbon cycle sources and sinks on a global level, or in policy terms the maximum amount of CO_2 that a country, sub-national entity or firm is permitted to emit over a specified time period.
Carbon intensity	The amount of CO_2 emitted per unit of another indicator associated directly or indirectly with CO_2 emitting activities. The carbon intensity of electricity is the mass of CO_2 emitted per unit of electricity generated by a plant or by the electricity system. The carbon intensity of the economy is the mass of CO_2 emitted per unit of economic output.
Carbon Tax	A tax levied for each tonne of CO_2 or CO_2-eq GHGs emitted by a firm, usually on an annual basis.
Combined-cycle gas turbine	An electric generating technology in which electricity is produced from otherwise lost waste heat exiting from one or more gas (combustion) turbines. The exiting heat is routed to a conventional boiler or to a heat recovery steam generator for utilization by a steam turbine in the production of electricity.
Concessional finance	Below market rate finance provided by major financial institutions, such as development banks and multilateral funds, to developing countries to accelerate development objectives.
Decommissioning	A group of operations that remediate, dismantle, and remove the structures and components of a power station at the end of its working life.
Decarbonisation	Human actions to reduce carbon dioxide emissions from human activities; in practice, involving a transition from energy and other societal systems which emit CO_2, to those which do not, over the medium to long term.
Dispatchable power	Generation capacity that can be dispatched onto the grid at any time at which it is required by the system operator.
Distributed generation	Generation assets that are located close to the particular load that it is intended to serve. General, but non-exclusive, characteristics of these generation assets include: an operating strategy that supports the served load; and interconnection to a distribution or sub-transmission system.
Distributive Justice	The risks and opportunities resulting from the transition must be distributed fairly, cognisant of gender, race, and class inequalities. The burden of transition should not be carried by impacted workers and communities and the costs of adjustment are to be borne by those historically responsible for the problem.

[151] Sources for this Glossary include IPCC's Sixth Assessment Report (2021/2), the US Energy Information Administration, the OECD, the World Bank and the PCC's Just Transition Framework.

Energy poverty	The absence of sufficient choice in accessing adequate, affordable, reliable, high quality, safe and environmentally benign energy services to support economic and human development.
Energy security	The uninterrupted availability of energy sources at affordable prices.
E-fuels	Synthetic fuels produced from hydrogen generated using renewable electricity and a source of CO_2. Unless the CO_2 is sourced from biomass which is sustainably harvested, combustion of e-fuels will still contribute to climate change when combusted.
Feed-in tariff	A price-based incentive mechanism for renewable energies, which grants the producer an "all-inclusive tariff." The payment of this tariff is guaranteed for a period of time linked to the economic life of the relevant renewable project.
Fischer-Tropsch Process	A catalytic chemical reaction in which carbon monoxide (CO) and hydrogen (H2) are converted into a range of hydrocarbons. In south Africa, CO and H2 are produced from coal and natural gas, and the process is used to manufacture synthetic liquid fuels; green H2 and biogenic CO could be used in the same process to produce synthetic fuels without GHG emissions in the manufacturing process.
Green Hydrogen	Hydrogen produced by splitting water into hydrogen and oxygen using renewable electricity.
Grant	Transfers made in cash, goods, or services, for which no repayment is required.
Green bond	Debt security designed to raise funds to support climate-related or environmental projects. These can fund large-scale projects such as green infrastructure, energy efficiency, transit, or renewable power that can be repaid over the long term.
Guarantee	Promise by the guarantor to pay back a borrower's debt if a borrower defaults on a loan. Guarantees can cover all or part of the debt and can be used to de-risk investments for conventional or commercial investors.
Installed capacity	The maximum rated output of installed electricity generating capacity.
Intergovernmental Panel on Climate Change (IPCC)	International body established in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) to assess from time to time the state of current scientific knowledge on anthropogenic climate change, its potential and actual impacts, and measures to mitigate or avoid such impacts.
Inverter	A device that converts direct current (DC) to alternating current (AC).
Just Transition	"A just transition aims to achieve a quality life for all South Africans in the context of increasing the ability to adapt to the adverse impacts of climate, fostering climate resilience and reaching net zero greenhouse gas emissions by 2050 in line with best available science. A Just Transition contributes to the goals of decent work for all, social inclusion and the eradication of poverty. A just transition puts people at the centre of decision making, especially those most impacted, the poor, youth, women, people with disabilities, and the youth – empowering and equipping them for the opportunities of the future. A just transition builds the resilience of the economy and people through affordable, decentralised, diversely owned renewable systems, conservation of natural resources, equitable access of water resources; an environment that is not harmful to one's health and well-being; and sustainable, equitable, inclusive land-use for all, especially for the most vulnerable." Equitably distributing the costs and benefits of climate action.
Load factor	The actual output of one or more electricity plants divided by their theoretical maximum output over a define period.
Load shedding	Intentional action by a utility that results in the reduction of firm customer load for reasons of maintaining the stability and continuity of service of the utility's bulk electric power supply system.
Maturity	The date at which the final repayment of a loan is due; by extension, a measure of the scheduled life of the loan.
Mitigation	A human intervention to reduce emissions of or enhance the absorbtion by sinks of greenhouse gases.

Net zero	Condition in which metric-weighted anthropogenic greenhouse gas (GHG) emissions are balanced by metric-weighted anthropogenic GHG removals over a specified period. If the term is used to refer to non-CO_2 greenhouse gases as well, then the quantification of net zero GHG emissions depends on the GHG emission metric chosen to compare emissions and removals of different gases, as well as the time horizon chosen for that metric.
Open-cycle gas turbine	A plant in which the prime mover is a gas turbine. A gas turbine consists typically of an axial-flow air compressor and one or more combustion chambers where liquid or gaseous fuel is burned, and the hot gases are passed to the turbine and where the hot gases expand drive the generator and are then used to run the compressor.
Paris Agreement	The Paris Agreement is a legally binding international treaty on climate change, under the United Nations Framework Convention on Climate Change. It was adopted by 196 Parties at COP 21 in Paris, on 12 December 2015 and entered into force on 4 November 2016.
Procedural Justice	Those impacted by the transition must be empowered and supported in the transition, with them defining their own development and livelihoods, that is, through procedural fairness including transparency, collaboration, participation, design, and implementation.
Pumped storage	Hydroelectric energy storage used by electric power systems for load balancing.
Readiness	The state of being fully prepared for an action to take place. For the JET IP, readiness for a proposed *capital project* refers to the advanced stage of technical feasibility study approval by the implementing institution just prior to an investment decision by its relevant governing body. Readiness for an *operational project* refers to the implementing institution's committed management capacity to execute.
Repowering	The replacement of generating capacity which has reached the end of its life with new generating capacity on the same site and using the same grid infrastructure and on-site resources, as appropriate.
Restorative Justice	Historical damages against individuals, communities, and the environment must be addressed, with a particular focus on redress: rectifying or ameliorating the situations of harmed or disenfranchised communities environmentally, socially, and economically.
Sink	Any process, activity or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere.
Special Economic Zone	Geographically designated area set aside for specifically targeted economic activities to promote national economic growth and exports.
Technical assistance	The process of providing targeted and expert support for development purposes.
Transmission (electricity)	The movement or transfer of electric energy over an interconnected group of lines and associated equipment between points of supply and points at which it is transformed for delivery to consumers or is delivered to other electric systems. Transmission is considered to end when the energy is transformed for distribution to the consumer.
Transmission System Operator	An entity entrusted with transporting energy in the form of natural gas or electrical power on a national or regional level, using fixed infrastructure.
Unbundling (Eskom)	Separation of the transmission, generation, and distribution functions of the public utility
Utility-scale	A facility, normally 1MW or larger, that generates power and feeds it into local power grids.
Vehicle Parc	The number and type of vehicles in operation in a geographical area.
Wheeling agreement	An agreement between generators, consumers and the owners/operators of the relevant transmission and distribution systems to transmit energy from a generator to an end-user located in another area through the use of existing distribution or transmission networks.

ABBREVIATIONS

AC	Alternating Current
ACT	Accelerating Coal Transition programme (CIF)
AFD	Agence Française de Développement
AfDB	African Development Bank
AFOLU	Agriculture, Forestry and Other Land Use
AMEU	Association of Municipal Electricity Utilities
AML	Anti-Money Laundering
BESS	Battery Energy Storage Systems
BEV	Battery Electric Vehicle
Bn	Billion
BW	Bid Window
CBAM	Carbon Border Adjustment Mechanism
CBO	Community-Based Organisation
CCB	Climate Change Bill
CCGT	Combined-cycle gas turbine
CDP	Christian Democratic Party
CET	Community Education and Training
CIF	Climate Investment Funds
CFT	Combating the Financing of Terrorism
CO_2-eq	Carbon Dioxide equivalent
CoGen	Cogeneration
COP	Conference of the Parties
COSATU	Congress of South African Trade Unions
CSIS	Center for Strategic and International Studies
CSP	Concentrated solar power
CTF	Clean Technology Fund (CIF)
CTL	Coal-To-Liquids
DBSA	Development Bank of Southern Africa
DC	Direct Current
DFFE	Department of Forestry, Fisheries and Environment
DFI	Development Finance Institution
DGM	Dedicated Grant Mechanism
DHET	Department of Higher Education and Training
DMRE	Department of Mineral Resources and Energy
DoE	Department of Energy
DoT	Department of Transport
DSI	Department of Science and Innovation
DSM	Demand-side Management
DTIC	Department of Trade, Industry and Competition
DPME	Department of Planning, Monitoring and Evaluation
EE	Energy efficiency
EPWP	Expanded Public Works Programmes
Eq	Equivalent
ERA	Electricity Regulators Act
ESRG	Energy Systems Research Group
EU	European Union
EV	Electric Vehicle
EVIA	Electric Vehicle Industry Association
FATF	Financial Action Task Force
FBE	Free Basic Electricity
FCEV	Fuel-Cell Electric Vehicle
FSCA	Financial Sector Conduct Authority
GDP	Gross Domestic Product
GEAPP	Global Energy Alliance for People and Planet
GIZ	German Agency for International Cooperation GmbH
GH_2	Green Hydrogen
GHG	Green House Gas
GTS	Green Transport Strategy
$GtCO_2e$	Gigatonnes carbon dioxide equivalent
GW	Gigawatt
H2	Hydrogen
HEV	Hybrid Electric Vehicle
HCV	Heavy Commercial Vehicle
ICE	Internal Combustion Engine
IDC	Industrial Development Corporation
IEA	International Energy Agency

ILO	International Labour Organization
INEP	Integrated National Electrification Programme
IP	Investment Plan
IPCC	Intergovernmental Panel on Climate Change
IPG	International Partners Group
IPP	Independent Power Producer
IRENA	International Renewable Energy Agency
IRP	Integrated Resource Plan
ISA	Infrastructure South Africa
ITUC	International Trade Union Confederation
JET	Just Energy Transition
JETP	Just Energy Transition Partnership
JETP IP	Just Energy Transition Partnership Investment Plan
JSE	Johannesburg Stock Exchange
KfW	Kreditanstalt für Wiederaufbau ("Credit Institute for Reconstruction")
Kg	Kilogramme
Km	Kilometre
Ktpa	Kilotonnes per annum
kW	Kilowatt
LEDS	Low-Emission Development Strategy
LCV	Light Commercial Vehicle
MBT	Mini-bus Taxi
MDB	Multilateral Development Bank
MFMA	Municipal Finance Management Act
Mn	Million
MPG	Mpumalanga Provincial Government
Mt	Megatonne
Mtpa	Megatonnes per annum
MW	Megawatt
MWh	Megawatt-hour
M&E	Monitoring and Evaluation
NAAMSA	National Association of Automobile Manufacturers of South Africa
NBI	National Business Initiative
NCRP	National Climate Response Policy
NDC	Nationally Determined Contribution
NDP	National Development Plan
NEDLAC	National Labour and Development Council
NERSA	National Energy Regulator of South Africa
NEV	New Energy Vehicle
NEVA	National Employment Vulnerability Assessment
NGFS	Network of Central Banks and Supervisors for Greening the Financial System
NGO	Non-Governmental Organisation
NSF	National Skills Fund
OCGT	Open-cycle gas turbine
OECD	Organisation of Economic Cooperation Development
OEM	Original Equipment Manufacturer
PA	Prudential Authority
PARI	Public Affairs Research Institute
PCC	Presidential Climate Commission
PCFTT	Presidential Climate Finance Task team
PGM	Platinum Group Metals
PSET	Post School Education and Training
PV	Photovoltaic
Rbn	Billion Rands
RE	Renewable energy
REDZ	Regional Economic Development Zone
REDIS	Renewable Energy Data and Information Service
REIPPP	Renewable Independent Power Producer Procurement Programme
RMIPPP	Risk Mitigation Independent Power Producer Procurement Programme
RSA	Republic of South Africa
SA	South Africa
SAAM	South African Automotive Master Plan
SAICE	South African Institution of Civil Engineering
SALGA	South African Local Government Association

SAREM	South African Renewable Energy Masterplan
SARB	South African Reserve Bank
SATIM	South African TIMES model
SDG	Sustainable Development Goals
SDZ	Skills Development Zone
SETAs	Sector Education and Training Authorities
SEZ	Special Economic Zone
SJRP	Sector Jobs Resilience Plan
SMME	Small, Medium and Micro Enterprise
SOC	State-Owned Corporation / Company
SSEG	Small-Scale Embedded Generation
SUV	Sports Utility Vehicle
TCO	Total Cost of Ownership
TDP	Transmission Development Plan (ESKOM)
TIPS	Trade and Industrial Policy Strategies (NPO)
TPPs	Thermal Power Plants
TVET	Technical and Vocational Education and Training
UCT	University of Cape Town
UNFCCC	United Nations Framework Convention on Climate Change
VRE	Variable Renewable Energy
V2G	Vehicle-to-Grid
WB	World Bank
ZAR	South African Rand

LIST OF TABLES

LIST OF FIGURES

ANNEXURE A – JET IP CONSULTATIONS

Extensive working knowledge, specialist expertise, and experience exists in South Africa on the subject matters contained in the JET IP. In the process of compiling the JET IP, the Secretariat was therefore able to draw on these sources through desk top analysis, engagements with experts and stakeholders, and during specialised working group round tables. The Secretariat also consulted individually with the DFFE, DMRE, DSI and DTCI. These engagements enabled the preparatory work of the JET IP to be subjected to technical scrutiny by experts in the respective fields, and their feedback and further inputs were used in subsequent drafting updates to the JET IP.

In addition, the PCFTT convened a series of stakeholder constituency consultation sessions, which were facilitated by the PCC, and which provided valuable inputs to the preparation of the JET IP.

The following tables summarise the consultations that took place in August and September 2022.

Table 32. Secretariat Working Groups' round tables

Secretariat Working Groups' Round			
Date	Expert focus	Number of participant experts	Experts' sites of work
23-Aug	Electricity decarbonisation	49	Universities, Research institutes, NGOs, SOCs, local and international DFIs, MDBs, Government departments, Municipalities, Business associations, listed companies, small and medium-enterprises, Industry associations.
24-Aug	Just Transition	54	
29-Aug	GH_2	36	
30-Aug	IPG financing agreements finalised	40	
5-Sep	NEVs	29	

Table 33. Constituency consultations

PCFTT Constituency consultations facilitated by the PCC	
Date	Constituency
10-Aug	Youth
19-Aug	Business
26-Aug	Civil Society
26-Aug	Labour
9-Sep	Local Government

Table 34. Summaries of issues raised in PCFTT's constituency consultations

Date	Theme	Contributions
Youth	Intent and objectives	• JET is important and youth are passionate about its outcome.
	Transparency & accountability	• A mechanism is needed to hold the IPG accountable to its financial obligations. • A high degree of transparency is required, as PCFTT develops the investment plan.
	Methodology	• Marginalised parties, youth in rural communities, and communities immediately at risk in the transition should be involved in the engagement plan.
	Proposed investments	• Skills development and education (both basic and higher) should be equipping school leavers for the jobs of the future.
	Structure of the financial offers	• The financing mix (grants versus concessional), terms (maturity, penalties, interest rate, and IPG conditions), socioeconomic effects, and workflows / timelines are important considerations.
	Policy	• The policy should be set up to protect the integrity of the funds and prevent misappropriation.
	Just transition	• Gender, race, and class inequalities must be addressed. • Principles of restorative, procedural, and distributive justice should be used.
	Implementation	• Youth engagement is important throughout implementation – follow-up consultation plans should be incorporated into the investment plan.
Business	Intent and objectives	• JET has the potential to drive significant economic transformation and industrial development for South Africa.
	Transparency & accountability	• Fund transparency should be prioritised (for example, how to access, how much is available, where it is available from, and the associated risks).
	Methodology	• The quality of consultations could be improved by sharing the investment plan ahead of the engagements.
	Proposed investments	• Grid modernisation should be prioritised as a first step. • Additional sectors outside of those mentioned should be investigated (for example, green steel and green ammonia).
	Structure of the financial offers	• The cost of capital should be minimised to ensure that the funding is more cost-effective than other funding sources.
	Policy	• The policy should be enabling for the transition (for example, harmonised transport regulatory standards across provinces, OEM incentivisation, reduced delays at the port of entry, and revised carbon taxes).
	Just transition	• Seed funding and early capital should be made available for SMMEs.
	Implementation	• Skills building and transfer with a detailed skills and talent pipeline.

