

The cover features a white background with large, overlapping circular cutouts. The top-left cutout shows an orange Doosan excavator with its bucket raised against a blue sky with white clouds. The top-right cutout shows a dark silhouette of a high-voltage power line tower against a dark sky. The bottom-left cutout shows a series of power line towers receding into the distance against a sunset sky. The text is positioned in the top-right and middle-right areas.

SOUTH AFRICA
Yearbook
2021/22

Mineral Resources and Energy

Mineral Resources and Energy

The minerals and energy industry is a catalyst for economic growth and development. Reliable supply of energy drives economic activity and growth and as such, it should meet industrial, commercial and household needs. Challenges faced in the sector require all stakeholders to collaborate and work together for the sector to continue being sustainable, competitive and, ultimately, to improve the lives of all South Africans.

The Department of Mineral Resources and Energy (DMRE) is mandated to ensure the transparent and efficient regulation of South Africa's mineral resources and industry, and the secure and sustainable provision of energy in support of socio-economic development. The strategic objective derives from the National Development Plan (NDP), which envisages that, by 2030, South Africa will have a mineral resources and energy sector that promotes economic growth and development, social equity and environmental sustainability.

The NDP envisages that, by 2030, South Africa will have an adequate supply of electricity and liquid fuels to maintain economic activity and prevent economic disruptions, and a mining sector that prioritises the welfare of its human resources and the environment. To give effect to this vision, over the medium term, the DMRE will focus on transforming mining and energy resources, rehabilitating mines and the environment, extending access to electricity, enhancing energy efficiency, and managing nuclear energy in accordance with international commitments.

These focus areas contribute to Priority 1 (economic transformation and job creation) and Priority 5 (social cohesion and safe communities) of government's 2019-2024 Medium Term Strategic Framework.

Transforming mining and energy resources

As the DMRE seeks to accelerate transformation within the mining and energy sectors over the Medium Term Expenditure Framework (MTEF) period, it will aim to monitor and enforce compliance with the Mining Charter. This is expected to be done by conducting 636 social and labour plan verification inspections and economic verification audits on 1 275 mines.

The department's objective of inspecting 4 500 petroleum retail sites and issuing mining rights or permits to a targeted 360 historically disadvantaged South Africans over the period ahead is intended to enforce compliance with regulatory standards and transformation imperatives in the petroleum sector. These and other related activities are expected to result in expenditure of R1.5 billion over the medium term in the Minerals and Petroleum Regulation programme.

To address backlogs in the processing of mining licence applications and to improve efficiency, the department plans to invest in a new IT system through additional allocations of R84.4 million in 2022/23 and R44.5 million in 2023/24. As a result, spending in the Administration programme is set to increase from R625.9 million in 2021/22 to R729.5 million in 2022/23, then decrease to R687.2 million in 2024/25 as the additional funding comes to an end.

Rehabilitating mines and the environment

To promote the health and safety of mine employees and people in surrounding communities, the DMRE will continue to rehabilitate dangerous, derelict and ownerless mining sites. Over the medium term, it aims to rehabilitate 9 mines and seal 120 shafts/holings,

and conduct 3 825 environmental verification inspections. As a result, spending in the Mine Health and Safety Inspectorate programme is expected to increase at an average annual rate of 1.6%, from R235.5 million in 2021/22 to R247.3 million in 2024/25.

Extending access to electricity

Ensuring that all South Africans have access to electricity is a key government priority. The Integrated National Electrification Programme subprogramme in the Mineral and Energy Resources Programmes and Projects programme oversees and manages the financing and implementation of the integrated national electrification programme, manages and coordinates technical audits, and manages annual planning processes such as electrification infrastructure plans. Spending in the Integrated National Electrification Programme subprogramme is expected to increase at an average annual rate of 8.3%, from R5.2 billion in 2021/22 to R6.6 billion in 2024/25.

Transfers to Eskom are expected to increase at an average annual rate of 12.2%, from R2.8 billion in 2021/22 to R4 billion in 2024/25, and transfers to municipalities are expected to increase at an average annual rate of 4.9%, from R2 billion in 2021/22 to R2.3 billion in 2024/25. Although transfers for non-grid connections are expected to decrease at an average annual rate of 0.6%, from R265 million in 2021/22 to R260.2 million in 2024/25, they are expected to enable 45 000 households to be connected through non-grid technology. This decrease is attributed to a high baseline in 2021/22 from a rollover of R32.7 million in that year. A targeted 640 000 households are expected to be connected to the grid over the same period.

The department will review procurement programmes for independent power producers in 2022/23 at a projected cost of R114 million. This is to ensure that additional electricity capacity is procured in line with the integrated resource plan. As a result, spending in the Electricity Infrastructure and Industry Transformation subprogramme in the Mineral and Energy Resources Programmes and Projects programme is set to increase to R120.2 million in 2022/23, before decreasing to R6.5 million in 2024/25.

In August 2021, Eskom announced the completion of Medupi Power Station with all six generation units fully on the grid. This will go a long way in alleviating the pressure on the grid and government remains focussed on ensuring energy security.

Enhancing energy efficiency

The energy efficiency and demand-side management grant enables municipalities to upgrade municipal infrastructure that is not energy efficient, such as replacing street and traffic lights with greener technology. To save a targeted 1.5 terawatt hours of energy over the medium term, allocations to the grant are expected to increase at an average annual rate of 3.2%, from R220.9 million in 2021/22 to R242.5 million in 2024/25.

Managing nuclear energy

The Nuclear Energy Regulation and Management programme accounts for an estimated 11.1% (R3.5 billion) of the department's budget over the medium term, mainly comprising transfers to entities. The South African Nuclear Energy Corporation is allocated R3 billion of this amount, of which R2.3 billion is for operational costs and R644.5 million for the decontamination and decommissioning of old nuclear facilities.

An additional R40 million in 2022/23 is earmarked for preparatory work to procure a multipurpose reactor to replace the 55-year-old SAFARI-1 research reactor, which is approaching the end of its useful life. The reactor is used for research and development, and to manufacture medical isotopes.

The National Radioactive Waste Disposal Institute is expected to receive R153.5 million over the period ahead for its operationalisation while it awaits approval for a radioactive waste disposal licence from the National Nuclear Regulator. It will, in the meantime, begin plans for establishing a centralised interim storage facility, which is planned to be operational by 2030.

The recovery plan for mining and energy sectors

The Mining and Energy Recovery Plan intends to restore and restructure the industry within the context of a renewed, sustainable minerals and energy complex pivotal in the reindustrialisation of the country, while transforming the mining and energy industry. The plan aims to restore business confidence, stimulate investment as well as safeguard and create jobs.

COVID-19 has had an impact on the petroleum sector as a whole. The destruction in the demand of jet fuel is making the operations of refineries very challenging. The retailers have had to maintain operations when demand was below 60% of normal demand. The department continues to engage and seek ways of mitigating challenges caused by COVID-19.

The Small-scale Mining Support Programme, as part of the Mining Sector Economic Recovery Plan, will focus on the implementation of the Small Scale Mining Framework; forming partnerships with aligned departments and entities to leverage on their resources and experiences for maximum impact; widen reach by providing technical, social regulatory support for community-based projects; as well as develop an artisanal and small scale mining policy.

Interventions to drive import substitution industrialisation within the ferrochrome sector are underway – the DMRE has already drafted a paper on a set of interventions to revive and increase the competitiveness and sustainability of the ferrochrome sector. The paper will be presented to Cabinet for approval. The interventions will ensure maximum benefit from the country's mineral wealth, save jobs and place the sector on a new growth path.

The Council for Geoscience (CGS) has intensified the identification and drilling of selected mineral target areas for quantification of priority minerals deemed critical for development, including input to pharmaceutical applications, food security, industrialisation and energy security.