Date	Theme	Contributions
Labour	Intent and objectives	• Passionate about the case for change
	Transparency & accountability	• A list of names in the working groups should be shared. • Details of the investment plan are needed for further engagement. • A formal engagement platform should be created.
	Methodology	• The JETP connection to the overall SA climate strategy should be clear.
	Proposed investments	• Funds should go towards bottom-up efforts (community-based initiatives).
	Structure of the financial offers	• IPG should have limited control over fund allocations – this should be driven by South Africa only.
	Policy	• Sector privatisation and the impact of the liberalisation of the energy sector should be properly investigated and noted as a risk.
	Just transition	• Labour migration should be addressed. • Renewables projects should be community-owned.
	Implementation	• The technical readiness of Eskom's project pipeline should be assessed before implementation. • An accountability mechanism should be included.
Civil Society	Intent and objectives	• Civil Society is supportive of JET overall, but requires more details.
	Transparency & accountability	• Proper engagement is not possible without seeing a draft of the investment plan's priority investments and the balance between sectors should be clear.
	Methodology	• The investment plan should be aligned closely with the other investment plans of the public / Eskom. • Eskom and the state will play a central role – the privatisation of the electricity sector will diminish the power of the state for successful JET execution.
	Proposed investments	• New manufacturing jobs should be a key focus. • The electricity crisis and Eskom's debt crisis should be addressed through the investment plan.
	Structure of the financial offers	• If loans are not ZAR-denominated, currency exposure risks need to be considered. • Details on conditions are required for further engagement – especially with regards to the size of the grant versus concessionary funding.
	Policy	• N/A
	Just transition	• Specific conditions should be built in (for example, the onshoring and the employment of ex-coal workers only). • Equitable access to energy and the distribution of renewables must be a focus.
	Implementation	• The international community is better at execution than us; we should use the IPG to learn valuable implementation lessons.

Date	Theme	Contributions
Local Government	Intent and objectives	• Eager constituency group that arrived, prepared with proposals, recommendations, and collated feedback from internal sessions hosted.
	Transparency & accountability	• Proposal for commitment to a more transparent consultation process.
	Methodology	• SALGA personnel, working specifically on supporting the JETP, should be financed by the process. • Capital should be mobilised with a dedicated bid window. • Partnerships with the private sector should be explored for risk sharing.
	Proposed investments	• Proposed projects include upgrades and expansions of distribution network, the development of small- and large-scale embedded generation, the updating of the municipal masterplan and pricing strategy, and the creation of new electricity capacity procurement models.
	Structure of the financial offers	• Foreign currency denomination of the loans should be limited to mitigate currency risk • Municipalities that do not have a good balance sheet should still be included.
	Policy	• IPP contracts should be structured to ensure that benefits are realised and owned by people.
	Just transition	• Rural districts should be included and kept at the forefront of conversations. • Energy poverty eradication should be at the core of the plan.
	Implementation	• Efforts related to the just transition should be well-coordinated throughout the whole country across all organisations and stakeholders.

ANNEXURE B – ELECTRICITY SECTOR MODELLING ASSUMPTIONS AND TECHNICAL ANALYSIS, AND ESKOM JET PROJECT PIPELINE

OVERVIEW

This Annexure provides a detailed description of the key assumptions, methodology and results of the analysis of the investment requirements for implementation of South Africa's 2030 NDC mitigation target referred to above.

KEY QUESTIONS TO BE ADDRESSED IN THE ANALYSIS

The Political Declaration, made at COP 26 by South Africa, the European Union, the United States, United Kingdom, France, and Germany sets out a process for providing support to South Africa's just transition, and the implementation of South Africa's NDC and low-emissions development strategy, "*...to achieve the most ambitious target possible within South Africa's Nationally Determined Contribution range to the extent of available resources".* The objective of the analysis is therefore to assess options for implementation of the NDC which would result in an ambitious outcome in 2030 and contribute to the assessment of the level of support which would be needed (an "ambitious outcome" is defined as 350-375 Mt CO_2-eq in 2030), within the context of existing policies and measures.

METHODOLOGY

Analysis of the investment requirements for the electricity sector in the context of South Africa's 2030 NDC target was undertaken using the SATIMGE modelling framework. The modelling framework consists of the South African TIMES (SATIM) model – an economy-wide partial equilibrium linear optimisation model built on the TIMES platform, which was developed and is maintained by the Energy Systems Research Group (ESRG) at the University of Cape Town: the Energy-South African General Equilibrium (ESAGE) model, a Computable General Equilibrium model of the South African economy which has more granularity in the energy sector; and two spreadsheet-based models of the waste and agriculture and land use sectors, to cover all GHG emissions sources in the South African economy. The model components are hard-linked to ensure coherence and consistency for scenario modelling. SATIMGE was used by the ESRG for the technical analysis which supported DFFE's NDC update process in 2020-2021. In this case, due to time constraints, the CGE component was not run, but the sectoral and subsectoral economic growth paths, used in SATIM and the waste / agriculture, forestry and other land use (AFOLU) components of SATIMGE, are consistent with ESAGE projections. The modelling methodology in this case is based on three previous sets of analyses which provided technical support to the DFFE in updating South Africa's NDC in 2020/21, and initial analysis of long-term low-emissions development pathways towards net zero CO_2 emissions around 2050.

A central feature of the SATIMGE modelling framework is that because sectors in the economy are modelled on one integrated platform, complex interactions between sectors are captured effectively, and the demand for energy carriers is determined endogenously on the basis of major drivers such as population and economic growth, and as a result of sectoral interactions. The energy component of the model specifies a demand for energy services, which is translated via demand-side technologies selected on the basis of system cost and user-determined constraints into a demand for energy carriers and the investment requirements associate with these. This includes electricity demand.

In this case, 65 separate cases were modelled, with variations in key policy-relevant characteristics, based on existing mitigation-relevant policies and measures, the GHG profile of the key sectors of the economy, and available mitigation options within a timeframe to 2030 and beyond.

SOUTH AFRICA'S 2030 NDC MITIGATION TARGET

South Africa's 2030 mitigation target consists in ensuring that national GHG emissions are within the range 350 to 420 Mt CO_2-eq. The NDC also specifies that the target will be accounted for as follows:

- All GHG categories, sectors and sources which are currently estimated in the national GHG inventory will be accounted for against the target range, except for the land use sector;
- GHG sources and sinks in the land sector will be accounted for using a GHG inventory-based approach, and emissions from natural disturbances will NOT be accounted for against the NDC target;
- The target will be accounted for using IPCC 2006 GHG inventory guidelines, with categories from the 2019 Refinement if not available in the 2006 guidelines, and global warming potential values used will be those from the IPCC's Fifth Assessment Report (AR5), as specified in decision 18/CMA.1.

The same accounting approach has been used in this analysis, to ensure comparability, with the exception of the land sector – estimates for natural disturbances have been included in accounting for national GHG emissions in the modelling framework, based on historical averages.[152]

SOUTH AFRICA'S LONG-TERM MITIGATION GOALS

South Africa expressed an aspirational net zero CO_2 by 2050 in its low emissions development strategy communicated to the UNFCCC in 2020; this was more recently affirmed in the Presidential Climate Commission's Just Transition Framework, recently approved by Cabinet. In addition to this, it is a cornerstone of South Africa's climate policy that South Africa make a "fair contribution" to the

global mitigation effort. This has been represented in the current modelling framework via two characteristics of GHG emissions pathways; namely the inclusion of a net zero CO_2 goal, and also the inclusion of an overall GHG budget over the period 2021-2050, estimated from international mitigation burden-sharing literature, and taking into account the key principles of the UNFCCC and the Paris Agreement concerning "common but differentiated responsibilities and respective capabilities" of developed and developing countries, in "the light of national circumstances". Pathways modelled for this analysis feature a net zero CO_2 goal in 2050, and an overall GHG emissions budget over the period 2021-50 of 7.8-8.5 Mt CO_2-eq.[153]

Modelling a long-term GHG emissions constraint to achieve a medium-term GHG emissions constraint has many methodological advantages compared to approaches which cap GHG emissions at a certain point (for instance, 2030). Imposing a GHG emissions cap for a single year in an optimization modelling framework such as TIMES usually results in solutions which are implausible, and do not meet many other policy goals (for instance, swapping out coal plants for diesel plant for a single year). Imposing a GHG emissions constraint for a number of years to overcome this problem usually results in a suboptimal economic outcome.

Using a set of long-term budget constraints on the other hand takes advantage of the model's perfect foresight to allocate mitigation measures over a long time period in the most economically efficient way, taking into account existing infrastructure and other national circumstances. Since there is a near-linear relationship between cumulative CO_2 emissions and temperature increase which is relatively insensitive to when the CO_2 emissions occur, a long-term budget is also consistent with the science of climate change. Moreover, this approach also achieves consistency between medium-term mitigation objectives and long-term decarbonisation objectives.

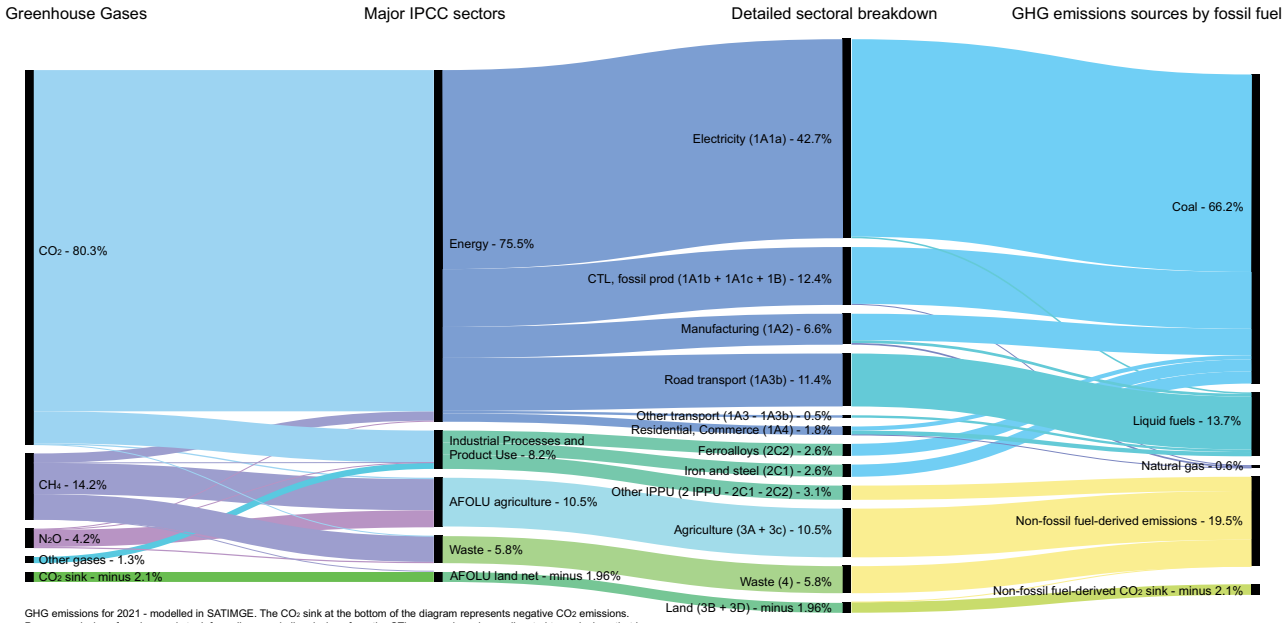
[152] More information on the estimated impact of including / excluding GHG emissions from natural disturbances (mostly wildfires in the South African context) can be found in Marquard et al., 2021a. The average impact of their exclusion is around 10 Mt.

[153] For a discussion of equity in the context of mitigation with reference to the NDC, see Winkler et al., 2021.

SOUTH AFRICA'S GHG EMISSIONS AND MITIGATION OPTIONS TO 2030

South African GHG emissions are dominated by CO_2, by energy emissions and specifically the electricity sector, and two thirds of emissions are as a result of the combustion or other uses of coal.

Figure 13. South Africa's current (2021) GHG emissions, classified by GHG, IPCC sectors, major emissions categories, and sources by fossil fuel



Source: *JETP-IP Secretariat, 2022*

The electricity sector alone is responsible for 43% of emissions, followed by the liquid fuels manufacturing process (mainly coal-to-liquids (CTL)) at 12%, and road transport at 11%. Options for mitigation in these and other sectors, as well as the relevant policy contexts, are as follows:

- Electricity. The economics of electricity supply technology have changed fundamentally in the last ten years – whereas coal power produced by very large plants, often on top of coal mines, was for decades the cheapest source of electricity in South Africa, this is no longer the case – a combination of wind and solar power with appropriate storage or dispatchable power is now the cheapest option for new capacity in the sector, and the same time, Eskom's ageing coal fleet is set to retire over the next three decades. The key question is how fast this transition occurs, what the costs and benefits are of accelerating this transition, and what measures need to be taken to both maximise the development benefits of the transition and minimize the potentially disruptive impact on communities and workers in relevant sectors.

- On the demand side, energy efficiency programmes have the potential to significantly reduce the costs of the transition and create employment. Policies are already in place to drive this transformation in the form of the IRP 2019; government is currently finalizing the post 2015 National Energy Efficiency Strategy (NEES).
- Liquid fuels manufacturing. Almost all the GHG emissions in this sector are produced by the production of liquid fuels from coal at Sasol's Secunda plant. Sasol announced publicly that GHG emissions from its South African operations would be reduced by 10% from current levels, and a year later, announced that GHG emissions would be reduced by 30%. Up to 2030, this is the second largest mitigation option after the electricity sector.
- Other industries, including iron and steel, ferroalloys, chemicals, cement, and other process emissions. While there is significant scope for energy efficiency in these sectors and longer-term programmes to phase down and phase out artificial GHGs, many of these subsectors, including cement and minerals processing are "hard to abate" sectors in which there are currently no mitigation options, options which have not been commercialised (for instance, green iron production using hydrogen), or where mitigation options are prohibitively expensive (for instance, carbon capture and storage (CCS).
- Transport. The main sources of GHG emissions in the transport sector is the use of fossil-derived liquid fuels for road transport. Mitigation options include shifting from ICEs to electric or hybrid vehicles, biofuels, and shifting from road to rail (freight) and from private passenger vehicles to public transport, and finally the use of green hydrogen in combination with fuel cells. On the supply side government is developing an industrial policy to manufacture hybrid and electric vehicles for the domestic market and for export. The key economic uncertainty is at what point EVs will become cost-competitive or more economical than ICE vehicles. The provision of safe and effective public transport is also a development imperative. On the demand side, government has developed a Green Transport Strategy (GTS) which includes shifting to zero-emissions vehicles and modal shifts in the freight and passenger sectors.
- Agriculture, land use emissions and sinks, and waste. In these sectors, mitigation policy is still being developed and is unlikely to have a significant impact on GHG emissions up to 2030, although mitigation post 2030 is key to achieving South Africa's long-term goal of net zero CO_2 around 2050.

Based on existing studies on mitigation to 2030 and beyond (Marquard et al. 2021a, 2021b), the key mitigation options identified by sector are described below.

ELECTRICITY SECTOR

SATIMGE contains a wide range of technology options for electricity supply, the characteristics of which are contained in the parameters section below. Four options were identified and modelled, as presented below:

Table 35. Four scenarios for investment in the electricity supply sector to 2030.

Scenario	Technology	2022	2023	2024	2025	2026	2027	2028	2029	2030
E0 – no constraints	No lower limits	–	–	–	–	–	–	–	–	–
E1 – large-scale RE investment	Wind	0	0	1 600	4 100	4 200	3 200	3 200	3 200	3 200
	Utility-scale PV	0	0	1 500	3 500	3 500	2 000	2 000	2 000	2 000
	Distributed PV	500	500	500	1 000	1 000	500	500	500	500
	Battery storage	0	0	513	0	0	450	150	1 575	0
E2 – moderate RE investment	Wind	0	0	1 600	4 100	3 500	2 500	2 500	2 500	2 500
	Utility-scale PV	0	0	1 500	3 500	3 000	1 500	1 500	1 500	1 500
	Distributed PV	500	500	500	1 000	1 000	500	500	500	500
	Battery storage	0	0	513	0	0	450	150	1 575	0
E3 – IRP-based RE investment	Wind	0	0	1 600	4 100	3 400	2 400	1 600	1 600	1 600
	Utility-scale PV	0	0	1 500	3 500	2 500	0	1 000	0	1 000
	Distributed PV	500	500	500	1 000	1 000	500	500	500	500
	Battery storage	0	0	513	0	0	450	150	1 575	0

Units are MW of new capacity, assumed to begin commercial operation at the beginning of the relevant year. These are minimum levels of new capacity for each technology – in other words, the new capacity for each year will be >= the capacity specified for that year.

Source: *JETP-IP Secretariat, 2022*

Committed capacity, including the final units of Medupi and Kusile, the remaining projects from REIPPP bid windows 1-4, bid windows 5 and 6 and Eskom's and other project pipelines are included in all scenarios. Scenario E0 has no constraints, and the model will meet demand in the most cost-effective way, based on the existing stock of generation capacity and the available technology options. This scenario results in new capacity consisting primarily of wind, PV, gas (OCGT/CCGT), and battery storage. The battery storage capacity proposed in the IRP is also included in all scenarios, as is 750 MW of power imported from the region during this period. On this basis, the other three scenarios were designed based on the policy requirement of localising the RE value chain by specifying a minimum amount of additional capacity per year to create certainty for investors. For all scenarios, these are minimum new capacity additions. The model will add other

capacities, including additional gas, battery storage, and other technologies, as required for system stability and to meet demand. Aside from these constraints, the model finds a least-cost solution.

Scenario E1 requires a large-scale (a minimum of 3 200 MW of wind and 2 500 of solar PV per year) investment in renewable energy. Scenario E2 requires a more moderate programme (2 500 MW of wind and 2 000 of PV), and Scenario E3 is based on the renewable energy capacity in the IRP 2019. The same minimum total capacity of wind and solar PV is achieved by 2030 by E3 and the IRP 2019; however, because the current procurement of new capacity is behind schedule, some of the capacity is compressed into the earlier years.

LIQUID FUELS SECTOR

Two options are modelled for GHG emissions from the CTL process: one in which emissions are reduced by 10% by 2030, and another in which emissions are reduced by 30%, corresponding to Sasol's sequential commitments to reduce emissions.

ROAD TRANSPORT

Since road transport comprises 96%[154] of overall transport emissions, and since there are currently limited mitigation options for aviation and shipping, this analysis is focused on road transport only. Six scenarios were modelled for the road transport sector based on variations in the year in which electric and/or hybrid vehicles achieve capital cost parity with internal combustion engine vehicles (three scenarios), or on a target number of electric vehicles in the overall vehicle population (one scenario), or on an industrialization strategy for local manufacture of EVs (two scenarios), as presented below. In addition, a scenario in which the multiple measures contained in the GTS, are implemented, including modal shifts, is modelled with these scenarios. The GTS has been implemented in the model in a package of demand-side policies and measures, which are described in more detail overleaf.

[154] This figure accounts for domestic aviation and maritime GHG emissions only – in other words, it excludes GHG emissions from ships planes that arrive in South Africa from elsewhere or depart from South Africa for another country, in accordance with the IPCC 2006 guidelines. This is the basis on which South Africa's NDC targets will be accounted for.

Table 36. Scenarios for the uptake of electric vehicles; annual figures are 1 000s of new EVs per year.

Scenario	Year of cost parity	Vehicle type (all EVs)	2023	2024	2025	2026	2027	2028	2029	2030
T0	2030	Model finds least-cost solution based on the relative costs of different transport technologies.								
T1	2027	Model finds least-cost solution based on the relative costs of different transport technologies.								
T2	After 2030	Model finds least-cost solution based on the relative costs of different transport technologies.								
T3 – based on the IDC's EV industrialisation strategy, aimed at both national and international markets	2030	Bus	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.3
		Car	32.2	64.3	96.5	128.7	160.9	160.9	160.9	160.9
		LCV	0.4	0.8	1.1	1.5	1.9	1.9	1.9	1.9
		Minibus taxi	0.4	0.7	1.1	1.5	1.5	1.5	1.5	1.5
		SUV	8.0	16.1	24.1	32.2	40.2	40.2	40.2	40.2
		Scooter	6.6	13.1	19.7	26.2	32.8	39.3	45.9	52.4
T4 - based on the IDC's EV industrialisation strategy, aimed at the international market, with limited national uptake	2030	Bus	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
		Car	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		LCV	0.2	0.4	0.6	0.7	0.9	0.9	0.9	0.9
		Minibus taxi	0.2	0.4	0.6	0.8	0.8	0.8	0.8	0.8
		SUV	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Scooter	3.9	7.8	11.7	15.6	19.5	23.4	27.3	31.2
T5 – one million EVs in the vehicle population by 2030	2030	Bus	0.1	0.1	0.1	0.2	0.3	0.6	1.0	1.8
		Car	12.0	9.0	15.7	27.4	47.9	83.8	146.5	256.1
		LCV	4.6	3.4	6.0	10.5	18.4	32.1	56.2	98.3
		Minibus taxi	0.6	0.5	0.8	1.4	2.5	4.4	7.6	13.3
		Scooter	0.6	0.4	0.8	1.3	2.3	4.0	7.0	12.3
		SUV	2.2	1.6	2.8	5.0	8.7	15.2	26.5	46.4

Source: *JETP-IP Secretariat, 2022*

NATURAL GAS UTILISATION

Currently, in almost all electricity systems in which there is a significant level of uptake of renewable energy, gas turbines (open or combined cycle) play a valuable role in supporting the grid at times at which either solar or wind power is unavailable. There are several non-fossil fuel options which can also play this role, such as utility-scale battery storage, pumped storage, or hydro plants, and in future large-scale hydrogen fuel cells and/or gas turbines.

Given the sensitivity currently attached to investing in gas infrastructure, two variations were modelled: one without any restrictions on the uptake of gas power (G0) and the other in which any gas-fuelled generating capacity can only come online from 2031 onwards (G1). The model still has the option of choosing liquid fuels-based generation (diesel) similar to the existing peaking plants in the country. Although diesel is still a fossil fuel, there is less risk of future-stranded assets, given the very significant difference in infrastructure requirements between natural gas (probably in the form of liquified natural gas (LNG)) and diesel.

LONG-TERM GHG EMISSIONS CONSTRAINT AND LONG-TERM NET ZERO CO_2 GOAL

As discussed above, almost all modelled cases in this analysis have an associated cumulative GHG emissions budget from 2021 to 2050, which is correlated to South Africa's "fair share" of the remaining GHG emissions space related to the long-term temperature goal of the Paris Agreement. The effect of using this approach also ensures consistency between medium-term (NDC) goals and long-term goals. Three variants of GHG budgets were modelled – 8.5 Gt CO_2-eq, 8 Gt CO_2-eq, and 7.8 Gt CO_2-eq, coupled with a long-term goal of reaching net zero CO_2 emissions in 2050.

DEMAND-SIDE POLICIES AND MEASURES

Two additional scenarios were modelled which include the energy efficiency targets contained in the draft post-2015 NEES and the GTS.

The GTS (DoT 2018) consists of a number of long-term qualitative goals and a number of very ambitious quantified short-term goals. These have been implemented conservatively in the current analysis as follows:

- A shift from road to rail for corridor freight transport. By 2030, the rail share of corridor freight transport will be 30%, and by 2050, 50%.
- A shift from private to passenger transport. A 20% relative shift to public transport by 2030.
- Alternative vehicles. A minimum of 10% of the vehicle population will comprise EVs and hybrid vehicles by 2030, reaching 40% by 2050.

- Minibus conversion to bifuel (compressed natural gas (CNG) / petrol) vehicles. 10% of the minibus taxi fleet will be converted to be bifuelled by 2030, reaching 40% by 2050.
- Metrobus to gas. 10% of the municipal bus fleet will be converted to gas by 2030, reaching 30% by 2050.

The GTS also contains references to biofuels – 2% blending with petrol and 5% blending with diesel by 2030 have also been included in the Planned policies scenario.

Energy efficiency measures modelled in the Planned policies scenario are, in the absence of a finalised energy efficiency policy and/or strategy, based on the draft post-2015 NEES (DoE 2016), which proposes sectoral targets for 2030. These are included as follows:

- Residential. A 30% improvement in the efficiency of household energy appliances by 2030, and a 20% improvement in the energy efficiency of residential buildings is achieved by 2030.
- Commercial. A 37% reduction in energy intensity in commercial buildings, including government buildings, by 2030.
- Mining. The 40 petajoules (PJ) savings identified by the NEES translates into a 4% energy savings by 2030.
- Manufacturing. 35% improvement in energy efficiency in all applications other than furnaces and kilns, which improve by 5%, by 2030.

These measures were modelled in combination with the other scenarios above.

KEY PARAMETERS, ASSUMPTIONS AND OUTPUTS

Key parameters and assumptions are listed below, including some results such as electricity demand, which are key inputs to other modelling frameworks, for comparison.

DISCOUNT RATE, ECONOMIC GROWTH RATE, AND EXOGENOUS ENERGY PRICES

SATIMGE uses a universal discount rate of 8.2%. The economy is assumed to have recovered to 2019 levels after the COVID driven recession in 2023, and to grow at around 2% per year thereafter, with higher growth rates after 2030. International oil and gas prices are derived from the International Energy Agency's *World Energy Outlook's* Sustainable Development Scenario for 2020: the oil price is assumed to be around 84 US$/bbl in 2020, declining to 50 US$ in 2050, and the international LNG price follows a similar trajectory, beginning at R84/GJ in 2020 and declining to R74 in 2050 (in 2015 Rands).

POWER PLANT CHARACTERISTICS

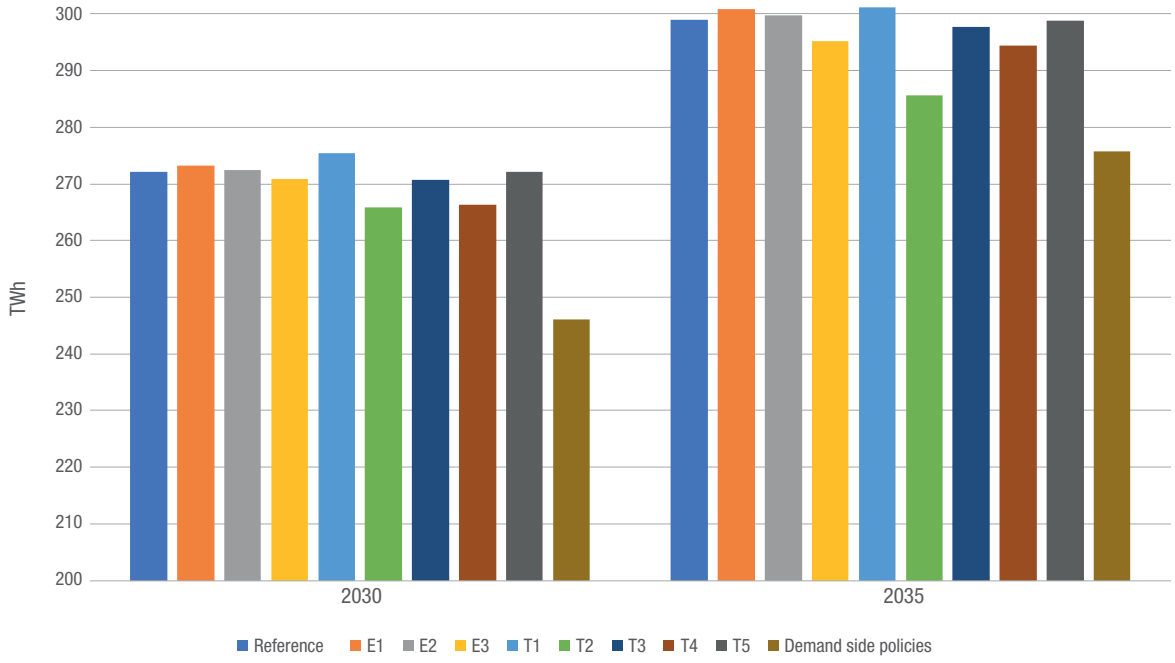
The characteristics of both new and existing power plants are presented in Table 37.

RESULTS

This section will primarily focus on the electricity sector.

ELECTRICITY DEMAND

Figure 14. Electricity demand for selected scenarios for 2030 and 2035



Source: *JETP-IP Secretariat, 2022*

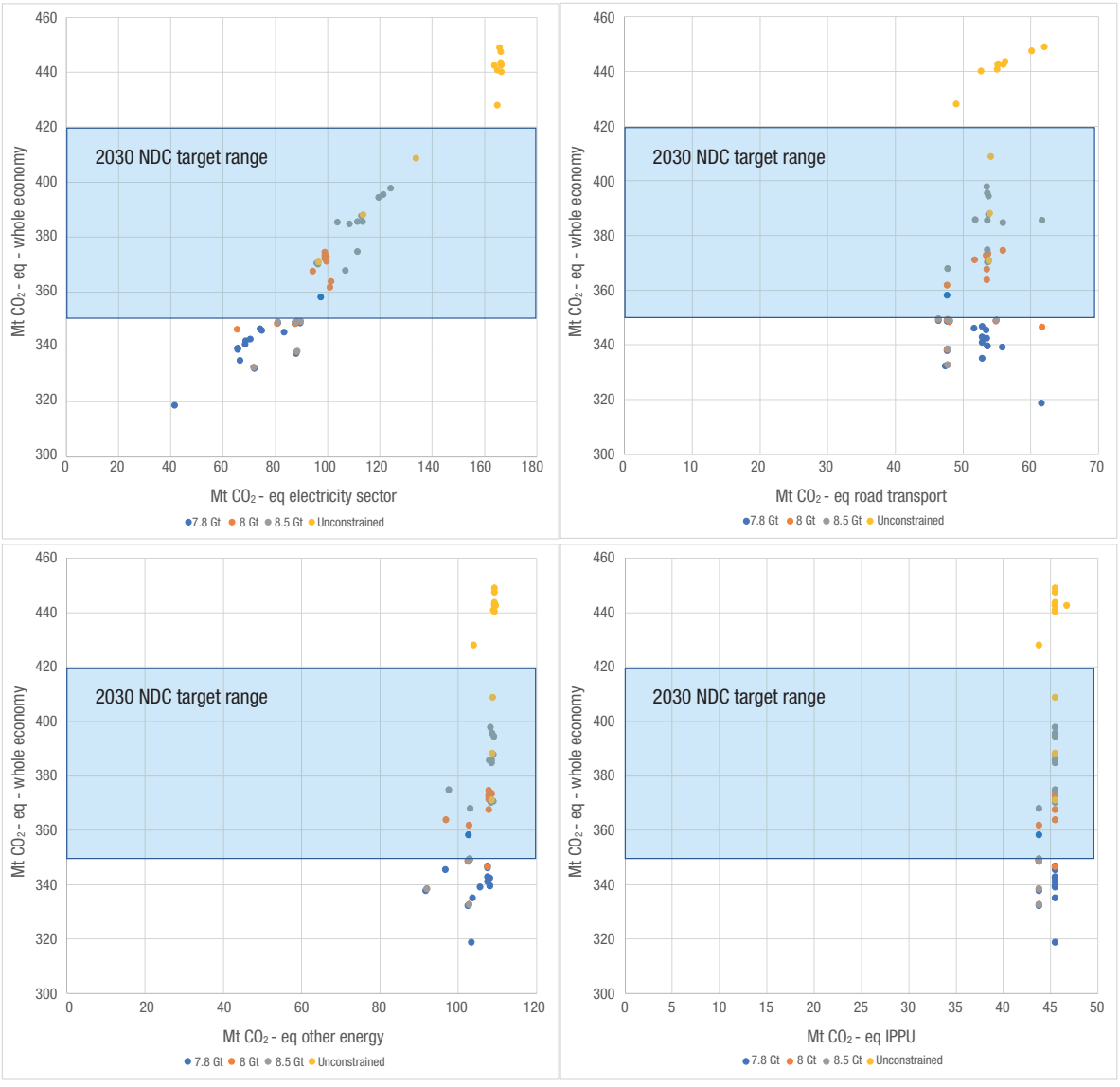
Figure 14 presents electricity demand for individual scenarios for electricity and transport. The reference demand is a least-cost case with no constraints, and in which it is assumed that cost parity is reached by 2030. There is a small impact on electricity demand from the different electricity scenarios, but the most significant differences are driven by either a faster uptake of electric vehicles or the implementation of demand-side policies in both transport and in the industrial, commercial, and residential sectors.