A reconnaissance assessment of the Molteno-Indwe coalfield in the Eastern Cape and the Ga-Ramokoka Carbonatite Complex in the North West Provinces, respectively, has been concluded. Preliminary results in the Molteno-Indwe coalfields show an estimated economically exploitable coal tonnage of 320 million tonnes (t), with a value beneath the ground of R122 billion, using a conservative estimate of R350 per t.

The Ga-Ramokoka Carbonatite Complex hosts numerous minerals that span an estimated tonnage of Rare Earth Elements at 470 000 t, phosphates at 300 000 t and copper 30 000 t. The potential value of a suite of minerals in the carbonatite is estimated at R1.4 billion.

Mintek is working with industry and international researchers to develop a world-class smelter complex to exploit the Bushveld Complex

deposits, which constitute the world's largest unexploited repository of iron, titanium and vanadium. This will entrench South Africa's position as the leading supplier of vanadium and titanium, and funding of nearly R120 million has been secured for this initiative.

The South African iron and steel sector has been struggling with uncompetitive costs. One of the drivers is that up to 50% of the iron ore that is mined is discarded as fine and waste material. Mintek has developed technology to beneficiate this low grade and fine material and is working with industry players to implement the solution and significantly impact the current uncompetitive cost structure. It has also developed fuel-cell catalysts and membranes are currently being commercialised with the aim of supplying the global market.

As part of gas industrialisation, government has embarked on the Liquefied Petroleum Gas (LPG) Expansion Initiative. LPG is the most efficient form of energy for cooking, space heating as well as water heating. Plans are under way to double consumption of LPG in South Africa over the next five years. This will alleviate pressure on the Eskom power supply. To ensure orderly development, all role players in the value chain will have to be registered with the DMRE. The DMRE will work with the Department of Trade, Industry and Competition to localise the manufacturing of gas cylinders and appliances.

A resolution has been taken to appoint the CGS as the implementing state agency of the Carbon Capture Utilisation Storage (CCUS) project, previously implemented by the South African National Energy Development Institute (SANEDI), a project co-funded by the South African Government and the World Bank. Concerns around climate change and the just transition have necessitated a deliberate investment in research for clean coal technology that considers carbon capture, sequestration and utilisation in order to reduce the nation's carbon footprint, in accordance with South Africa's ratification of international climate change protocols.

In June 2020, Cabinet approved the request to merge three subsidiaries of the Central Energy Fund (CEF). The decision paves the way for the formation of the National Petroleum Company (NPC), comprising of iGas, Strategic Fuel Fund and Petroleum Oil and Gas Corporation of South Africa (PetroSA). The CEF Board was mandated to manage the process and ensure the establishment of the NPC within six months. The CEF has appointed a professional restructuring company specialising in mergers to investigate the most viable model for the establishment of the NPC.

Growth supported by secure and affordable energy supply

South Africa continues to pursue an energy mix as espoused in the country's energy blueprint, the Integrated Resource Plan. Even though the country and the rest of the world are increasingly under pressure to mitigate against climate change, South Africa's energy capacity is largely dependent on fossil fuels. Government is committed to a just transition and has begun investing in clean technologies to ensure transition from high to low carbon economy, while ensuring security of energy supply.

In 2020, government committed to interventions that would address electricity supply shortages. As of July 2021, government had managed to advance the following:

- Connecting 1 200 megawatts (MW) to the grid from projects signed under Bid Window 4 of the Independent Power Producers (IPP) Programme, with the remaining 1 000 MW planned to connect by

not later than December 2021.

- Approving eight preferred bidders with three recommended for appointment subject to them meeting specific value for money conditions. This initiative will deliver 1 995 MW of power into the grid within the next 12 to 18 months.
- Eskom has procured 200 MW from IPP under the Short-Term Power Purchase Programme.
- Issuing a request for proposals for 2 600 MW from wind and solar energy technologies, as part of Bid Window 5.
- Amending electricity regulations on new generation capacity and clarifying the requirements for municipalities when undertaking the process to develop or buy power from IPPs.
- Amending and gazetting Schedule 2 of the Electricity Regulation Act, 2006 (Act 4 of 2006) – increasing the threshold for registering embedded generation from one to 10 MW.
- National Energy Regulator of South Africa (NERSA) has to date registered 200 projects under one MW, totalling 94 MW and licensed five projects above one MW. The mining industry is also taking steps towards self-generation – Goldfields will soon commence with construction of its licenced 40 MW.

The DMRE planned to issue additional requests for proposals as follows:

- 2 600 MW from renewable energy around August 2021.
- 513 MW from storage around August 2021.
- 1 500 MW from coal around December 2021.
- 3 000 MW from gas around December 2021.
- 1 600 MW from renewable energy around January 2022.

In line with Sustainable Development Goal 7 of achieving universal access to affordable, reliable, sustainable, and modern energy by 2030, government plans to connect 180 000 additional households in 2021/22, following 166 886 households connected in 2020/21.

Creating an enabling environment through investor-friendly legislation

South Africa is centered around a legislative framework that captures, among others, the country's transformative agenda, environmental commitment to society, as well as setting both the minerals and energy sectors on a growth path. To ensure this, government has:

Finalised the amendment of the Gas Amendment Bill which was introduced to parliament on 30 April 2021. This Bill aims to unlock investment into the gas sector and facilitate the development of gas infrastructure.

Amended the blending requirements on biofuels and expanded the definition to include second and third generation biofuels.

Finalised amendments of the Clean Fuels Regulations, which aim to ensure a reduction of the sulphur content in standard grade diesel from 50 to 10 parts per million.

Gazetted the LPG Strategy, which seeks to address a suite of challenges prohibiting access and affordability of this energy source.

Approved the Upstream Petroleum Resources Development Bill.

Approved the NNR Amendment Bill, which is expected to be tabled in Parliament during the 2020/22 financial year.

Work is at an advanced stage with the drafting of the Radioactive Waste Management Fund Bill, which aims to enforce the polluter pays principle for all nuclear waste generators.

Legislation

The Acts that regulate the mining, minerals and energy sectors include the:

- Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002), which provides the regulatory framework for equitable access to, and the sustainable development of mineral resources and related matters;
- Mine Health and Safety Act, 1996 (Act 29 of 1996), which governs mine health and safety;
- National Energy Act, 2008 (Act 34 of 2008), which empower the Minister of Mineral Resources and Energy to plan for, and ensure the security of supply for the energy sector;
- Petroleum Products Act, 1977 (Act 120 of 1977), which regulates the petroleum industry at manufacturing, wholesale and retail levels; and
- Electricity Regulation Act, 2006 (Act 4 of 2006), which establishes a national regulatory framework for the electricity supply industry, including registration and licensing.

Budget

For the 2021/22 financial year, the DMRE was allocated R9.2 billion. Transfers and subsidies to public entities and municipalities account for an estimated 80.7% (R26.2 billion) of the department's planned spending over the MTEF period. Total expenditure is expected to increase at an average annual rate of 6.6%, from R9.2 billion in 2021/22 to R11.2 billion in 2024/25. This is mainly due to increased spending through the integrated national electrification programme grant as previous reductions imposed on the grant come to an end in 2022/23.

The department's regulatory and oversight work is labour intensive. It requires inspections to be conducted to ensure that mining companies and petroleum licence holders comply with legislative requirements, and that electricity connections are verified through the integrated national electrification programme. Expenditure on compensation of employees accounts for an estimated 10.1% (R3.2 billion) of the department's budget over the medium term. To remain within government's expenditure ceiling for compensation of employees, the number of personnel in the department is expected to increase to 1 663 in 2024/25.

Entities

Central Energy Fund

The CEF's mandate is to research, finance, develop and exploit appropriate energy solutions to contribute to South Africa's security of energy supply.