GHG EMISSIONS

All 65 cases in various combinations of the scenarios described above are presented in Figure 15, with varying GHG emissions constraint over the 2021-2050 period, which in combination with different scenarios for the electricity, transport, and liquid fuels sectors, (including an unconstrained scenario for each GHG emissions budget) and for demand-side measures, results in a GHG emissions range for the economy in 2030 from 450 Mt CO_2-eq (above the NDC range) to below 320 Mt CO_2-eq (below the NDC range). The top left figure plots economy-wide emissions against electricity sector emissions, and illustrates am almost linear response by the model in the electricity sector

to GHG emissions constraints over a very wide range; but this is a little misleading since there are only three GHG constraints; the electricity sector also responds clearly to three other key elements; the one is the speed of electrification of transport, which increases demand to 2030 and /or beyond; the second is the impact of energy efficiency measures, which decrease demand, and the third is the result of mitigation in other sectors, specifically the liquid fuels sector, which results in a GHG constrained scenario gives the electricity sector more emissions space up to 2030. By comparison, the transport sector responds over a much smaller range, and the impact of the policy scenarios is much greater than the very small response to more constrained GHG emissions budgets. The response of the remaining energy emissions in the economy is far narrower, and there is even less response from industrial processes and products use (IPPU) emissions: the only response is on account of demand-side policies being added to the GHG emissions constraint. The difference in response indicates both the differences in mitigation costs up to 2030 and the availability of technology options.

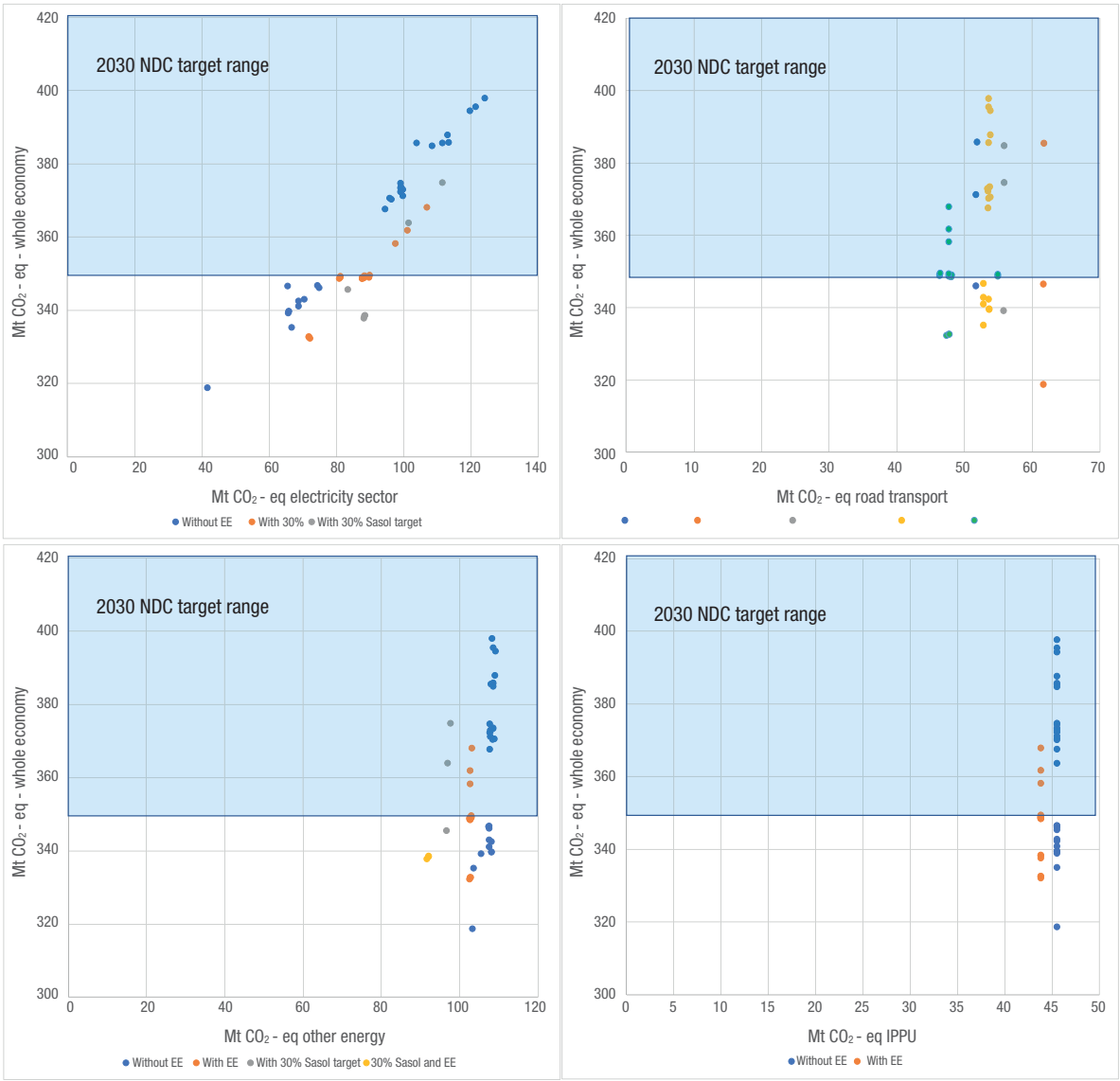
Figure 15. GHG emissions for the whole economy and by sector in 2030, categorised by GHG constraints.



Source: *JETP-IP Secretariat, 2022*

Figure 16 uses the same data, but without the unconstrained cases, and it is classified in relation to the key variables which affect the GHG emissions outcome for each sector. In the case of the electricity sector, by separating out cases which feature energy efficiency measures and greater mitigation in the liquid fuels sector, it is evident that the linear response takes place in three different trajectories – one without EE, one with EE, and one with what is effectively a larger GHG emissions budget because of mitigating elsewhere. For road transport emissions in the figure on the top right, cases have been categorized into the different transport scenarios, which are the dominant driver of GHG emissions outcomes in the sector rather than the GHG emissions constraint. The point at which EVs reach cost parity with ICE vehicles effectively drives the outcome; the IDC industrialization strategy is slightly more conservative than the model, and both are based on cost parity being reached in 2030. The details of the strategy indicate the level of effort and investment which will be required by South Africa to achieve this.

Figure 16. GHG emissions for the whole economy and specific sectors, categorised by whether demand-side policies have been included. Unconstrained cases are not shown; the remaining cases are consistent with a long-term pathway to net zero CO_2 emissions in 2050.



Source: *JETP-IP Secretariat, 2022*

Other energy emissions respond mainly to EE measures and as a result of the scenario with 30% mitigation in the liquid fuels sector (the emissions of which are included in this figure). IPPU emissions respond only marginally to EE measures. The response to EE measures by the electricity and transport sectors, and the rest of the energy systems is presented in Figure 17. While such measures unequivocally result in mitigation in the rest of the energy system, electricity sector emissions change in a more complex way (which sometimes results in higher emissions from the electricity sector), as a result of the interaction between the cost of mitigation in the sector and the availability of additional carbon space.

Figure 17. GHG mitigation as a result of imposing EE measures, per sector, as the difference between pairs of cases which only vary in the addition of EE measures that include modal shifting in the transport sector

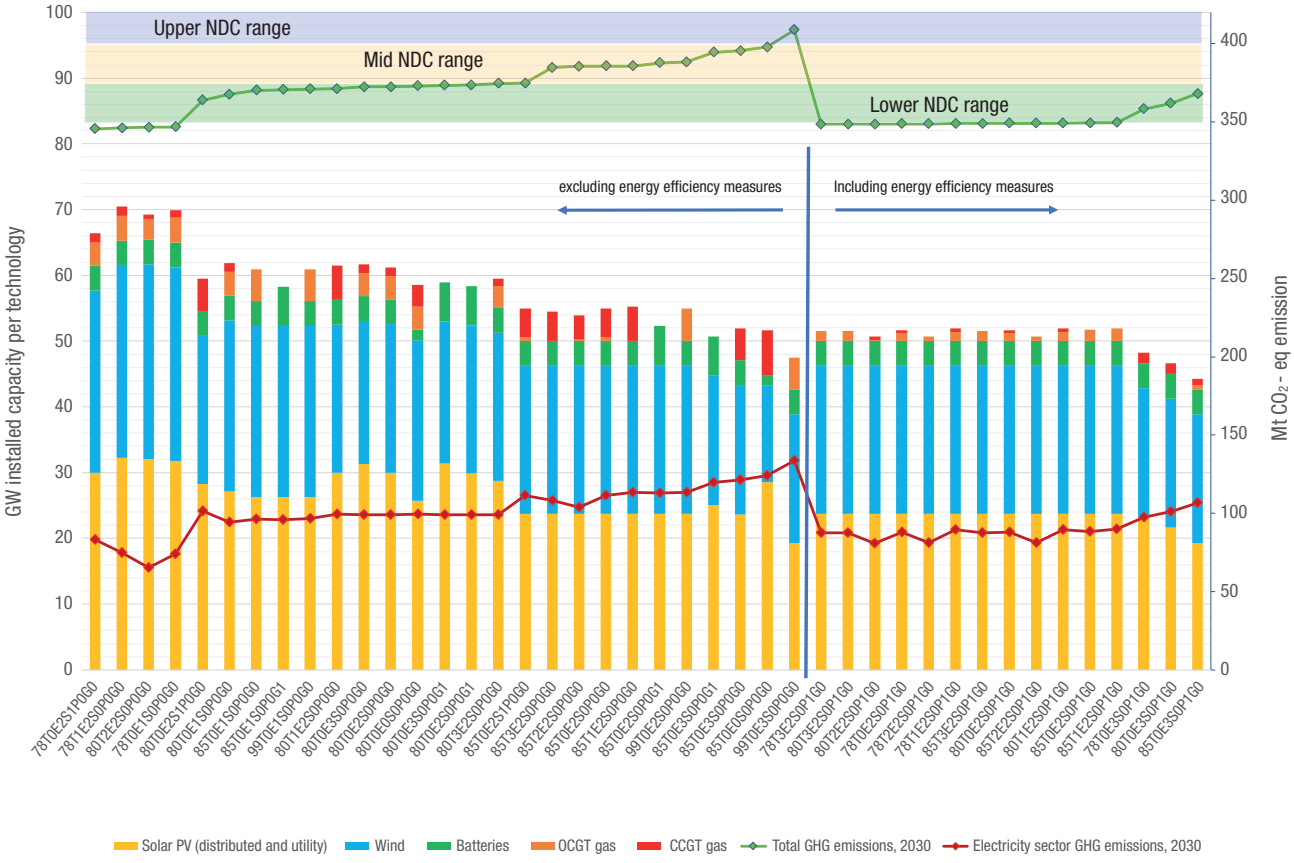
Source: *JETP-IP Secretariat, 2022*

The three key sectors to focus on in terms of South Africa's NDC target are thus the electricity sector, the road transport sector and the liquid fuels sector. Relatively little is known about how GHG emissions will be reduced in the liquid fuels sector by 30%; it has been assumed here that this will result from a combination of replacing a proportion of onsite coal-fired utilities with renewable energy, and improving the efficiency of the overall process, which could involve further use of natural gas or green hydrogen.

MITIGATION IN THE ELECTRICITY SECTOR

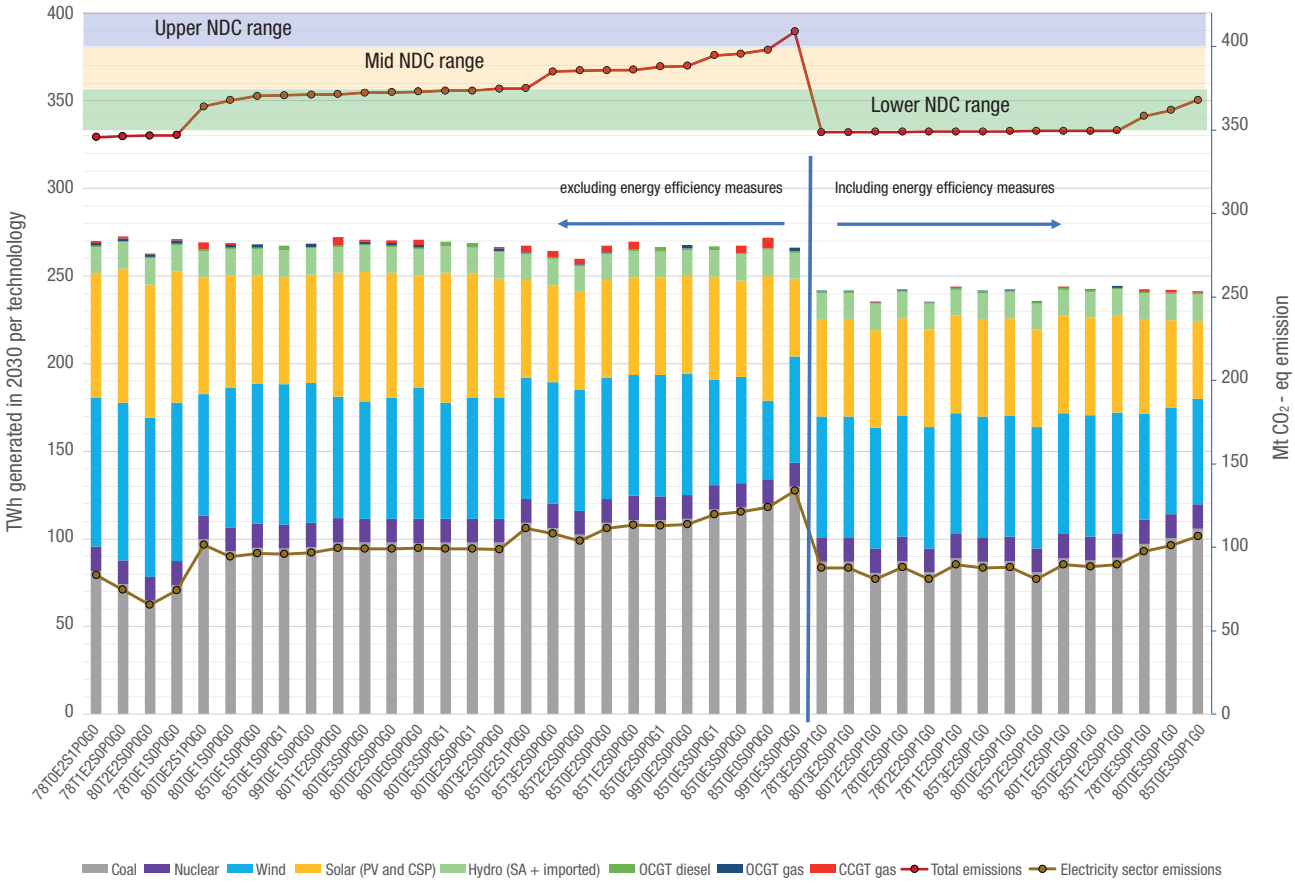
Since emissions in the electricity sector are almost entirely generated by the combustion of coal, GHG emissions reduction will require burning less coal. GHG emission reductions aimed at achieving an ambitious outcome in 2030, in relation to the NDC target range, cannot be solely achieved within the time frame through the retirement of part of the coal fleet up to 2030; in addition, the key determinant of GHG emissions in 2030 will be the annual load factor of Eskom's coal fleet. The range of GHG emissions outcomes in 2025, 2030 and 2035 in relation to the average load factor is presented in Figure 20. The extent to which the fleet output can be curtailed while ensuring energy security is dependent on procuring the requisite low- or zero carbon capacity. Figure 18 and Figure 19 present the additional capacity that will be required to achieve a specific GHG emissions outcome in 2030. The ranges of wind and PV capacities, which will be required to either reach the lower part of the NDC range (350-375), or the bottom of the range (345-355) in 2030, is presented in Figure 21.

Figure 18. Installed capacity for selected technologies (excluding residual capacity) in 2030, correlated with electricity sector and total GHG emissions. The cases on the right include energy efficiency measures.



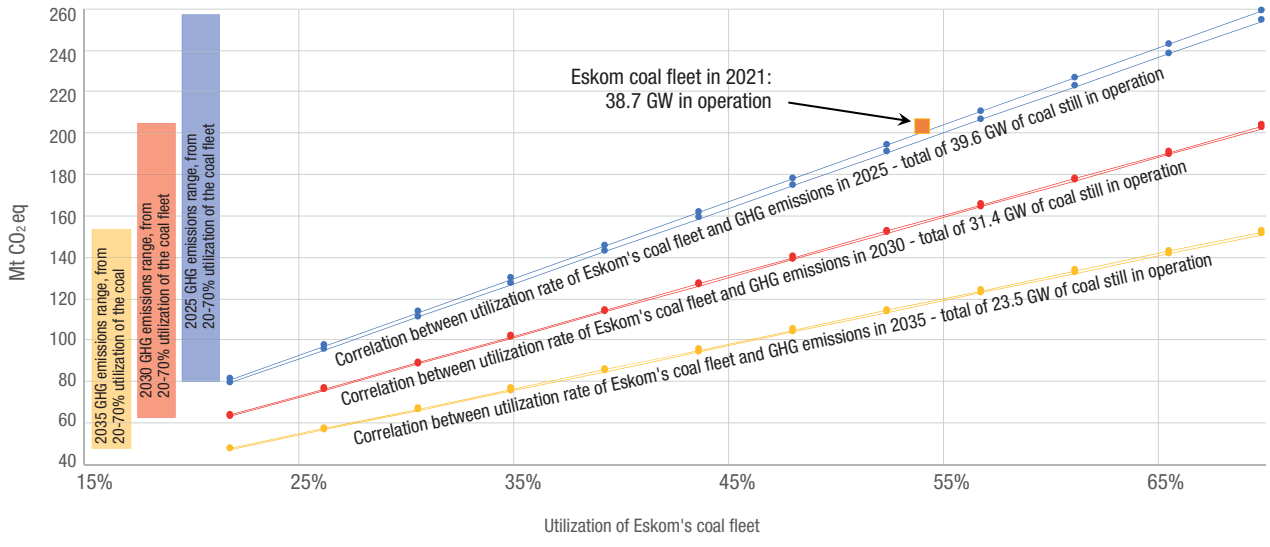
Source: *JETP-IP Secretariat, 2022*

Figure 19. Electricity production by technology, correlated with electricity sector and total GHG emissions. The cases on the right include energy efficiency measures.



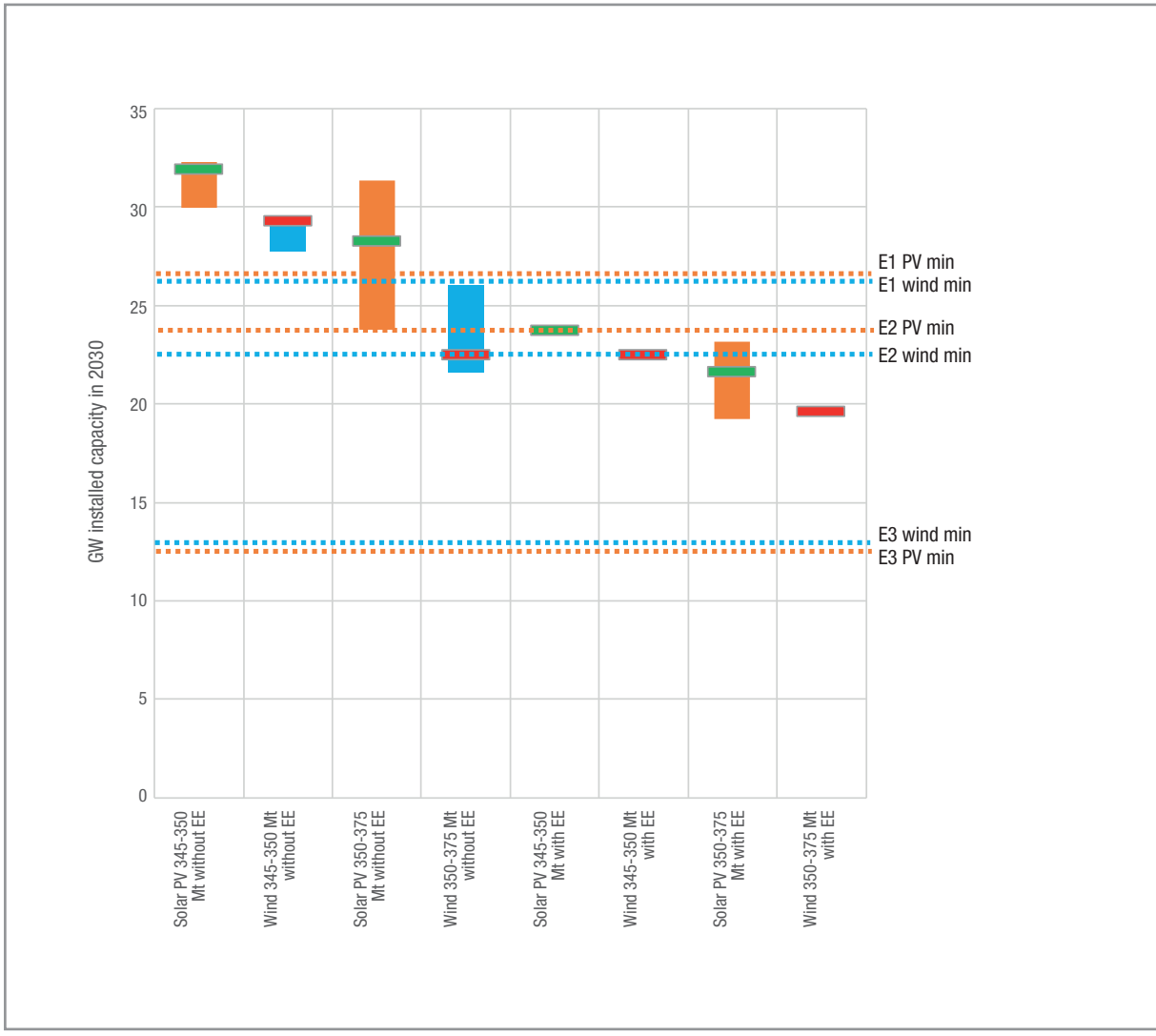
Source: *JETP-IP Secretariat, 2022*

Figure 20. Correlation between the average load factor of Eskom's coal fleet and GHG emissions from the fleet.



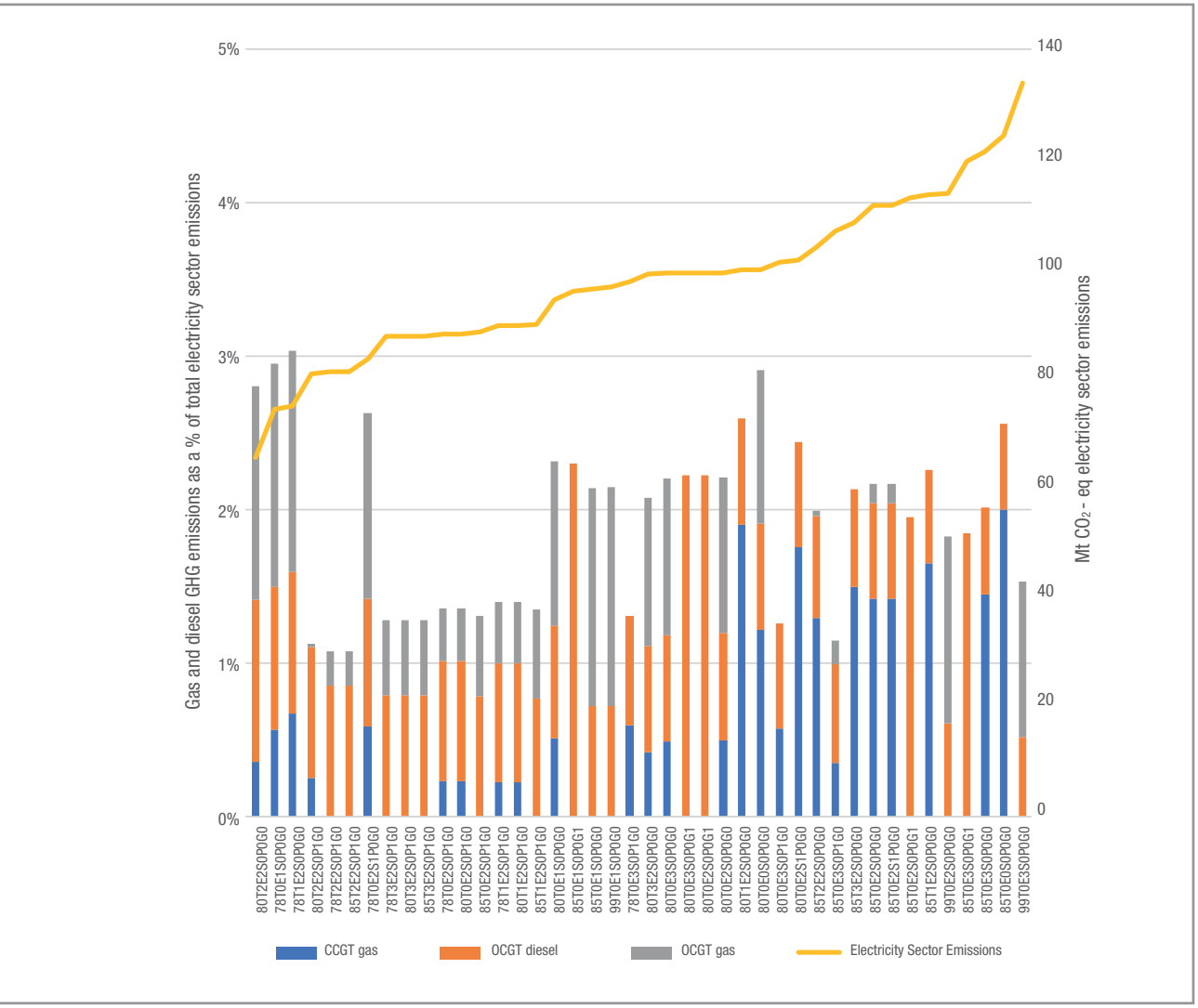
Source: *JETP-IP Secretariat, 2022*

There is a distinct difference between the cases modelled with and without energy efficiency measures; the former requires significantly less new capacity, and because of the investment plans in scenarios E1 and E2 combined with lower electricity demand, GHG emissions are markedly lower, essentially because of overinvestment in new capacity. In general, to achieve a mitigation outcome in the lower part of the NDC range, 45-55 GW of wind and solar will need to be operational by the beginning of 2030. While there is a need for between 1 and 6 GW of OCGT, CCGT and battery storage by 2030, even with large scale investment in gas plant, in 2030 GHG emission from gas and diesel combustion comprise only 1-2% of electricity sector emissions, with a few outliers in cases which have higher RE uptake, as presented in Figure 21.



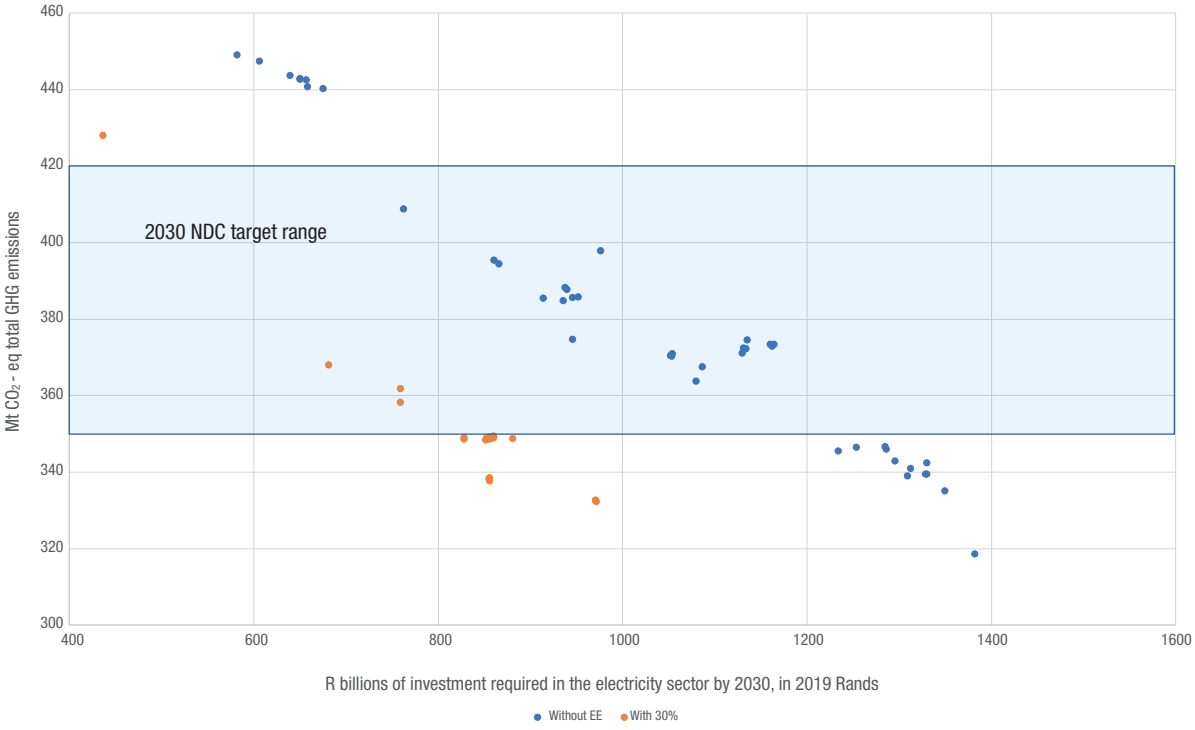
Source: *JETP-IP Secretariat, 2022*

Figure 21. (left) Range of solar PV and wind capacities required by 2030 to reach the corresponding NDC target range. The smaller bars are median values. (right) % of total electricity sector emissions generated by gas and diesel, ordered by total electricity sector emissions.



As presented in Figure 22, investment requirements in the electricity sector to 2030 amount to around ZAR1 trillion (in 2019 Rands) to achieve a GHG outcome in 2030, which is at the lower end of the NDC. This requirement could be as much as 40% lower with a very aggressive energy efficiency programme.

Figure 22. Total GHG emissions in 2030 plotted against total investment required in the electricity sector by 2030



Source: *JETP-IP Secretariat, 2022*

Table 37. Electricity generation plant characteristics in SATIM. All Rand values are in 2015 Rands.

	Plant / technology	Installed capacity			Efficiency	Variable cost	
		GW	GW	GW	%	R/GJ[155]	R/kW
		2020	2021	2022			
Eskom coal fleet	Arnot	2.232	2.232	2.232	31%	9.2	382.2
	Camden	1.45	1.45	1.45	28%	9.2	382.2
	Duvha	2.875	2.875	2.875	33%	9.2	382.2
	Grootvlei	0.54	0.54	0.54	26%	9.2	382.2
	Hendrina	1.293	1.1083	1.1083	27%	9.2	382.2
	Kendal	3.84	3.84	3.84	32%	9.2	382.2
	Komati	0.092	0	0	24%	9.2	382.2
	Kriel	2.85	2.85	2.85	31%	9.2	382.2
	Kusile	2.133	2.133	2.133	37%	9.2	382.2
	Lethabo	3.558	3.558	3.558	34%	9.2	382.2
	Majuba wet cooled	2.01	2.01	2.01	31%	9.2	382.2
	Majuba dry cooled	1.833	1.833	1.833	30%	9.2	382.2
	Matimba	3.69	3.69	3.69	34%	9.2	382.2
	Matla	3.45	3.45	3.45	33%	9.2	382.2
	Medupi	3.61	3.61	3.61	37%	9.2	382.2
	Tutuka	3.51	3.51	3.51	31%	9.2	382.2
Other existing plants	Kelvin coal plant	0.6	0.6	0.6	25%	9.2	382.2
	Sasol SSF Coal Plant	0.333	0.3	0.2667	25%	9.2	382.2
	Sasol Infrachem Coal Plant	0.128	0.128	0.128	25%	9.2	382.2
	Sasol SSF Gas Plant	0.249	0.249	0.249	33%	0.7	161.7
	Sasol Infrachem Gas Plant	0.172	0.172	0.172	45%	19.6	425.2
	Eskom OCGT	2.4	2.4	2.4	32%	0.0	66.5
	IPP OCGT	1.005	1.005	1.005	31%	0.7	161.7
	Hydro South Africa	0.665	0.665	0.665	100%	0.0	41.4
	Hydro Cahora Bassa	1.5	1.5	1.5	0%	94.4	41.4
	Drakensberg / Palmiet pumped storage	1.58	1.58	1.58	73%	0.0	4.5
	Ingula pumped storage	1.32	1.32	1.32	78%	0.0	183.1
	Koeberg nuclear	1.86	1.86	1.86	32%	0.0	400.3

[155] Variable costs EXCLUDE fuel costs and are measured on plant output.