Through its subsidiaries, the CEF is also mandated to finance and promote the acquisition of coal; exploit coal deposits; manufacture liquid fuel, oil and other products from coal; market these products; and acquire, generate, manufacture, market, distribute or research any other form of energy. The fund's subsidiaries are the Petroleum Oil and Gas Corporation of South Africa (PetroSA), the South African Gas Development Company (iGas), Petroleum Agency South Africa, Oil Pollution Control South Africa, the Strategic Fuel Fund, African

Exploration Mining and Finance Corporation, Eta Energy Solutions and CCE Solutions. Over the medium term, the entity will continue to implement its long-term strategic vision, which extends to 2040.

This involves rolling out long-term projects such as the extension of the Vlakfontein coal mine and restoring the Mossel Bay gas-to-liquid refinery to full capacity, accelerating research and development, and investing in infrastructure in exploration activities, pipelines and tanks. It will also seek to finalise the acquisition of a 30% stake in the Republic of Mozambique Pipeline Company's pipeline, and rationalise PetroSA, iGas and the Strategic Fuel Fund to establish the National Petroleum Company of South Africa.

Total expenditure is expected to increase at an average annual rate of 17%, from R23.4 billion in 2021/22 to R37.4 billion in 2024/25. This relatively high increase is mostly due to increased oil and gas production. Spending on goods and services accounts for an estimated 95.9% (R103.8 billion) of total expenditure over the medium term, mostly for costs related to oil and gas production.

The fund expects to generate 95.2% (R102.7 billion) of its revenue over the MTEF period through commercial activities and the balance through other sources such as dividends and interest revenue. Total revenue is expected to increase at an average annual rate of 17.3%, from R23.3 billion in 2021/22 to R37.7 billion in 2024/25, also as a result of the projected increase in production and sales in the oil and gas sectors.

Council for Geoscience

The CGS was established in terms of the Geoscience Act, 1993 (Act 100 of 1993), to promote the search for and exploitation of any mineral in South Africa. It is mandated to generate, compile, curate and publish world-class geoscience knowledge products, provide geoscience-related services to the South African public and industry, and render advisory services related to geohazards and geo-environmental pollution.

Over the medium term, the council will continue to implement the geoscience national mapping programme, which entails conducting research and analyses, migrating and digitising data, and procuring key geoscientific equipment and infrastructure. Research that the council plans to conduct over the MTEF period includes: assessing geochemical anomalies in the Giyani, Orange River pegmatite belt and Kenhardt areas for precious and base metals; assessing alternative energy sources such as geothermal energy and battery minerals; investigating carbon capture, use and storage; assessing groundwater potential; determining environmental vulnerability in various areas; monitoring legacy mines for asbestos, dust and ground stability; and evaluating the impact of environmental effluence and determining suitable mitigation measures. The procurement of highly specialised equipment – such as 2 multipurpose drill rigs at an estimated combined cost of R50 million – and critical expert resources is expected to enhance and accelerate the council's ability to conduct this research over the medium term.

Total expenditure is expected to be R2 billion over the medium term, with compensation of employees accounting for an estimated 58.8% (R1.2 billion) of this amount as the entity requires highly specialised skills to fulfil its mandate. Spending on goods and services, mostly for project costs, accounts for a projected 37.3% (R739.4 million) of expenditure over the MTEF period.

The council is set to derive 82.6% (R1.6 billion) of its revenue over the medium term through transfers from the department and the balance through fees charged for the provision of geoscientific mapping and research services.

Mine Health and Safety Council

The Mine Health and Safety Council is mandated to advise the Minister of Mineral Resources and Energy on occupational health and safety at mines, develop legislation, conduct research and liaise with other statutory bodies.

Over the medium term, the council's key strategic focus will be on enhancing mineworker safety by disseminating research through materials such as handbooks, e-books, brochures and videos. As such, over the MTEF period, it aims to bolster these efforts by offering 18 programmes to promote safety awareness and promote 15 council programmes to improve workplace safety. To expand its research capabilities in fires and explosives risk, the council plans to finalise the transfer and upgrade of the Kloppersbos research facility over the medium term from the Council for Scientific and Industrial Research.

Total expenditure is expected to amount to R376.7 million over the MTEF period. Spending on compensation of employees accounts for 54.9% (R205.7 million) of this amount, while spending on goods and services, mainly for research activities, accounts for 37.5% (R141.2 million).

The council is set to derive 94.3% (R360.7 million) of its revenue over the MTEF period through levies from mining companies, in accordance with the Mine Health and Safety Act, 1996 (Act 29 of 1996). Transfers from the department account for an estimated 3.9% (

Mintek

Mintek's mandate is to maximise the value derived from South Africa's mineral resources through, among other things, research and development, technology transfer and the creation of an enabling environment for the establishment and expansion of mineral industries. To this end, Mintek develops appropriate, innovative technology for transfer to industry, and provides the industry with test work, consultancy, analytical and mineralogical services.

Over the medium term, the entity will focus on implementing its new operational model and furthering its research in key strategic programmes. These include establishing a local rare earth element mining and manufacturing industry, developing rapid diagnostic medical test kits, expanding fuel cell manufacturing infrastructure across the fuel cell value chain, and recycling e-waste. Another major project over the medium term is the procurement, design and construction of a manufacturing facility to conduct ferro alloy research. Over the MTEF period, the entity plans to register 3 intellectual property licences and 12 patents, and publish 103 journal papers and 115 conference papers.

As Mintek relies on personnel with scarce and highly specialised skills to fulfil its mandate, an estimated 45.9% (R898.1 million) of its budget over the medium term is allocated to compensation of employees. To complement this expenditure, the entity will continue to invest in furthering the academic qualifications of its researchers and providing the necessary platforms to gain valuable experience. Spending on goods and services is expected to amount to R708.2 million over the MTEF period, which includes specialised service fees to produce research.

Expenditure on the rehabilitation of ownerless and derelict asbestos mines and holdings is expected to amount to R326 million over the MTEF period, although the number of mine rehabilitation projects the entity plans to undertake may change, which will affect the final cost. Total expenditure is expected to decrease at an average annual rate of

4.5%, from R724.6 million in 2021/22 to R632.1 million in 2024/25. The entity expects to derive 49.8% (R985.2 million) of its revenue over the medium term through transfers from the department and 47.2% (R860 million) through commercial activities. Revenue from commercial activities is expected to decrease over the medium term due to the decrease in commodity demand and prices, which is expected to lead to a slowdown in project activity.

To mitigate the impact of this expected decrease, the entity plans to develop and implement a model to expand its commercial revenue generation streams to augment and strengthen commercial activities or partnerships while sustaining its contribution to national developmental imperatives.

National Energy Regulator of South Africa

The NERSA is mandated to regulate the electricity industry, the piped gas industry and the petroleum pipelines industry. In line with its mandate, the regulator's focus over the medium term will continue to be on ensuring the security, accessibility and affordability of energy supply, and fair competition and regulatory certainty in the energy sector. It will do this by setting and approving energy tariffs, licensing and registering energy service providers, and monitoring and enforcing compliance with regulations. To support these activities, total expenditure is expected to increase at an average annual rate of 3.7%, from R384.5 million in 2021/22 to R429.1 million in 2024/25.

As the regulator's work requires personnel with scarce and specialised skills, compensation of employees accounts for an estimated 72.6% (R907.4 million) of total spending over the medium term. Spending on goods and services accounts for 27.4% (R327.2 million), mainly on activities required to fulfil the regulator's mandate, such as advisory services and travel and subsistence.

The regulator generates its revenue mainly through the prescribed licence fees and levies it imposes on the electricity, piped gas and petroleum pipeline industries to recover the costs involved in administering and regulating them, and through interest earned on investments. Total revenue over the medium term is expected to amount to R1.2 billion, increasing at an average annual rate of 8.7%.

National Nuclear Regulator

The NNR regulates safety standards for nuclear activities in South Africa. This includes establishing safety standards and regulatory practices, ensuring nuclear installations are safe by enforcing regulatory control, granting nuclear authorisations, conducting compliance inspections, and ensuring that provisions are in place for nuclear emergency planning.

Over the medium term, the regulator will focus on evaluating the application for the life extension of Koeberg nuclear power station, as well as its ongoing regulatory activities such as inspections, investigations, surveillance, environmental monitoring and sampling at nuclear technology facilities. In this regard, it plans to undertake 105 nuclear power plant inspections over the medium term. The regulator will continue to advance regulatory research and development, and teaching and learning, and provide technical support to the industry through state-of-the-art irradiation and analysis equipment for researchers and students to use, including analytical and inspection laboratories and computer modelling facilities.

Because the regulator relies on personnel with highly specialised

skills to fulfil its mandate, compensation of employees is expected to account for 67.5% (R741.7 million) of total spending over the medium term. Total expenditure is expected to increase at an average annual rate of 7.1%, from R307.1 million in 2021/22 to R377.5 million in 2024/25.

The regulator expects to generate 71.3% (R784.3 million) of its revenue over the MTEF period from the payment of authorisation fees by licenced operators, and derive 13.6% (R143.3 million) through transfers from the department.

National Radioactive Waste Disposal Institute

The National Radioactive Waste Disposal Institute manages the disposal of radioactive waste at national level. The institute is responsible for the long-term care and disposal of radioactive waste in a safe, technically sound, socially acceptable, environmentally responsible and economically feasible manner.

Over the medium term, the institute will focus on developing security upgrade plans to store and dispose of radioactive waste, drafting a national waste inventory report, conducting inspections to ensure that all disposal waste packages meet the waste acceptance criteria, and developing an environmental impact assessment report for the long-term storage of spent nuclear fuel at the centralised interim storage facility. It plans to finalise the transfer of the Vaalputs low-level waste disposal function from the South African Nuclear Energy Corporation over the medium term, as well as the allocation of the nuclear installation licence from the National Nuclear Regulator. This will allow it to become the licence holder and generate its own revenue by providing waste-disposal and related services to waste generators.

An estimated 81% (R128.1 million) of the institute's spending over the medium term is set to go towards compensation of employees and 16.9% (R26.4 million) towards goods and services, mostly for the Vaalputs function shift and nuclear installation licence, research and development activities, and the provision of radioactive waste management education to the public. Total expenditure is expected to increase at an average annual rate of 2.2%, from R50.9 million in 2021/22 to R54.3 million in 2024/25.

The institute expects to derive 96.9% (R153.5 million) of its revenue over the MTEF period through transfers from the department.

South African Diamond and Precious Metals Regulator (SADPMR)

The SADPMR's core functions include facilitating the buying, selling, exporting and importing of diamonds through its Diamond Exchange and Export Centre, and regulating the acquisition, possession, smelting, refining, beneficiation, use and disposal of precious metals.

Over the medium term, the regulator will focus on implementing its mandate, which involves issuing licences and permits, conducting diamond valuations, conducting compliance inspections, and facilitating tenders for rough and polished diamonds. These activities will ensure competitiveness, sustainable development and job creation in the diamond and precious metals industry while ensuring that all compliance and legislative requirements are met.

The work of the regulator is labour intensive as personnel are required to perform compliance inspections and audits. As such, compensation of employees accounts for an estimated 75.5% (R266.8

million) of spending over the medium term. Total expenditure is expected to increase at an average annual rate of 3.4%, from R111.7 million in 2021/22 to R123.5 million in 2024/25.

Transfers from the department are expected to account for 54.2% (R192 million) of total revenue over the medium term, while fees – mostly for various licences and permits – are expected to generate 43.5% (R159.7 million) of total revenue. Revenue is expected to increase at an average annual rate of 4.3%, from R110.5 million in 2021/22 to R125.2 million in 2024/25.

South African National Energy Development Institute

The SANEDI's mandate is to direct, monitor and conduct applied energy research and development, and demonstrate and deploy specific measures to promote the uptake of green energy and energy efficiency in South Africa.

Over the medium term, the institute will continue to focus on projects that support sustainable energy, renewable energy technologies and smart grid projects. This focus will be applied to three main areas: climate change and decarbonisation, service delivery within the municipal environment, and knowledge and technological convergence. Through an increased focus on commercialisation, the institute will seek to scale the impact of its innovations.

Total expenditure is expected to amount to R307.8 million over the medium term, with goods and services accounting for a projected 49.1% (R154.3 million) of this amount, mostly for project-specific funding. Expenditure on compensation of employees is expected to increase at an average annual rate of 4.3%, from R43.1 million in 2021/22 to R49 million in 2024/25. The institute expects to derive 94.8% (R288.1 million) of its revenue over the medium term through transfers from the department and other sources, such as donor funding and funding from the Department of Science and Innovation for energy research.

South African Nuclear Energy Corporation

The NECSA derives its mandate from the Nuclear Energy Act, 1999 (Act 46 of 1999), the Nuclear Energy Policy (2008), and directives conferred on it by the Minister of Mineral Resources and Energy. The corporation's subsidiaries include international fluoro-chemical producer Pelchem; radiopharmaceutical and radioisotope producer NTP Radioisotopes; and Pelindaba Enterprises, which specialises in the manufacturing of power-generation components.

It also operates the South Africa Fundamental Atomic Research Installation-1 nuclear reactor for research, technology development and the production of radioisotopes. The corporation is responsible for the decommissioning and decontamination of nuclear facilities and contributes to South Africa's obligations in terms of international nuclear treaties and agreements.

Over the medium term, the corporation will continue to focus on increasing medical radioisotope production and radiation applications used locally and internationally to diagnose and treat cancer and produce fluorochemical products. It will work on the replacement for the SAFARI-1 nuclear reactor, which is expected to reach the end of its useful lifespan in 2030. It will also continue to provide support for nuclear power generation, and the decommissioning and decontamination of disused nuclear facilities.

Total expenditure is expected to amount to R7.4 billion over the MTEF period. Spending on goods and services accounts for an

estimated 49.1% (R3.6 billion) of this amount, mainly for the production of medical radioisotopes. Compensation of employees accounts for an estimated 45.6% (R3.5 billion), increasing at an average annual rate of 6.3%, from R1.1 billion in 2021/22 to R1.3 billion in 2024/25.

The sale of nuclear technology products, chemical products and nuclear engineering services is expected to account for 56.4% (R4.3 billion) of the corporation's revenue over the medium term, with transfers from the department accounting for an estimated 40.3% (R3 billion). Revenue is expected to increase at an average annual rate of 3.2% as the entity recovers from lower sales due to the impact of the COVID-19 pandemic, from R2.4 billion in 2021/22 to R2.6 billion in 2024/25.

State Diamond Trader

The State Diamond Trader promotes equitable access to and local beneficiation for the country's diamonds. The trader is mandated to conduct research, develop a client base, contribute to the growth of the local diamond beneficiation industry, and develop efficient means of marketing diamonds not suitable for local beneficiation.

Over the medium term, the trader will focus on growing the local diamond beneficiation industry and increasing the sale of rough diamonds to historically disadvantaged South Africans. It plans to do this by acquiring up to 10% raw or unprocessed diamonds from all legitimate producers in South Africa for sale to registered customers – in an equitable manner – through an application and approval process. This includes Alexkor, which sets aside 10% of its rough diamond production to be procured by the State Diamond Trader.

Total expenditure is expected to amount to R1.4 billion over the medium term, with 93.1% (R1.4 billion) earmarked for goods and services, mostly for the procurement of diamonds. Compensation of employees is expected to account for 6.6% (R51.9 million) of total spending over the period ahead.

The trader generates revenue through the sale of rough diamonds. Revenue is expected to increase at an average annual rate of 2.1%, from R723.6 million in 2021/22 to R769.4 million in 2024/25.