	Fixed cost %		Annual availability		Overnight cost				
					R/kW	R/kW	R/kW	R/kW	R/kW
	2020	2025	2030	2035	2020	2025	2030	2035	2050
	55%	48%	–	–	–	–	–	–	–
	50%	–	–	–	–	–	–	–	–
	46%	45%	41%	41%	–	–	–	–	–
	75%	40%	–	–	–	–	–	–	–
	51%	–	–	–	–	–	–	–	–
	64%	64%	61%	61%	–	–	–	–	–
	73%	–	–	–	–	–	–	–	–
	45%	47%	–	–	–	–	–	–	–
	66%	72%	67%	80%	–	–	–	–	–
	62%	55%	50%	50%	–	–	–	–	–
	67%	67%	59%	59%	–	–	–	–	–
	67%	67%	59%	59%	–	–	–	–	–
	83%	78%	79%	79%	–	–	–	–	–
	62%	61%	58%	58%	–	–	–	–	–
	70%	71%	68%	80%	–	–	–	–	–
	47%	45%	–	–	–	–	–	–	–
	32%	32%	32%	32%	–	–	–	–	–
	73%	73%	73%	73%	–	–	–	–	–
	56%	56%	56%	56%	–	–	–	–	–
	85%	85%	85%	85%	–	–	–	–	–
	85%	85%	85%	85%	–	–	–	–	–
	96%	96%	96%	96%	–	–	–	–	–
	80%	80%	80%	80%	–	–	–	–	–
	12%	12%	12%	12%	–	–	–	–	–
	69%	69%	69%	69%	–	–	–	–	–
	100%	100%	100%	100%	–	–	–	–	–
	66%	66%	66%	66%	–	–	–	–	–
	93%	93%	93%	93%	–	–	–	–	–

	Plant / technology	Installed capacity			Efficiency	Variable cost	
		GW	GW	GW	%	R/GJ[155]	R/kW
		2020	2021	2022			
New capacity options	Generic Waterberg Coal Plant	–	–	–	44%	22.4	932.6
	Generic Waterberg Coal Plant with CCS	–	–	–	33%	41.3	1 590.0
	Fluidised Bed Combustion Coal	–	–	–	36%	48.5	627.1
	Open Cycle Gas Turbine – LNG	–	–	–	31%	0.7	161.7
	Combined Cycle Gas Turbine – LNG	–	–	–	49%	6.1	167.0
	Combined Cycle Gas Turbine – LNG-CCS	–	–	–	41%	9.5	396.6
	Gas Engines – LNG	–	–	–	45%	19.6	425.2
	Hydrogen Turbine or Fuel Cell	–	–	–	50%	74.6	0.0
	Biomass municipal waste	–	–	–	45%	32.0	1 594.5
	Landfill gas	–	–	–	45%	17.3	1 594.5
	New Nuclear	–	–	–	35%	10.4	976.8
	Wind	1.937	2.353	2.881	100%	0.0	611.0
	Solar Central Receiver 9 hrs storage	0.5	0.5	0.5	100%	0.2	1017
	Solar PV Fixed	0.774	0.774	0.774	100%	0.0	269.8
	Solar PV tracking	0.494	1.177	1.232	100%	0.0	285.8
	Solar PV rooftop commercial	0.9522	1.2322	1.2322	100%	0.0	312.9
	Solar PV rooftop residential	0.1234	0.1634	0.1634	100%	0.0	472.1
	Solar PV rooftop Industry	0.1584	0.2384	0.2384	100%	0.0	312.9
	Grand Inga	–	–	–	100%	0.0	0.0
	Utility scale battery storage – 4hrs	–	–	–	89%	0.0	622.6

Source: *JETP-IP Secretariat, 2022*

[155] Variable costs EXCLUDE fuel costs and are measured on plant output.

	Fixed cost %		Annual availability		Overnight cost				
					R/kW	R/kW	R/kW	R/kW	R/kW
	2020	2025	2030	2035	2020	2025	2030	2035	2050
	80%	80%	80%	80%	39 335	39 335	39 335	39 335	39 335
	80%	80%	80%	80%	76 087	76 087	76 087	76 087	76 087
	80%	80%	80%	80%	47 478	47 478	47 478	47 478	47 478
	85%	85%	85%	85%	9 066	9 066	9 066	9 066	9 066
	85%	85%	85%	85%	9 955	9 955	9 955	9 955	9 955
	85%	85%	85%	85%	21 875	21 875	21 875	21 875	21 875
	85%	85%	85%	85%	14 144	14 144	14 144	14 144	14 144
	85%	85%	85%	85%	23 508	23 508	23 508	23 508	23 508
	85%	85%	85%	85%	18 911	18 911	18 911	18 911	18 911
	85%	85%	85%	85%	18 911	18 911	18 911	18 911	18 911
	85%	85%	85%	85%	68 550	68 550	68 550	68 550	68 550
	35%	35%	35%	35%	12 500	12 391	12 283	12 069	11 859
	47%	47%	47%	47%	52 631	43 999	35 368	35 368	35 368
	25%	25%	25%	25%	9 822	9 220	8 662	7 695	6 798
	28%	28%	28%	28%	10 471	9 829	9 234	8 203	7 247
	20%	20%	20%	20%	11 394	10 695	10 048	8 926	7 886
	20%	20%	20%	20%	17 189	16 135	15 158	13 466	11 897
	20%	20%	20%	20%	11 394	10 695	10 048	8 926	7 886
	78%	78%	78%	78%	51 227	51 227	51 227	51 227	51 227
	85%	85%	85%	85%	16 510	11 396	9 276	8 116	6 957

Table 38. Committed/planned capacity.

	Existing capacity	New (+) or retiring (-) capacity[156]	
	2022	2022	2023
Coal existing capacity, available 1 Jan 2022[157]	39 578		
Coal new capacity (Medupi and Kusile)	720		720
Eskom coal capacity retirement (capacity retired during the year in question)		-114	-559
Kelvin (City Power) retirement			
Nuclear	1 860		
Gas /diesel			
OCGT diesel existing capacity (Eskom + IPP OCGT)	3 414		
OCGT gas (Eskom extension at Ankerlig and Gourikwa)			
CCGT gas (Richards' Bay – Eskom or IPP)			
Pumped Storage	2 724		
Batteries (Eskom proposed projects)			
Hydro (South Africa)	600		
Hydro (Cahora Bassa)	1 500		
Wind (Eskom's Sere wind plant plus REIPPPP bid windows 1-4)	3 238		
Wind (remaining capacity from REIPPPP bid windows 1-4)			305
Wind [159]			
Wind (Eskom lease – assume in operation by 1 Jan 2026)			
Wind (Eskom proposed projects at Aberdeen and Kleinzee)			
Solar PV (REIPPPP bid windows 1-4)	2216		
Solar PV (remaining from REIPPPP Bid Windows 1-4)			71
Solar PV[160]			
Solar PV (Eskom lease – assume in operation by 1 Jan 2025)			
Solar PV (Eskom's proposed projects)			
Solar CSP (REIPPPP bid windows 1-4)	500		
Solar CSP (REIPPPP remaining bid windows 1-4)			

156 New capacity is assumed to be available from 1 January of the specified year, and retiring capacity is assumed to retire during the course of the year.
157 Includes Eskom plants and Kelvin at 200 MW.
158 Retirement schedule verified by Eskom.
159 Assumes REIPPPP Bid Window 5 projects are operational by 1 Jan 2025 and Bid Window 6 projects are operational by 1 Jan 2026.
160 Assumes REIPPPP Bid Window 5 projects are operational by 1 Jan 2025 and Bid Window 6 projects are operational by 1 Jan 2026.

New (+) or retiring (-) capacity[156]			
2024	2025	2026	Source
			Eskom Integrated Report 2021
720	720		Engineering news update on timing for Kusile Medupi completion
-745	-1312	-1555	Eskom[158]
-200			
			Eskom Integrated Report 2021
			Eskom Integrated Report 2021
	1 000		Eskom project pipeline
		3 000	Eskom project pipeline
			Eskom Integrated Report 2021
	1 200		Eskom project pipeline
			Eskom Integrated Report 2021
			Eskom Integrated Report 2021 + Renewable Energy Data and Information Service (REDIS)
			REDIS (http://redis.energy.gov.za)
	1 608	1 600	
		500	
	500		
			REDIS (http://redis.energy.gov.za)
			REDIS (http://redis.energy.gov.za)
	975	1 000	
		1 500	
716.4	1 149.5		
			REDIS (http://redis.energy.gov.za)
100			REDIS (http://redis.energy.gov.za)

Table 38. Committed/planned capacity.

	Existing capacity	New (+) or retiring (-) capacity[156]	
	2022	2022	2023
New capacity summary			
Coal			0
OCGT gas			
CCGT gas			
Batteries			0
Wind			305
Solar PV			71
Solar CSP			0
Total expected capacity (available 1 Jan of each year)			
Coal	39 578		39 739
Nuclear	1 860		1 860
OCGT diesel	3 414		3 414
OCGT gas	0		0
CCGT gas	0		0
Pumped storage	2 724		2 724
Batteries	0		0
Hydro (South Africa)	600		600
Hydro (Cahora Bassa)	1 500		1 500
Wind	3 238		3 543
Solar PV	2 216		2 287
Solar CSP	500		500

Source: *JETP-IP Secretariat, 2022*

New (+) or retiring (-) capacity[156]			
2024	2025	2026	Source
New capacity summary			
0			
	1 000		
		3 000	
0	1 200	0	
0	2 108	2 100	
716.4	2 24.5	2 500	
100	0	0	
Total expected capacity (available 1 Jan of each year)			
39 514	3 8922	37 367	
1 860	1 860	1 860	
3 414	3 414	3 414	
0	1 000	1 000	
0	0	3 000	
2 724	2 724	2 724	
0	1 200	1 200	
600	600	600	
1 500	1 500	1 500	
3 543	5 651	7 751	
3 003	5 128	7 628	
600	600	600	

Table 39. Eskom's JET project pipeline

Project Name	Duration	Total Estimated Project Cost (ZAR million)	Capacity (MW, and also MWh for storage projects)
Storage			
Tubatse Pumped Hydro Storage	2025	35 868	1 500MW / 21 000MWh
Battery Energy Storage Systems (BESS)			
Battery Storage Phase 1	2018-2023	5 035	830MWh
Battery Storage Phase 2	2018-2024	6 060	610MWh
Camden Power Station BESS	2024-2026	4 000	600MWh
Hendrina Power Station BESS	2024-2026	4 000	600MWh
Komati Power Station BESS	2024-2026	4 000	600MWh
Grootvlei Power Station BESS	2026-2027	4 000	600MWh
Renewable Energy			
Sere Phase 1A PV	2022-2023	293	19.5
Majuba PV	2022-2023	1 048	65
Arnot PV	2022-2023	278	17
Duvha PV	2022-2023	380	23.5
Tutuka PV	2022-2023	1 062	65.9
Lethabo PV	2022-2023	1 210	75
Kleinzee Wind	2022-2024	6 334	300
Sere Phase 1B PV	2023-2024	844	50
Olyvenhoutsdrift PV	2023-2025	9 625	550
Aberdeen Wind	2023-2025	4 476	200
Komati Power Station Renewables Solar PV	2024-2024	2 500	100
Hendrina Power Station Renewables Solar PV	2024-2026	2 500	100
Camden Power Station Renewables Solar PV	2024-2026	2 500	185
Sere Phase 2 PV	2024-2026	9 268	530
Other wind (100MW)	2024-2026	2 372	100
Gamma Sub Station PV	2025-2026	625	35
Matimba PV	2025-2026	625	35
Grootvlei Power Station Renewables Solar PV	2026-2027	2 500	100

Source: *JETP-IP Secretariat, 2022*

Project Name	Duration	Total Estimated Project Cost (ZAR million)	Capacity (MW, and also MWh for storage projects)
Gas and Diesel			
Richards Bay Greenfield Gas	2016-2029	70 000	3 000
Ankerlig and Gourikwa OCGT conversion BOP Phase 1b	2024-2026	1 878	-
Ankerlig and Gourikwa OCGT to CCGT conversion Phase 2	2027-2030	20 000	1 000
Transmission			
Upington Str: 500MVA 400/132kV trfr 2 - IPP	2022-2024	136	
Aggeneis 400/132kV 500MVA trf - IPP	2022-2025	332	
Asteria 400/132kV S/S integration	2022-2025	677	
Upington Str: Aries-Upington 400kV line 1 - IPP	2023-2025	928	
Upington Str: Ferrum-Upington 400kV line 1 - IPP	2023-2026	1603	
Aggeneis-Paulputs 220KV LINE	2024-2026	620	
Komsberg 500MVA 400/132kV trfr 2 - IPP	2024-2026	167	
Mookodi 1x 500MVA 400/132KV Transformer - IPP	2024-2026	227	
Gamma Str: 1st 500 MVA 400/132 kV transformation	2024-2027	581	
Garona 275/132kV integration - IPP	2025-2026	118	
Helios Strengthening ph 2 - IPP	2025-2027	132	
Agulhas 400/132kV S/S Integration	2025-2028	561	
Richards Bay 3GW Gas Integration - IPP	2025-2028	1786	
Hydra-Kronos-Aries 400kV line 2 - IPP	2025-2029	2527	
Poseidon South 400/132kV S/S - IPP	2025-2029	840	
Kimberley Ph 4: Boundary 400kV ph2	2026-2027	2322	
Coega Gas Integration ph1	2026-2028	405	
Droerivier 500MVA 400/132kV trfr 3 - IPP	2026-2029	301	
Gromis 400/132kV 500 MVA trfr - IPP	2026-2029	321	
Hydra B 400/132kV S/S Ph1 - IPP	2026-2029	485	
Korana Int Ph1: Korana 400/132 kV S/S - IPP	2026-2029	442	
Namaqualand Str for IPPs : Gromis-Nama 400kV line	2026-2029	1431	
Paulputs 3rd Transformer : 1st 400/132kV 500 MVA	2026-2029	402	
Kimberley Ph 3 : Hermes - Mookodi - Ferum 400kV line	2027-2028	3228	
Aggeneis – Groeipunt 400 kV line 2	2027-2029	407	
Gamma Str : 2nd 500 MVA 400/132 kV transformation	2027-2029	126	
Gamma Str: Gamma 765/400 kV trfr - IPP	2027-2029	544	

Project Name	Duration	Total Estimated Project Cost (ZAR million)	Capacity (MW, and also MWh for storage projects)
Kimberley Ph 4B: Boundary 400kV Str	2027-2029	1105	
Koring 400/132 kV MTS Integr - IPP	2027-2029	488	
Aries 400/132kV 500MVA trf - IPP	2027-2030	325	
Dealesville 400/132kV s/s integration	2027-2030	492	
Dorper 400/132kV S/S Integr - IPP	2027-2030	608	
Droerivier B 400/132 kV MTS - IPP	2027-2030	632	
Groeipunt 400/132kV Establishment - IPP	2027-2030	495	
Paulputs 400 kV Str Ph 2 - IPP	2027-2030	650	
Grahamstown 400/132kV MTS - IPP	2027-2030	586	
Cape Corridor Ph 4: Kappa-Sterrekus 2nd 765kV Line	2027-2031	2923	
Cape Corridor Phase 4: 1st Perseus – Zeus 765 kV line	2027-2031	8561	
Cape Corridor Phase 4: 2nd Gamma – Perseus 765 kV	2027-2031	6106	
Greater East London Strength Ph 4	2027-2031	1227	
SGS PH3: GAMMA-GRASSRIDGE 765KV LINE 1	2028-2028	6621	
Aries–Aggeneis 400 kV line 2	2028-2029	1157	
Cape 765 ph4 Gamma-Kappa 765kV no. 2	2028-2029	6001	
Kronos IPP Transformation Ph 3	2028-2029	249	
SGS PH4: GAMMA-GRASSRIDGE 765KV LINE 2	2028-2029	5597	
Hydra B 400/132kV S/S Ph2 - IPP	2028-2030	304	
Kappa 500 MVA 400/132kV trfr 2 - IPP	2028-2030	219	
Komsberg Ext 3rd 500 MVA 400/132kV Transformers - IPP	2028-2030	372	
Aurora - Juno 400 kV Line 2	2029-2031	1055	
Coega Gas Integration ph2	2029-2031	1069	
Upington Str: 500MVA 400/132kV trfr 3 - IPP	2029-2031	159	
Hlaziya 400/132 kV MTS Integr - IPP	2029-2032	2 895	
Cape Ph 5A: 765 kV (400kV Operation) - IPP	2029-2033	17 915	
Hydra B 400/132kV S/S Ph3 - IPP	2030-2032	163	
Cape Ph 5B: 765 kV Operation - IPP	2031-2035	12 921	
Droerivier-Narina-Gourikwa 400kV	2032-2034	1 561	
Cape Corridor Ph 6 : 2nd Mercury to Sterrekus 765kv line	2032-2037	27 145	