Resources

Mining Qualifications Authority

The future of mining in the country depends largely on the successful implementation of skills development initiatives. Particular focus is placed on artisan and artisan aid, as well as other technical skills. The authority was established as a sector education and training authority. It facilitates the development of appropriate knowledge and skills in the mining, minerals and jewellery sectors.

Shale gas

Shale gas is a natural gas that is occurring and can be extracted from shale. The natural gas, which is imbedded in the Karoo Basin, can be used for energy production. The CGS and PetroSA are undertaking shale gas research that unlocks the unknowns and assumptions about shale gas occurrence in the country. The project will build scientific skills in shale gas exploration and exploitation as this resource has not been exploited in the country.

The programme is funded by the DMRE and will assist government in making well informed decisions about the future of shale gas in South Africa.

The programme aims to collect and review new geological information to define an environmental baseline, to assess the amount of recoverable gas mainly from the Whitehill and Prince Albert Formations, to cover various geo-environmental impacts like ground water dynamics with possible contamination, and monitor potential seismic interferences.

The Shale Gas Project will serve as a baseline study for future shale gas research work and play a vital role in review of petroleum exploration and exploitation regulations.

Reserves

Gold

The large-scale gold mines operating in South Africa include the record-setting TauTona Gold Mine, which extends 3.9 km underground. TauTona means “great lion” in Setswana. South Africa accounts for 10.5% of the world’s gold reserves. The Witwatersrand Basin remains the world’s largest gold resource.

Coal

Government has emphasised the importance of ensuring a sustainable local coal supply for the country’s energy requirements. This commodity currently plays a vital role in meeting South Africa’s primary energy needs, as well as in the economy in general. It is recognised that coal contributes to the economy, not only to supply energy, but through the generation of export revenue, contributing to the GDP and employment.

Platinum group metals (PGMs)

Platinum, palladium, rhodium, osmium, ruthenium and iridium occur together in nature alongside nickel and copper. Platinum, palladium and rhodium, the most economically significant of the PGMs, are found in the largest quantities.

South Africa is the world’s leading platinum and rhodium producer, and the second-largest palladium producer after Russia. South Africa’s production is sourced entirely from the Bushveld Complex, the largest known PGM resource in the world.

Platinum

South Africa accounts for over 80% of known global reserves of the PGMs. The Merensky Reef, stretching from southern Zimbabwe through to the Rustenburg and Pretoria regions, is the centre of platinum mining in South Africa, playing host to companies such as Rustenburg Platinum Mines and Bafokeng Rasimone Platinum Mines.

Palladium

South Africa is the world’s second-largest palladium producer. All of South Africa’s production is sourced from the Bushveld Igneous Complex, which hosts the world’s largest resource of PGMs. Palladium, together with platinum, is more abundant than any of the other PGMs.

Ferrous minerals

These are the largest new investments in the manganese industry in the country, and support government’s drive to increase the beneficiation in South Africa.

Copper

Palabora, a large copper mine, smelter and refinery complex managed by the Palabora Mining Company in Limpopo, is South Africa’s only producer of refined copper

Useful by-product metals and minerals include zirconium chemicals, magnetite, nickel sulphate and small quantities of gold, silver and platinum.

Manganese

South Africa has significant proven manganese reserves, but the exploitation of the mineral has not reflected its development potential.

Industrial minerals

Of the hundreds of producers of industrial minerals in South Africa, almost half are in the sand and aggregate sector. There are producers of clays (brickmaking), limestone and dolomite, dimension stone, salt and silica in South Africa. Bulk consumption of industrial minerals is realised in the domestic market, as most are low-priced commodities and sold in bulk, making their economic exploitation highly dependent on transport costs and distance to markets.

Geology

South Africa has a long and complex geological history. The preservation of so much Archaean geology, dating back more than 2 500 million years, has resulted in the Archaean Witwatersrand Basin, as well as several greenstone belts being preserved.

Mining production

South Africa has long been considered a regional and global mining powerhouse, with more than 90% of the platinum group metals. South Africa has been engulfed by a series of political shocks and economic underperformance that have taken a significant toll on its position as Southern Africa’s leader in the extractives industry.

Amid a backdrop of recession and allegations of corruption, South Africa faces the challenges associated with an aging mining sector. Some concerns exist around the pace of transformation in the mining and minerals industry. Government has published a new Mining Charter aimed at strengthening its effectiveness, while considering the realities facing the industry.

Energy

Guided by the National Energy Act of 2008, government’s responsibility is to ensure that diverse energy resources are available in sustainable quantities and affordable prices to support economic growth.

Government is committed to extending access to electricity and enhancing energy efficiency, managing nuclear energy in terms of international commitments and diversifying the energy generation mix.

The NDP proposes that gas and other renewable resources like wind, solar and hydroelectricity will be viable alternatives to coal and will supply at least 20 000 MW of the additional 29 000 MW of electricity needed by 2030. Other recommendations in the NDP include diversifying power sources and ownership in the electricity sector, supporting cleaner coal technologies, and investing in human and physical capital in the 12-largest electricity distributors.

Goals beyond 2020 include contracting more than 20 000 MW

of renewable energy, including an increasing share from regional hydroelectricity. South Africa has committed to attain substantial reductions in carbon dioxide emissions by 2025.

The country supports research, technology development and special measures aimed at environmentally sustainable economic growth.

National Strategic Fuels Stock Policy

The National Strategic Fuels Stock Policy sets out the framework for the storage of fuel stock by government and the industry. It aims to ensure uninterrupted supply of petroleum products throughout South Africa by providing adequate strategic stocks and infrastructure such as storage facilities and pipeline capacity.

Strategic stocks are to be used during declared emergencies. The Minister of Mineral Resources and Energy will have the power to decide when a shortage of fuel and oil is at such a level to warrant an emergency.

National Liquid Petroleum Gas Strategy

The strategy’s main objectives are to provide access to safe, cleaner, efficient, portable, environmentally friendly and affordable thermal fuel for all households, and to switch low-income households away from the use of coal, paraffin and biomass to LPG.

The strategy highlights options that could be adopted for the orderly development of the LPG industry in South Africa to make LPG an energy carrier of choice for thermal applications. LPG is considered one of the safest, cleanest and most sustainable energy sources.

Gas Utilisation Master Plan (GUMP)

The GUMP scope includes the development of gas pipeline infrastructure for the country’s needs and to connect South Africa with African countries endowed with vast natural gas resources.

The GUMP is a roadmap which analyses the potential and opportunity for the development of South Africa’s gas economy and sets out a plan of how this could be achieved. A key objective of the GUMP is to enable the development of indigenous gas resources and stimulate the introduction of a portfolio of gas supply options. The Gas to Power Programme will provide a market for a potential supply of gas. It also provides long-term gas demand sinks for future indigenous gas supplies.

National building standards

Energy-efficient regulations for new buildings form part of the deliverables of South Africa’s National Energy Strategy to strengthen standards and regulations for energy efficiency. The energy-efficient regulations apply to residential and commercial buildings, places of learning and worship, certain medical clinics and other categories of building.

The regulations make it compulsory for all new buildings to be designed and constructed to a standard that makes it possible for the user to minimise the energy required to meet the functional requirements. This will save energy significantly, which will relieve pressure on the electricity supply grid.

In addition to temperature regulations, all buildings will also have to be fitted with renewable energy water-heating systems, such as solar systems, which also have to comply with South African national standards.

Southern African Power Pool (SAPP)

The SAPP was created with the primary aim to provide reliable and economical electricity supply to the consumers of each of the SAPP members, consistent with the reasonable use of natural resources and the effect on the environment.

The SAPP allows the free trading of electricity between the Southern African Development Community (SADC) member countries, providing South Africa with access to the vast hydropower potential in the countries to the north, notably the Congo River (Inga Falls).

Electricity

As part of the Integrated National Electrification Programme, which aims to extend access to electricity to all households across South Africa, about 590 000 households are expected to be connected to the electricity grid over the medium term.

A further 20 000 households per year over the same period would be provided with non-grid (mainly solar) electrification systems. Government planned to develop an electrification master plan to inform the roll-out of electrification connections for universal access.

Integrated National Electrification Programme

Through the Integrated National Electrification Programme, the DMRE is responsible for assisting municipalities with funding for implementation of electrification projects so that universal access to electricity is reached by 2025. Beyond reaching universal access to energy for all and addressing the electrification backlog, it is vital that policy guidelines are adhered to when implementing electrification projects through the INEP.

Biofuel

The biofuels industry in South Africa, the continent's biggest agricultural producer, has been held back by an inadequate regulatory regime and concerns that biofuels would hurt food security and affect food prices.

Canola, sunflower and soya are feedstock for biodiesel, while sugarcane and sugar beet are feedstock for ethanol.

Maize, South Africa's staple food, will not be used in the production of biofuels to ensure food security and control high prices. The biofuels sector has strong linkages to agriculture, manufacturing and distribution, and has the potential to create substantial numbers of labour-intensive jobs in the agriculture sector in particular.

In addition, second generation biofuel technology can also contribute to South Africa meeting its renewable energy targets sustainably.

In May 2021, Saudi-based ACWA Power announced that it had secured R11.6 billion funding for the Redstone Concentrated Solar Power Plant in the Northern Cape.

The plant is part of South Africa's major infrastructure projects and the largest renewable energy investment in the country. Redstone plant is set to produce 100 MW of renewal energy that is expected to be delivered at the end of 2023, which will reliably deliver a stable electricity supply to more than 200 000 households.

Hydropower

Energy from water can be generated from waves, tides, waterfalls and rivers, and will never be depleted as long as water is available. South Africa has a mix of small hydroelectricity stations and pumped-water storage schemes.

South Africa has entered a treaty for the development of the Grand Inga Project in the Democratic Republic of Congo (DRC), with some of the power intended for transmission to South Africa across the DRC, Zambia, Zimbabwe and Botswana. The regional development drivers are compelling, since there is very little energy trade between these countries, due to the lack of infrastructure. The potential for intra-SADC trade is huge as it could open economic trade.

Solar power

Most areas in South Africa average more than 2 500 hours of sunshine per year, and average daily solar-radiation levels range between 4.5 kilowatt-hours per square metre (kWh/m²) and 6.5 kWh/m² in one day.

The southern African region, and in fact the whole of Africa, has sunshine all year round. The annual 24-hour global solar radiation average is about 220 W/m² for South Africa.

Wind Power

Wind energy, like solar energy, is a free and sustainable renewable energy source that is being used to generate electricity.

Hybrid systems

Hybrid energy systems are a combination of two or more renewable energy sources such as photovoltaic, wind, micro-hydro, storage batteries and fuel-powered generator sets to provide a reliable off-grid supply.

Nuclear

The Nuclear Energy Policy of 2008 highlights the vision of government to become self-sufficient in all aspects of the nuclear value chain for peaceful use. Amongst government policy objectives is the promotion of nuclear energy as an important electricity supply option through the establishment of a national industrial capability for the design, manufacture and construction of nuclear energy systems.

Government has committed, through the Nuclear Energy Policy and Integrated Resource Plan (IRP), to an energy mix consisting of coal, gas, hydro, nuclear, solar and wind. The Nuclear New Build Programme will enable the country to create jobs, develop skills, create industries and catapult the country into a knowledge economy.

The IRP 2010 – 2030 envisages 9 600 MW additional nuclear capacity by 2030. The IRP is a 20-year projection on electricity supply and demand. Eskom operates the Koeberg Nuclear Power Station near Cape Town, the only nuclear power station in South Africa and the entire African continent, which supplies power to the national grid.

The extension of life of Koeberg Power Station is critical for continued energy security in the period beyond 2024, when it reaches the end of its 40-year life. In accordance with IRP2019, the Koeberg Power Plant design life must be extended by another 20 years to ensure that the necessary technical and regulatory work can be completed.

To this end, the DMRE will commence with preparations for a nuclear build programme towards an additional 2 500 MW at a scale and pace that the country can afford, to ensure security of energy supply.

Integrated Resource Plan

The IRP is a legal instrument for South Africa's energy generation planning. The IRP is designed to help meet forecast annual peak and energy demand, as well as some established reserve margin. This will be achieved through a combination of supply-side and demand-side resources over a specified future period and driven by a set of predetermined objectives, which include ensuring the security of South Africa's energy supply, reducing the cost of South Africa's energy supply, minimising water usage related to energy supply and reducing carbon dioxide.

The plan is the leading policy framework for addressing the short- to long-term challenges that the country faces with regard to its energy needs. It formulates specific interventions to address electricity infrastructure development based on least-cost electricity supply and demand balance, considering security of supply and the environment (minimising negative emissions and water usage). The plan identifies the preferred generation technology required to meet expected demand growth up to 2030.

The available options include:

- Coal: Beyond Medupi and Kusile, coal will continue to play a significant role in electricity generation in South Africa in the foreseeable future as it is the largest base of installed generation capacity and makes up the largest share of energy generated. Due to the design life of the existing coal fleet and the abundance of coal resources, new investments must be made into more efficient coal technologies (High-Efficiency, Low-Emissions (HELE) technology, including supercritical and ultra-supercritical power plants with CCUS to comply with climate and environmental requirements. The stance adopted by the Organisation for Economic Cooperation and Development and financial institutions regarding financing coal power plants, is to consider the support of HELE technology. This ensures that South African coal still plays an integral part in the energy mix. Given the significant investments required for carbon capture and storage (CCS) and CCUS technology, South Africa could benefit from establishing strategic partnerships with international organisations and countries that have made advancements in the development of CCS, CCUS and other HELE technologies.
- Nuclear: Koeberg Power Station will reach its end of design life in 2024. To avoid the demise of nuclear power in the energy mix, South Africa has granted an extension on the design life and the expansion of the nuclear power programme into the future. In line with power system requirements, additional capacity from any technology deployed should be done at a scale and pace that flexibly responds to the economy and associated electricity demand, in a manner that avoids tariff shocks in particular; it is the user of electricity that ultimately pays. To this end, as is the case with coal, small nuclear units will be a manageable investment when compared to a fleet approach. The development of such plants globally is therefore particularly interesting for South Africa, and upfront planning with regard to additional nuclear capacity is a requisite, given the less than 10-year lead time, for timely decision making and implementation.
- Natural gas: Gas-to-power technologies provide the flexibility required to complement renewable energy. While in the short term

the opportunity is to pursue gas import options, local and regional gas resources will allow for scaling up within manageable risk levels. Exploration to assess the magnitude of local recoverable shale and coastal gas are being pursued. There is enormous potential and opportunity in this respect and the Brulpadda gas resource discovery in the Outeniqua Basin of South Africa, piped natural gas from Mozambique (Rovuma Basin), and indigenous gas like coal-bed methane and ultimately shale gas, could form a central part of the strategy for regional economic integration within SADC. Cooperation with neighbouring countries is being pursued and partnerships are being developed for joint exploitation and beneficiation of natural gas within the SADC region.