Project Name	Duration	Total Estimated Project Cost (ZAR million)	Capacity (MW, and also MWh for storage projects)
Microgrids/Distribution			
Calitzdorp Substation	2021-2024	45	
Dumasi/Kohlo 22kV Overhead Line	2021-2024	31	
Tombo/Majola 22kV Overhead Line	2021-2024	15	
First Falls 10MVA 66/22kV Substation	2021-2024	TBD	
Mqojeni	2021-2024	1	
Mtumbeni/Mboleni	2021-2024	0	
Mkhumbeni/Ludikidiki	2021-2024	3	
Lugadu/Ngqulana	2021-2024	4	
Lalashe	2021-2024	1	
Pongola NB 1 Feeder	2021-2024	54	
Kamberg NB45 Feeder	2021-2024	6	
Estuary NB67 Feeder	2021-2024	10	
Lammington NB22 Feeder	2021-2024	2	
Komatipoort/Turnbush Feeder - Kruger National Park - Lower Sabie Camp	2021-2024	62	
Malamulele/Mhinga Feeder - Kruger National Park - Punda Maria Camp	2021-2024	101	
Foskor/Krugerpark Feeder - Satara Rest Camp Cluster	2021-2024	146	
Foskor/Krugerpark Feeder - Olifants Rest Camp Cluster	2021-2024	71	
Foskor/Krugerpark Feeder - Olifants Pump Cluster	2021-2024	8	
Foskor/Krugerpark Feeder - Letaba Rest Camp Cluster	2021-2024	100	
Foskor/Krugerpark Feeder - Shingwedzi Rest Camp Cluster	2021-2024	141	
Foskor/Krugerpark Feeder - Bateleur Bush Camp Cluster	2021-2024	26	
Foskor/Krugerpark Feeder - Mopani Rest Camp Cluster	2021-2024	84	
Pilanesberg Nature Reserve - Black Rhino Game Reserve	2021-2024	36	
Pilanesberg Nature Reserve - Tshukudu Bush Lodge	2021-2024	7	
Rietfontein	2021-2024	68	
Noenieput	2021-2024	4	
De Beers Kommagas	2021-2024	TBD	
De Beers Diamant Substation	2021-2024	TBD	
Andriesvale	2021-2024	TBD	

ANNEXURE C – METHODOLOGICAL NOTES ON JUST TRANSITION PRIORITY AREAS AND INTERNATIONAL LESSONS ON COAL TRANSITIONS

Table 40. Methodological Notes on Just Transition Priority Areas

Priority Area		Method for assessing investment need and data used
Priority Area 1: Repurposing of coal plants and mines for new uses	1.1: Repurposing coal plants	The investment needs do not include decommissioning or repowering investments but are based on the social and repurposing investments associated with coal plant closures. The estimates are based on the investments being made at Komati and applied to the pipeline of planned closures over the period to 2030 (that is, for Grootvlei, Hendrina, Camden, Arnot, and Kriel only).
	1.2: Repurposing coal mining land	The indicative costing includes addressing both derelict and ownerless (D&O) mines and financing for the short-term closures and repurposing of private mines. **D&O mines:** The publicly available DMRE estimate of national costs, divided by the last publicly available number of D&O mines in Mpumalanga as a share of the total (~13% of total D&O mines nationally), was applied. This is likely to be an underestimate; therefore, a detailed analysis of the remediation needs and the repurposing investment is required, as it does not exist publicly. Mines require specific environmental rehabilitation assessments that define the costs of remediation, while a land use / spatial planning strategy will support repurposing investments. Specific D&O costings were requested from DMRE and the Council for Geoscience, but they were not received. **Operating mine sites:** Since there is no database of mine closures expected over the period to 2030, the financial provisions set aside by a large major miner to cover the expected closure costs of its mines (the major share of mines expected to close by 2030) were used as a guideline for assessing the possible investment needs of the private sector to undertake such closures. These investment needs are relatively certain, given the life of their assets, but the assessment is still likely to underestimate the total closure need over the period for the region, where production could fall much faster, and many mines do not have sufficient rehabilitation funding even under a 'business as usual' closure scenario. The estimate used covers mines that produce approximately 15 Mtpa versus a projected decline in Eskom's coal use of 37 Mt from 2021 to 2027 (in scenarios used in the JET IP). However, the major mining house used as a reference has set aside more rehabilitation provision than is required under current law.

Source: *JETP-IP Secretariat, 2022*

Priority Area		Method for assessing investment need and data used
Priority Area 1: Repurposing of coal plants and mines for new uses	1.2: Repurposing coal mining land	**Challenges in estimating the need:** There is high variability between international and local expected costs of closure per hectare (ha) of disturbed land for the Province of Mpumalanga. Total provincial mining land is estimated at 64,400 ha (https://ccis.environment.gov.za/carbon-sinks/#/sa-districts). The difference between international estimates (based on Europe) and local companies is significant – 15–26 times higher in cost per hectare – using local estimates. The low end applies the financial provisioning requirements of the Mineral and Petroleum Resources Development Act, 2002, while the upper end represents actual company financial provisions in cash / trust / bank guarantees, based on companies' assessment of the financial provisioning requirements emanating from the National Environmental Management Act, 1998. This could represent differences in approach (return to pre-mining condition versus repurposed use requiring a lower investment. Nonetheless, estimating total needs is made very uncertain, when a land use planning process and repurposing strategy for the region and specific mine sites is absent. Applying actual company provisions per hectare to the total land disturbed by mining (in ha) in the province generates a cost estimate that ranges by tens of billions of rands (ZAR28–48 billion). However, the coal production and use, consistent with the low NDC, does not easily translate into disturbed hectares to be remediated and hence cannot be assessed for the short term without further analysis. Refining these estimates will require the implementation of the technical analyses outlined in the Enabling Conditions section of the JET IP.
Priority Area 2: Economic diversification	2.1: Improve infrastructure for development	**Roads:** Road rehabilitation costs are derived from existing projects that average US$20 million per similar road distance. In the absence of the Mpumalanga Infrastructure Masterplan, the rehabilitation of 10 provincial roads was estimated to be US$200 million / ZAR3 billion. **Water:** There is a Water and Sanitation Provincial Implementation Plan (Oct 2020) that is based on the Municipal Priority Action Plan. **Energy access:** Broader energy access needs / costs are not known at the provincial level. **Digital connectivity:** Estimates are based on existing digital projects in Southern and Eastern Africa to (i) improve digital adoption and (ii) expand digital infrastructure. The total cost is estimated to be US$200 million / ZAR3 billion. A Mpumalanga Infrastructure Masterplan is currently under development by the Council of Scientific & Industrial Research (CSIR). Once completed, more refined estimates of the investment need will be available for the later iterations of the JET IP. The Masterplan will cover built infrastructure, energy access, and social infrastructure.

Priority Area		Method for assessing investment need and data used
	2.2: Diversify local economies	The estimates are based on possible investments identified through existing data-gathering exercises on Provincial investment opportunities and expert interviews with Trade and Industrial Policy Strategies (TIPS), Greencape, and Eskom to cost proposed projects in Mpumalanga that contribute to a just transition and promote provincial sectors that form part of economic diversification activities. They are also based on the proposed project pipeline and projects identified in municipal Integrated Development Plans. Though estimates include full investment costs, project feasibility and other costs need further due diligence. Estimates of enterprise development investments to support local livelihoods are from existing bio-economy enterprise development and SMME training and support grants funded by the World Bank Group, cross-checked against existing training and seed funding estimates from local experts, and existing implementation by Avocado Vision (a local enterprise development organization). The number of enterprises is based on an estimate of the impacted value chain and workers over the period, and while it likely underestimates the need, this estimate recognises limitations on absorptive capacity/growth in the first period of the JET IP. Costing of public employment schemes to support diversification and worker transition are based on the existing Presidential Employment Scheme (PES) costings for appropriate employment for transitioning coal workers and affected youth.
Priority Area 3: Workers and communities	3.1: Caring for the coal work-force	The number of coal miners affected by coal phasedown are based on NDC-compatible scenarios that reach the low end of the NDC target range in 2030 (see Annexure B). The total number of jobs in the base year is based on StatsSA 2019 and the projections of coal demand are from the ESRG modelling (see Annexure B). The post-apartheid labour market survey data is used to assess additional/forced job losses, while accounting for normal retirement, but it does also differentiate between forced job losses and older workers who typically exit the sector long before retirement age and are replaced by younger workers (Schers et al).[161] Costs of temporary income support (to support workers for a year while they receive training for new opportunities), worker placement, reskilling, relocation, and salary bridge are derived from the work of Cruywagen (2020) of Stellenbosch University,[162] supplemented by Tyler et al.'s work (2021) that includes estimates of placement support for workers (based on Harambee). Investment needs are calculated based on a retirement package for older workers, retraining for younger workers, and skills development for youth / young workers. Eskom's figures are from its internal Human Resources analysis of coal plant closures to 2035. Komati is excluded, as it falls outside the JET IP's timeline (2023–2027).

[161] Methodology from Jules Schers and Vincent Bagilet, 2019, "Managing the Coal Transition for Workers in South Africa Scenario Analysis of Age Cohorts & Skills Profiles of Coal Workers," Presentation at the SA-TIED workshop, Pretoria, August 28, 2019, https://sa-tied.wider.unu.edu/sites/default/files/pdf/Event-28August2019-Schers.pdf.

[162] Michelle Cruywagen, 2020, "Estimating the Cost of Mitigating Coal Labour Losses in SA's energy Transition," Master's thesis, Stellenbosch University, https://scholar.sun.ac.za/bitstream/handle/10019.1/108449/cruywagen_cost_2020.pdf?sequence=2&isAllowed=y.

Priority Area		Method for assessing investment need and data used
	3.2: Investing in future generations	Training support, placement support, and enterprise training costs are derived from Tyler et al. (2021) and interviews with local enterprise development organisations. They are applied to the number of jobs in coal mining that disappear over the period.
Priority Area 4: Enabling Conditions for a Just Transition	4.1: Plan for success	The plan is based on similar existing planning processes internationally. It assumes the availability of a grant for the overall assessments of the sector described in the programme area and detailed assessments of sites. Approximately US$2million are needed per mining area (can include clusters of mines or isolated sites), though this is dependent on the broader analysis of closures. Ten sites are assumed to be targeted for the first period of the JET IP, based on possible mine closures from publicly available databases. There are 7 mines, with life of mine (LOM) reached before 2030 in the *Global Coal Mine Tracker* but the data is patchy and many LOM estimates are missing; hence more closures are expected over the period.
	4.2: Policies for post-mining redevelopment	The estimate will be based on the need to cover policy processes over 5 years.
	4.3: Capacity for success	The estimate is based on existing programmes globally, interviews with entities/institutions active in Mpumalanga, and estimates of support for strengthening the local government capacity from existing funded programmes. We identified the need to support core funding for implementation agencies and provide enabling finance for accelerators, demos, etc. (This is separate from the enterprise development (ED) / SMME grants and larger investments).
Priority Area: Electricity sector just transition	1: Clean energy investment	The figures are based on the work done for the forthcoming SA Renewable Energy Masterplan on the proposed / planned investment and the lost value thereof (ZAR1.6 billion) in 2017. A more nuanced but conservative approach that costs investments for particular components (for example, towers, solar module assembly, and inverters) yields a range within 10% for a first round of investments. This is likely to underestimate the total investment need, especially for a low NDC scenario and in light of the private sector's proposed pipeline, which implies a significantly higher renewable energy rollout compared to that contemplated in 2017.
	2: Social ownership* pilots	The investment need is based on interviews with national experts involved in community ownership projects in different sectors and types, as well as local DFIs: estimated ZAR500 million per pilot for infrastructure investment; ZAR30 million per pilot for associated engagement and assessments (based on existing local DFI development planning for community empowerment); and ZAR25 million in grants to support capacity building, community of practice, research, and other interventions. Further background on social ownership is provided below this table.

*Social Ownership Considerations
See note overleaf

***Social Ownership Considerations**

South Africa's economy is characterised by a concentration of wealth and income, high levels of energy insecurity / lack of access, and poverty. A core element of a just transition in the post-apartheid context aims to address this concentration and ensure restorative and distributive justice. As one way of progressing this ambition, the national Just Transition Framework thus calls for a "diversely owned renewable system" and a broadening of ownership of productive assets in support of a just transition.[163] This follows calls, over many years, from social partners and the stakeholder engagements under the JET IP for including social ownership.[164] Social ownership, in the context of the JET IP, can refer to a wide diversity of ownership models, including state ownership at different levels (for example, municipalities), employee ownership, co-operative ownership, citizen ownership of equity in private companies or vehicles, individual ownership, and collective ownership (and management).[165] Social ownership, therefore, includes multiple options, such as enhanced participation in private utility-scale renewable energy, household use with or without grid feed-in, community-owned use and feed-in, or worker and community ownership shares (amongst others, and in sectors other than electricity). The model that should be chosen will depend on community-identified problems and associated needs, be it local investments and jobs, income generation, poverty alleviation, energy security, along with participation in the management of assets.[166]

There are potential opportunities to address energy poverty and access with concomitant benefits, especially for women and youth, where distributed, socially owned renewables could offer low-income households both access and revenue-generating opportunities, if financial (for example, affordability and access) and other barriers (including regulatory) can be addressed.[167] Social ownership can also support municipalities in achieving their climate and energy targets while supporting active participation by the community in energy planning.[168] In general, innovative ownership models can ensure that it is not only wealthy households and industry that benefit from their own generation and grid feed-in, although further work is needed to identify barriers and challenges and to match such solutions to community-identified problems.[169] Similarly, the community ownership of RE assets has the potential to address rural poverty and inequality. South

163 PPCC, 2022.

164 COSATU, 2022; JETP's Working Groups on electricity and just transition.

165 SEA (Sustainable Energy Africa), 2022, A Feasibility Study Exploring Energy Access Through Community-Led Socially Owned Renewable Energy Development in South Africa": Community- and worker-led options also imply that communities and workers are empowered to make decisions about their energy futures, rather than having decisions imposed on them. Collective ownership can happen through trusts, nonprofit organisations (NPOs), associations, co-operatives etc.

166 A key element is related to procedural justice: "Engaging communities in shared decision-making processes can lead to increased transparency and inclusiveness in the planning, construction, and management of installations. Making collective decisions about the use and distribution of investments and generated income enable communities to achieve greater autonomy and self-governance. Such shared and inclusive participation can increase community sense of ownership and community unity, as well as raise awareness, acceptance, and active support for the energy transition" (IRENA [International Renewable Energy Agency] 2020).

167 Since fuel stacking persists even in electrified households, energy service bundles may need to be considered to address energy service needs like cooking and heating (SEA 2022).

168 Ibid.

169 One issue raised by the Working Groups was what social ownership is intended to solve for, be it access, jobs, growth, inequality, etc., as this will impact design and implementation.

Africa has, since the inception of the REIPPPP in 2011, included local community ownership in the company structures of REIPPs, delivering benefits largely through allocating shareholding to entities representing communities in a 50-km or district boundary around a renewable energy project site.[170] Most frequently, the entity type chosen is that of a community trust,[171] which have an (average) of 9% total shareholding in the sector with R27 billion nominal net income to benefit project host communities for at least the 20-year Power Purchase Agreement period.[172]

Although results differ across sectors, the models practised have experienced challenges, and community inclusion could be enhanced in both design and practice for community-owned projects. This holds for both renewables and other sectors, including mine land repurposing, eco-tourism, and manufacturing. In the REIPPP, alternate financing models that will support a smoother distribution of cash flows to community trusts have been identified as a priority intervention. Nascent examples of community-led projects show that community-led formal ownership can take a considerable time to set up, and that project execution, long-term sustainability, and success rest on a sense of ownership and self-identified need, and requires significant supportive / complementary training and effort concentrated on non-technical aspects. Scaling up and replication may also require institutional reforms, and changes in ownership patterns will depend critically on scaled-up and innovative financing for these novel approaches, alongside the non-technical aspects of project development. For municipalities, clear guidelines on their participation in new models of generation, institutional planning, and grid strengthening will be needed to enable them to participate actively in public ownership. Importantly, municipalities are critical for supporting other models of social ownership effectively (see the section on municipal change management and energy access).