- Renewable energy: Solar photovoltaic (PV), wind and concentrated solar power with storage present an opportunity to diversify the electricity mix, to produce distributed generation and to provide off-grid electricity. Renewable technologies also present ample potential for the creation of new industries, job creation and localisation across the value chain. The Wind Atlas, developed for South Africa, provides a basis for the quantification of the potential that wind holds for power generation elsewhere in the country, over and above the prevalence of wind resources around the coastal areas. Most wind projects have been developed in the Western Cape and Eastern Cape thus far. The generation of electricity and heat (to be supplied for industrial processes), through biomass and biogas holds huge potential in South Africa, recognising that such projects range from small (kW) to larger (MW) scale and could be distributed across the industrial centres. Biomass from the waste, paper and pulp, and sugar industries can be utilised in co-generation plants and deliver electricity at a price-competitive level with minimal transmission and distribution infrastructure requirements. When deployed together, the nexus between the biomass and government-backed biofuels programmes could improve the economics of the initiatives and create job opportunities in rural and urban centers.
- Energy storage: There is a harmonising relationship between smart grid systems, energy storage and non-dispatchable renewable energy technologies based on wind and solar PV. The traditional power delivery model is being disrupted by technological developments related to energy storage, and more renewable energy can be harnessed despite the reality that the timing of its production might be during low-demand periods. Storage technologies, including battery systems, compressed air energy storage, flywheel energy storage and hydrogen fuel cells are developments that can address this issue, especially in the South African context where over 6 GW of renewable energy has been introduced, yet the power system does not have the requisite storage capacity or flexibility.

Integrated Energy Plan (IEP)

The development of a national IEP was envisaged in the White Paper on the Energy Policy of the Republic of South Africa of 1998 and, in terms of the National Energy Act of 2008. The IEP provides a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development. The IEP examines current energy consumption trends within different sectors

of the economy and uses this to project future energy requirements, based on different scenarios.

While the IEP focuses on demand for all energy forms across all the economic sectors at a high level, more detailed analysis of different demand growth profiles and supply-side options for the two main energy sub-sectors, namely electricity generation and liquid fuels supply, will be detailed in supporting sector plans. For the gas sub-sector, a draft framework which explores future possible options for the development of a gas market in South Africa is being developed. This has been undertaken to analyse the differences in each of the sectors, considering the complexities and level of maturity of each sub-sector.

Natural gas

There is enormous potential and opportunity through the Brulpadda gas resource discovery in the Outeniqua Basin of South Africa and piped natural gas from Mozambique (Rovuma Basin). Indigenous gas, like coal-bed methane and shale gas, form a central part of the country's strategy for regional economic integration within SADC.

Cooperation with neighbouring countries is being explored and partnerships are developed for joint exploitation and beneficiation of natural gas within the SADC region. The SADC Gas Master Plan will identify the short- and long-term infrastructure requirements to enable the uptake of a natural gas market.

South Africa continues to run diesel plants at Ankerlig (Saldanha Bay), Gourikwa (Mossel Bay), Avon (Outside Durban) and Dedisa (Coega Industrial Development Zone), because of the unavailability of natural gas, which is cheaper than diesel. The gas to power nexus has not yet been exploited to the extent that gas plants at Avon and Dedisa could be converted to combined cycle plants, provided that natural gas, either pipeline or LNG infrastructure, is developed.

Renewable Energy Independent Power Producer Procurement Programme (REIPPPP)

The REIPPPP has become one of the world's most progressive and successful alternative energy programmes. Ever since the introduction of these renewable energy technology programmes (solar, wind, biomass, small hydro and landfill gas power), plants have been going up across the country, feeding additional, clean energy into the national grid.

The REIPPPP represents the country's most comprehensive strategy to date, in achieving the transition to a greener economy. The programme has been designed to contribute to the development of a local green industry and the creation of green jobs.

The programme seeks to procure energy from small-scale IPPs with projects that generate between one MW and five MW of energy from solar, wind, biomass and landfill gas projects.

International cooperation

South Africa is a member of the International Energy Forum (IEF), which aims to foster greater mutual understanding and awareness of common energy interests among its members.

The 74-member countries of the forum are signatories to the IEF Charter, which outlines the framework of the global energy dialogue through this intergovernmental arrangement. South Africa is a member state of the International Renewable Energy Agency (IRENA)

which seeks to make an impact in the world of renewable energy by maintaining a clear and independent position, providing a range of reliable and well-understood services that complement those already offered by the renewable energy community and gather existing, but scattered, activities around a central hub.

The country has been a member of the International Atomic Energy Agency (IAEA) for decades and has been both a recipient and provider of services emanating from the agency.

As a member state of the IAEA, permanent member of the board of directors and actively participating in nuclear energy, safety, technology, security and disarmament, South Africa has contributed to efforts of ensuring that nuclear energy is used for peaceful purposes like power generation, as well as medical, industrial and agricultural initiatives.

Sustainable development in Africa

The Intergovernmental Memorandum of Understanding (MoU) on the Western Power Corridor Project is a flagship programme for the African Union Development Agency-New Partnership for Africa's Development. It intends to pilot the use of hydro-electric energy obtained from the Inga rapids site in the DRC to ensure the security of supply in the SADC.

The participating utilities are those of Angola, Botswana, the DRC, Namibia and South Africa. A joint-venture company has been formed to initiate studies determining the viability of the project and to build, own and operate the infrastructure.

The main project outside South Africa's borders is Westcor. It entails a five-way intergovernmental MoU signed between the utilities of Angola, Botswana, the DRC, Namibia and South Africa. Westcor will tap into some of the potential in the DRC. Inga III, a 3 500-MW hydro plant on the Congo River, will be the first of these projects.

At the same time, the countries to the north could benefit through access to the coal-fired power resources in the south. Such an arrangement should stabilise the energy requirements of the region well into this century.

Exploitation of the vast hydropower resources would constitute a significant infusion of renewable energy resources into the energy economy of the region over the medium to long term.

The Lesotho Highlands Water Project could contribute some 72 MW of hydroelectric power to the system in the short term.

Global pressures regarding the environmental impact and displacement of settlements by huge storage dams are likely to limit the exploitation of hydropower on a large scale. Irrespective of the size of installation, any hydropower development will require authorisation in terms of the National Water Act, 1998 (Act 36 of 1998).

Joint Meeting of SADC Ministers of Energy and Water

The SADC Ministers responsible for energy and water met on 30 October 2020 through video conferencing. The meeting was hosted by Mozambique. The Ministers deliberated on programmes of regional dimensions in support of the implementation of the SADC Regional Indicative Strategic Development Plan (RISDP) 2020 – 30 and the SADC Vision 2050, particularly programmes of infrastructure development.

The meeting reviewed progress made towards the delivery of the programmes in the energy and water sectors, and implementation of previous Ministerial decisions from the meeting held in Windhoek, Namibia, in 2019. The meeting also considered a report on the impact

of the COVID-19 pandemic and how it has affected investments in the energy and water sectors in the region, and proposed mitigation measures that could be applied at regional and national level. Ministers reviewed strategic instruments for guiding adherence to COVID-19 and similar pandemics in the energy sector at regional and national level, and called for continuous assessment and monitoring of the impacts.

Fifth Brazil, Russia, India, China and South Africa (BRICS) Meeting of Energy Ministers

The Ministers of energy and heads of delegation of the BRICS countries held the fifth BRICS Ministers of Energy Meeting on

14 October 2020 via videoconference. It was chaired by Russian Energy Minister Alexander Novak. The Ministers discussed the coordination of international efforts to overcome the impact of the COVID-19 pandemic on the energy sector, promotion of the energy dialogue between the BRICS countries, expansion of technological cooperation, as well as the results of the BRICS Energy Research Platform's activities and plans for further development.

Cross-border gas trade agreements

To facilitate the movement of gas across international borders, South Africa has signed cross-border gas trade agreements with Mozambique and Namibia.

The South Africa-Namibia Gas Commission addresses harnessing the natural gas reserves in the Kudu Gas Field. In 2017, Eskom signed a five-year electricity sales agreement with Namibia's national electricity utility, NamPower.

Eskom will supplement generation capacity for South Africa's neighbour with its surplus electricity, providing Namibia with energy security and allowing for economic development and growth.