170 Holle Wlokas, 2022, "Framing Theory and Concepts: Reflections on the Role of Academic Research," in South Africa's Contested Transition to Energy Democracy, edited by Megan Davies, Holle Wlokas, Nina Callaghan, and Mark Swilling,Stellenbosch, South Africa: Centre for Sustainability Transitions, http://www0.sun.ac.za/cst/publication/south-africas-contested-transition-to-energy-democracy/.

171 Holle Wlokas, 2015, A Review of the Local Community Development Requirements in South Africa's Renewable Procurement Programme, Cape Town, South Africa: WWF SA.

172 DMRE, 2021, "Independent Power Producers Procurement Programme (IPPPP) Overview" as of 30 June 2021. This figure excludes the enterprise development and socioeconomic development spend in local communities.

173 Fumani Mthembi, "Scaling the Just Transition for Community-Based and Community-Placed Projects," Knowledge Pele, https://www.tips.org.za/images/Scaling_the_Just_Transition_for_community_based_and_community_placed_projects_Fumani_Mthembi_Knowledge_Pele.pdf.

174 In her work, Janet Cherry (2022) found challenges relating to municipal feed-in rules and licensing, formal banking and other institutional hurdles to community-owned renewable energy in Kwazakhele (Janet Cherry, 2022, "At the CORE of the Democratic Energy Transition: A Township-Based Renewable Energy Project" in South Africa's Contested Transition to Energy Democracy, edited by Megan Davies, Holle Wlokas, Nina Callaghan, and Mark Swilling, Stellenbosch, South Africa: Centre for Sustainability Transitions, http://www0.sun.ac.za/cst/publication/south-africas-contested-transition-to-energy-democracy.) Mthembi identifies limitations faced by financiers in supporting community-level just transition projects.

Table 41. Lessons from international coal transition experiences

Priority Area	Method for assessing investment need and data used
Repurposing mining lands and thermal power plants	• Former mining lands hold significant value for future, community-oriented investment use. • The best use of these lands involves assessing their post-mine value, ideally prior to closure. • Special spatial planning can fast-track new investments on former mining lands, with appropriate regulations and stakeholder consultations in place. • Establishing new repurposing entities, or converting coal companies into repurposing entities, allows for innovative financing for mine land re-development. • The right repurposing structure can quickly offset remediation and repurposing costs by developing income strips. • The recycling of coal plant materials can contribute to budget offsets.
Economic diversification	• Past transitions are a patchwork of successes and failures. Factors that increase success include: ▪ Increasing connectivity through infrastructure (including digital) due to the remoteness of many coal mining areas; ▪ Fostering linkages to larger municipal areas or urban conglomerates, which enhances opportunities for trade and productivity; and • Engaging in regional diversification planning to provide the foundation for transition programs to take shape.
Labour and Communities	• Given the scale of the indirect coal workforce in most countries, assistance programmes must consider both direct and indirect labour needs. • A systematic process to mitigate social and labour impacts that starts before any labour transition occurs can result in a more orderly, less stressful, and ultimately lower cost process. • Pre-layoff planning and assistance can prepare the workforce for impending layoffs. • Post-layoff assistance, including temporary income support, can help sustain laid-off labour in a way that results in them staying in the labour market. • Active labour market policies offer services, programmes, and incentives that can encourage and enable re-employment among laid-off workers.
Enabling Conditions	• High-level government coordination is required for successful planning and implementation of a just transition. • Hybrid governance models (bottom-up and top-down) show promise in ensuring early implementation wins and community buy-in. • Creating the right enabling environment for a transition starts with policy and legislative reforms. • Social conflict is better mitigated when genuine stakeholder consultation is applied from the very start.

Source: *JETP-IP Secretariat, 2022*

ANNEXURE D – CALCULATIONS FOR THE NEV SECTOR

Table 42. NEV vehicle projections by scenario

	Total vehicles ('000)					
	S0: reference case (price parity in 2030)		GWS1: price parity in 2027		S2: delayed transition	
	2030	2035	2030	2035	2030	2035
HCV – electric	11	37	17	43	1	12
LCV – electric	258	804	329	873	18	244
Car – electric	544	2252	1018	2727	23	745
Motorbike - electric	206	301	206	301	206	301
SUV - electric	88	396	165	472	4	129
Bus - electric	4	10	5	11	0	3
MBT - electric	42	98	50	106	2	26
Total	**1 153**	**3 898**	**1 790**	**4 534**	**253**	**1 461**

Source: *JETP-IP Secretariat, 2022*

Table 43. NEV sales as a percentage of total vehicle sales by scenario

Scenarios	NEV sales as a percentage of total vehicle sales	
	In 2030	Up to 2030
Transmission		
S1: price parity in 2027	63%	26%
S3: ambitious local vehicle deployment (planned local manufacturing)	35%	22%
S4: conservative local vehicle deployment (planned local manufacturing)	5%	2%
S5: 1 million NEVs by 2030	56%	15%

Source: *JETP-IP Secretariat, 2022*

	Total vehicles ('000)					
	S3: ambitious local vehicle deployment (planned local manufacture)		S4: conservative local vehicle deployment (planned local manufacture)		S5: 1 million NEVs by 2030	
	2030	2035	2030	2035	2030	2035
	11	37	11	37	11	37
	10	560	5	555	222	758
	965	2673	-	1708	598	2307
	236	303	140	283	29	225
	241	549	-	308	108	415
	2	7	0	6	30	30
	9	65	4	60	4	60
	1 474	**4 195**	**161**	**2 958**	**1 003**	**3 833**

Table 44. Assumed NEV price premiums relative to ICE per year (2021 ZAR '000)

NEV	2030	2024	2025	2026	2027	2028	2029	2030
HCV premium	337.94	318.87	299.81	239.85	179.89	119.93	59.96	-
LCV premium	84.42	79.31	74.19	59.35	44.51	29.68	14.84	-
Car premium	106.87	100.45	94.03	75.22	56.42	37.61	18.81	-
Moto premium	15.86	14.42	12.98	10.39	7.79	5.19	2.60	-
SUV premium	98.48	93.39	88.30	70.64	52.98	35.32	17.66	-
Bus premium	552.27	524.16	96.06	396.85	97.63	98.42	99.21	-
MBT premium	98.48	93.39	88.30	70.64	52.98	35.32	17.66	-

Source: *JETP-IP Secretariat, 2022*

Table 45. Additional calculation assumptions

Element	Assumption	Source / explanation
Availability of NEVs	Appropriate vehicles and adequate volumes will be available for each scenario.	• Vehicle numbers, modelled by 2030, are consistent with relevant studies and are informed by engagements with experts. • In some segments, such as the MBT sector, no options are currently available in the market (pilot vehicles will be introduced within the next year) and Toyota (who supplies over 90% of the local market) is not planning to produce or import e-MBTs for the local market.[175] Measures would be needed to ensure the availability of NEVs.
Scenario 5	The 1 million NEVs are apportioned based on the current bus, minibus, LCVs, and private car vehicle parcs.	• Current vehicle parcs.
Charging infrastructure costs	A ZAR4-billion investment is needed to accommodate 1 million NEVs by 2030,	• Private developer
Scenario 5	30% of public-charging infrastructure costs is what the industry suggests is needed to fast-track investments and ensure adequate coverage, including in areas where public charging stations are not likely to be profitable. The remaining investments will be made by the private sector in response to the market.	• Private developer
Charging infrastructure costs	BEV HCV-charging infrastructure: ZAR 1 million / vehicle	• Private developer • Assumes DC fast-charging mostly; numbers would depend on how optimally chargers are utilised • Excludes investments in power generation capacity and / or network upgrades
	BEV LCV charging infrastructure: 5% of the vehicle cost	• Based on MBT charging costs • Assumes DC and AC charging; numbers would depend on how optimally chargers are utilised • Excludes investments in power generation capacity and / or network upgrades.
	BEV car, sports utility vehicle (SUV), and motorbike / scooter-charging infrastructure: 2% of the vehicle cost	• Private developer • Many OEMs offer the home chargers as part of the vehicle price.

[175] Toyota is not incentivised to produce locally. The OEM has indicated that they need a minimum annual demand of 60 000 BEVs (preferably 100 000) to justify producing eMBTs locally. Demand for ICE MBTs is currently around 20 000 per year. New local production is being explored by developers, but these projects are at early stages

Element	Assumption	Source / explanation
	BEV bus-charging infrastructure: ZAR250 000 / vehicle	• Private developer • Assumes DC-fast charging mostly; numbers would depend on how optimally chargers are utilised • Excludes investments in power generation capacity and / or network upgrades
	BEV MBT-charging infrastructure: 5% of the vehicle cost	• Private developer • Assumes DC and AC charging; numbers would depend on how optimally chargers are utilised • Excludes investments in power generation capacity and / or network upgrades

Source: *JETP-IP Secretariat, 2022*

Table 46. Summary of current project and investment pipeline for the next 3-5 years

Projects and Transaction Categories	Description
NEV Auto-Related Projects	NEV Auto projects include assembly, infrastructure, and commercial mobility projects across scoping, pilot, and commercialisation phases for both local and export applications.
NEV Electro- mobility plant	NEV assembly plant located in the Western Cape for the manufacturing of micro-mobility and working vehicles at a conceptual stage
NEV Battery Mineral Supply Chain	NEV battery mineral projects include investments in battery mineral extraction and the develop-ment of precursor materials. Vanadium and manganese present significant export growth opportunities in addition to battery beneficiation. The battery value chain development can potentially enhance the value proposition for OEMs. Incentives for attracting OEMs to commit to the production of new NEV models in South Africa are in progress.
NEV Supply chain Investments	Investments required for the automotive supply chain to transition to NEVs
NEV Transactions[178]	NEV transactions include pilots across delivery logistics and tourism applications incorporating charging infrastructure, along with assembly and manufacturing.
NEV Public Transport	NEV projects for MBTs and buses, potentially at a green SEZ
Associated Infrastructure	Charging and enabling infrastructure investment required to support the rollout of adoption projects
Total Estimate	

176 UNEP (2022), Estimate for Kenyan motorcycle new registrations for 2021, sales per annum, estimated motorcycle stock in Kenya ca. 1,9 million.

177 NAAMSA Export Manual 2022; likely to grow at GDP levels per annum.

178 Figures from various sources and projects. Vehicle figures vary per vehicle type and project stage. Estimates are a combination of current capacity and roll-out demand. Excludes Fleet Vehicle Transition, estimated fleet rental units over last 5 years 55295.8 (source: NAAMSA)

179 Source: Confidential; number of sites is estimated based on current pilot projects and the likelihood of at least 1-2 sites per major city/province.

180 Other bus operators incl. MyCiti, Putco, Gautrain. Major Cities will have at least 1 bus operator. Figures based on inputs from GA.

Estimated Total Investment		Production and vehicle information	Local deployment (NEVs per annum)	
ZAR (US$) billions	Timeline		Low	High
8.5 (0.567)	2022-2026			
3.1*(0.207)	2023-2025 (SKD) 2027-2030 (CKD)	50 000 e-bicycles / e-motorbikes per annum, largely exported (for example, Kenya purchases 291 553[176] per annum)	30 000	50 000
5.1 (0.336)	2022-2027	Cross-cutting: no direct impact on local NEV deployment		
26.5+ (1.8)	2022-2027	First priority: annual e-car exports of 298 020 (229 672 to the EU & UK). Then up to 201 067[177] produced for the local market.	0	201 067
0.405 (0.25)	2022-2026	e-LCV: 90 per partner (170) e-game range vehicles: 30 per annum e-motorcycles: < 10 (pilot), <100 demonstration, >500 commercial per partner e-Van (3-wheel): 200 per annum e-bicycles: 100-500 per annum	1 400	2 800
3.750 (234)	2023-2026	e-MBT: 8 000 per annum production capacity being explored (95 per annum per site, with 1 -4 sites per province/ City).[17] e-Bus: 60 per annum per bus operator (currently only Golden Arrow in Cape Town).[180]	820 (60 e-buses; 760 e-MBTs)	1 760 (280 e-buses; 1 460 e-MBTs)
4.7 (0.296)	2022-2027	Cross-cutting: no direct impact on local NEV deployment		
51.4 (3.0)				

*Based on a 50 000 unit plant with an estimated total project cost of R3 billion plus project development cost of R100 million; Associated infrastructure estimated at 15%; + NEV Supply chain investments are based on findings from TIPS & B&M analyst study (2022) which estimated that the current supply chain investment required to 2035 is about R69 billion.

Source: *JETP-IP Secretariat, 2022*

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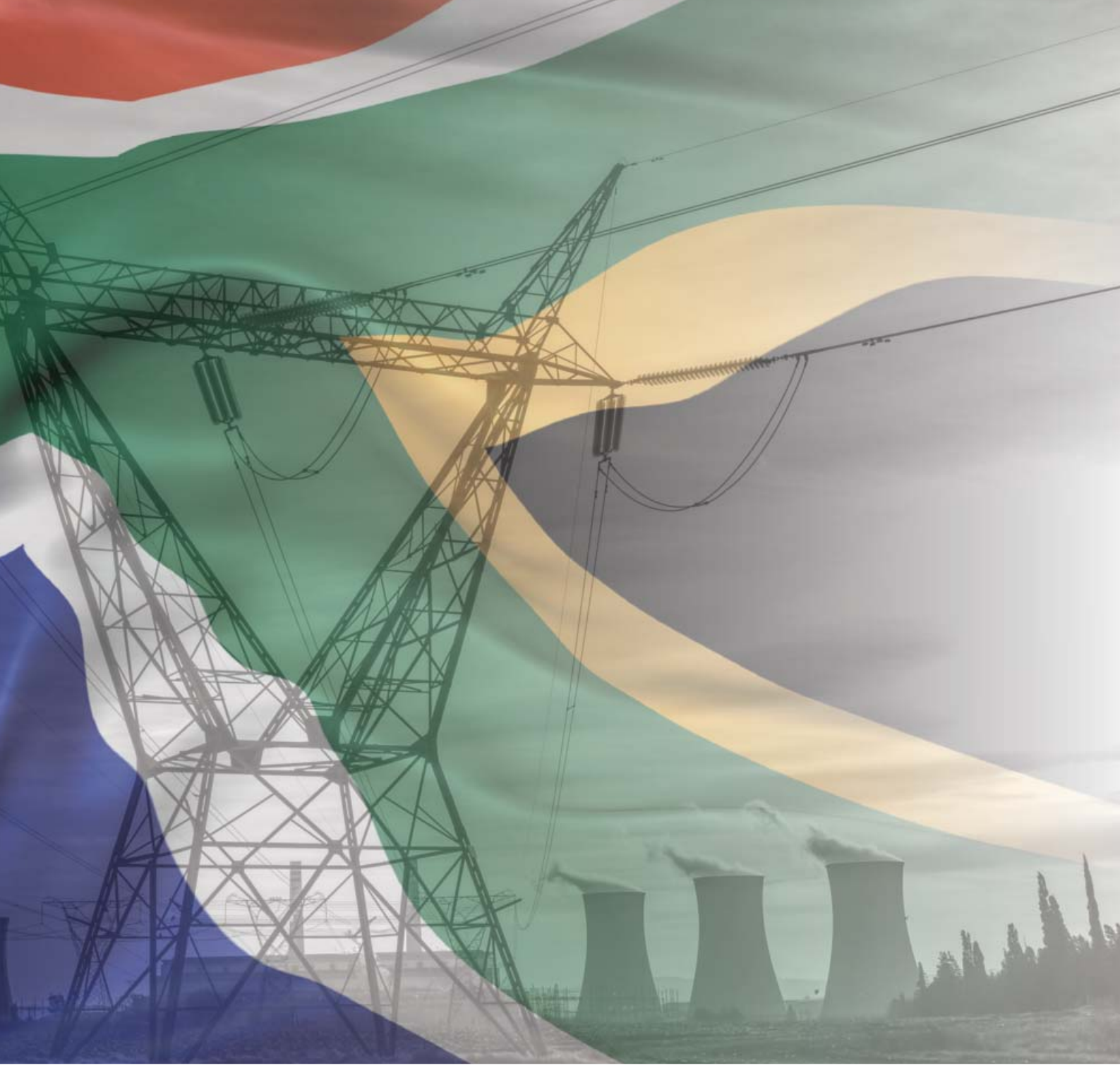

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