NamPower has also concluded a number of projects to establish renewable energy projects in Namibia and to enhance its local production.

The same year, Eskom and Botswana Power Corporation signed a three-year firm power supply agreement – in line with Eskom's plan to increase its electricity exports to South Africa's neighbouring states.

Import and export of fuel products

The import of refined products is restricted to special cases where local producers cannot meet demand. It is subject to state control to promote local refinery usage.

When overproduction occurs, export permits are required and generally granted, provided that the needs of both South Africa and other Southern African Customs Union members are met. More diesel than petrol is exported, due to the balance of supply and demand of petrol and diesel relative to refinery configurations.

Although petrol and diesel make up 55% of total liquid-fuel exports, South Africa is also the main supplier of all other liquid fuels to Botswana, Lesotho, Namibia and Eswatini.

Energy and the global environment

South Africa is classified as a developing country or a non-Annex 1 country. This means that within the international political and negotiation context, South Africa is not required to reduce its greenhouse gas emissions. South Africa is among the top 20 emitters of

GHGs in the world and the largest emitter in Africa, largely because of the economy's dependence on fossil fuels. It emits more than 400 megatonnes of carbon dioxide per year.

The National Climate Change Strategy requires that government departments collaborate in a coordinated manner to ensure that response measures to climate change are properly directed and carried out with a national focus.

The South African economy depends greatly on fossil fuels for energy generation and consumption, and is subsequently a significant emitter due to relatively high values being derived from emission intensity and emissions per capita.

Therefore, South Africa is proactively moving the economy towards becoming less carbon-intensive, with the DMRE playing a prominent role. The department has introduced systems to access investment through the clean development mechanism of the Kyoto Protocol. It developed the White Paper on Renewable Energy and Clean Energy Development, together with an energy efficiency programme, to support diversification in pursuit of a less carbon-intensive energy economy.

The South African Renewables Initiative secures international financing partnerships in investment in deploying renewable energy and develops renewable supply chains through securing a critical mass of renewable energy, without imposing undue burden on the fiscus or the South African consumer.

In line with this objective, the DMRE has signed a declaration of intent with Germany, the United Kingdom, Denmark, Norway and the European Investment Bank. The agreement will lead to the establishment of a fund to assist in the deployment of renewable energy.

Further, the DMRE participates in structures such as the:

- the IRENA,
- the IEF,
- International Partnership for Energy Efficiency Cooperation,
- United Nations (UN) Industrial Development Organisation,
- Clean Energy Ministerial, and
- African Union-European Union Energy Partnership.

Programmes

Minerals and Petroleum Regulation

The programme regulates the mining, minerals and petroleum sectors to promote economic growth, employment, transformation and sustainable development. The programme's objectives over the medium term include:

- Improving the participation of historically disadvantaged South Africans in the mining sector and contributing to its transformation by issuing mining rights and permits to 360 historically disadvantaged South Africans over the medium term, and monitoring and enforcing compliance with procurement requirements that relate to historically disadvantaged South Africans, as prescribed by the mining charter, on an ongoing basis.
- Monitoring and enforcing compliance with the statutory obligations of the Mineral and Petroleum Resources Development Act of 2002, and the Mining Charter by conducting 636 social and labour plan verification inspections, 1 275 mine economic verification audits and 3 825 environmental verification inspections over the medium term.
- Ensuring the development and transformation of the liquid fuels

industry, and the security of supply of petroleum and petroleum products by monitoring and enforcing technical and economic compliance with legislation, specifications, standards and licence conditions.

- Facilitating the orderly operation of the petroleum sector through an analysis of fuel supply and the efficient adjudication of licences for manufacturing, wholesaling and retailing activities on an ongoing basis.
- Strengthening the regulatory framework in the liquid fuels petroleum industry by implementing the regulatory accounting system to introduce a transparent fuel pricing mechanism that will provide appropriate returns to investors in the liquid fuels sector across the value chain on an ongoing basis.
- Strengthening the regulatory framework in the liquid fuels petroleum industry by implementing the regulatory accounting system to introduce a transparent fuel pricing mechanism that will provide appropriate returns to investors in the liquid fuels sector across the value chain on an ongoing basis.

Mining, Minerals and Energy Policy Development

The programme formulates, maintains and implements integrated minerals and energy policies to promote and encourage investment in the mining and energy industry.

The programme's objectives over the medium term include:

- Promoting investment in the mining, minerals and upstream petroleum sectors over the medium term, by hosting 138 promotional and awareness activities or events for local and foreign investors, participating in local and international mining and petroleum conferences and events, engaging with stakeholders in various forums, and leading the implementation of key government priorities, ensuring the full implementation of plans for developing the Oceans Economy for oil and gas exploration through Operation Phakisa, and ensuring the full implementation of the Shale Gas Action Plan through consultations, advocacy, research and promotional activities for shale gas exploration.
- Managing diplomatic imperatives and relations with foreign countries to benefit South Africa by establishing and implementing bilateral and multilateral partnerships for mining and upstream petroleum development on an ongoing basis.
- Promoting the sustainable use and management of mineral resources over the medium term, by participating in technical and strategic partnerships such as the intergovernmental forum on mining, minerals, metals and sustainable development; the Benguela Current Commission; and UN programmes.
- Improving energy security over the medium term by amending the Electricity Regulation Amendment Act, 2007 (Act 28 of 2007), the NERSA Amendment Act, 2004 (Act 40 of 2004) and the NNR Act, 1999 (Act 47 of 1999).

Mine Health and Safety Inspectorate

The inspectorate ensures the health and safety of employees in the mining sector. The programme's objectives over the medium term include:

- Promoting health and safety by reducing occupational fatalities by 20%, occupational injuries by 20% and occupational disease by

- 10%; implementing the Occupational Health and Safety Strategy; and enforcing guidelines and conducting investigations, inspections and audits on an ongoing basis.
- Contributing to skills development in the mining sector by implementing, monitoring and evaluating the certificate of competency model on an ongoing basis.
- Improving health care in the mining sector on an ongoing basis by ensuring 80% adherence to prescribed time frames for resolving medical appeals, 100% adherence to timelines for appeals to the chief inspector of mines, and 100% adherence to timelines for applications in terms of the Mineral and Petroleum Resources Development Act of 2002.

Mineral Resources and Energy Projects

The programme manages, coordinates and monitors projects focused on access to mineral and energy resources. The programme's objectives over the medium term include:

- Increasing access to electricity by managing funding and monitoring of the implementation of the INEP on an ongoing basis.
- Increasing public awareness on energy issues, while empowering disadvantaged and vulnerable groups by identifying, implementing, managing and coordinating upliftment programmes and projects on an ongoing basis.
- Ensuring the efficient management of electricity supply on an ongoing basis, by enhancing the application of business principles for project management to assist programme and project managers, coordinating, monitoring and reporting on the implementation of programmes and projects focused on the development, improvement and transformation of the energy generation, refinement, transmission and distribution industry and its infrastructure.
- Promoting the sustainable use and management of mineral and energy resources by rehabilitating 129 derelict and ownerless mines, providing marginal mines with subsidies for water management solutions, and managing the funding and monitoring of the Energy Efficiency and Demand-side Management Grant to municipalities.

Nuclear Energy Regulation and Management

The programme manages the South African nuclear energy industry and controls nuclear materials in terms of international obligations, nuclear legislation and policies to ensure the peaceful use of nuclear energy. The programme's objectives over the medium term include:

Ensuring compliance with international nuclear obligations by applying the relevant statutory frameworks and following the guidelines of the IAEA for best international practices on an ongoing basis.

Regulating the security of nuclear material, related equipment and facilities by developing and publishing appropriate regulations on an ongoing basis.

Conducting awareness workshops and training courses, and participating in regional and international forums to enhance compliance with legislation and international obligations on an ongoing basis.

