

## 5 NEED AND DESIRABILITY

This chapter provides an overview of the "need and desirability" of the proposed project, and essentially considers the strategic context of a project proposal within broader societal needs and the public interest.

The DFFE guideline on need and desirability (GN No. R891 of 20 October 2017) notes that while addressing the growth of the national economy through the implementation of various national policies and strategies, it is also essential that these policies take cognisance of strategic concerns such as climate change, food security, as well as the sustainability in supply of natural resources and the status of our ecosystem services. The guideline further notes that at a project level (as part of an ESIA process), the need and desirability of the project should take into consideration the content of regional and local plans, frameworks and strategies.

This chapter firstly highlights the applications for the use of hydrocarbons and, secondly, indicates how these applications are aligned within the strategic context of South Africa national policy and energy planning, broader societal needs, and regional planning, as appropriate.

### 5.1 THE USE OF HYDROCARBONS AND THE PETROLEUM INDUSTRY IN SOUTH AFRICA

The information in this section is mostly summarised from the report by KPMG (2016) for the South African Petroleum Industry Association on the petroleum industry's contribution to South Africa.

#### 5.1.1 Description of Upstream, Midstream and Downstream Activities

The petroleum / hydrocarbon industry is divided into three major sectors: upstream, midstream and downstream (see Figure 5-1). The upstream sector includes all the steps involved from the preliminary exploration through to the extraction of the resource, i.e. identifying potential reservoirs, drilling wells and recovering raw materials from underground. The midstream sector involves the transportation (by pipeline, rail, barge, oil tanker or truck), storage and wholesale marketing of crude or refined petroleum products, while the downstream sector is responsible for refining and the sale of the finished products (McClay 2021).

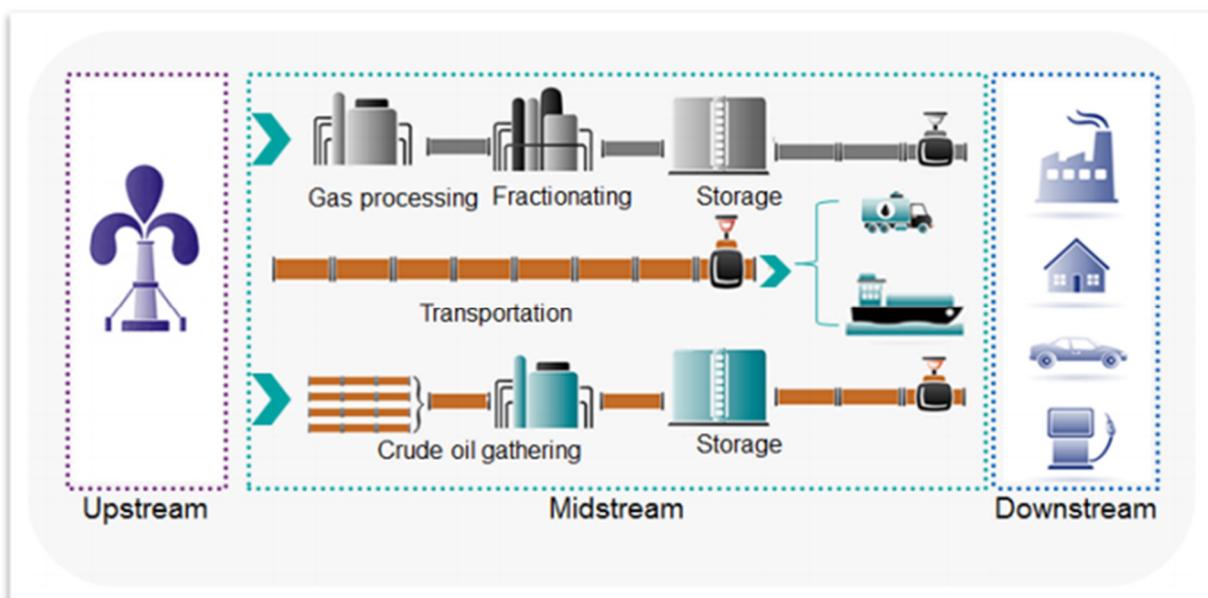


FIGURE 5-1: THE MAJOR SEGMENTS OF THE OIL & GAS/HYDROCARBON INDUSTRY

Source: KPMG 2016

South Africa has minimal commercially exploitable crude oil, with estimated proven reserves amounting to approximately 15 million barrels. Since there are minimal crude oil reserves in South Africa, the country imports nearly all its crude oil requirements from the Middle East and other parts of Africa. Thus, the South African value chain begins with crude imports or refined product imports. Crude is shipped to a refinery where it is transformed into a variety of value-added products, which are distributed to depots (secondary storage facilities) or to major customers. At the refinery, the products are supplemented by internationally and locally sourced finished products and blended, where necessary. From the depots, final products are distributed to major customers and the retail network.

#### 5.1.1.1 Refinery Activities

As noted above, South Africa currently relies on imports of crude oil and refined fuels to meet its liquid fuels needs. South Africa has the second largest refining capacity in Africa after Egypt, with a total refining / liquid fuels capacity of 703 000 barrels per day (bbl/d), with approximately 72% (503 000 bbl/d) crude oil refining, with the balance synthetic fuel refining. Petroleum consumed in South Africa is derived mainly from domestic refineries that import crude oil, and Coal-to-Liquid (CTL) and Gas-to-Liquid (GTL) plants. 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, Namibia, Lesotho and Swaziland.

The chemical engineering processes and other facilities are used to transform hydrocarbons (i.e. crude oil or natural gas) into useful products such as Liquefied Petroleum Gas (LPG), gasoline or petrol, kerosene, jet fuel, diesel oil and fuel oils. In this way, crude oil is the starting point for many products including:

- LPG - used for heating and cooking;
- Petrol - motor fuel;
- Kerosene - fuel for jet engines, lighting and heating; input material for other products;
- Diesel - used for diesel fuel and heating oil; input material for other products;
- Base oil - used for motor oil, grease, use in many other lubricating oils;
- Fuel oil - used for industrial fuel; input material for other products; and
- Residuals - coke, asphalt, tar, waxes; input material for other products.

In South Africa, these petroleum products are produced through six refineries (see Figure 5-2):

- Crude oil refiners, including Astron Energy Cape Town refinery (previously CHEVREF) (Cape Town), ENREF (Durban), NATREF (Sasolburg) and SAPREF (Durban);
- CTL and GTL fuels (by Sasol in Sasolburg); and
- Natural GTL fuels (by PetroSA in Mossel Bay).

The products and by-products from these refineries are important contributors to the economy, not only as a source of fuel, but also a variety of petrochemical products such as lubricants, bitumen and solvents. Base oils and lubricants service a variety of machinery and equipment in the construction, manufacturing and agri-processing sectors. With limited infrastructure to import LPG, an important by-product, these local sources are key for security of supply. LPG also contributes to the diversification of South Africa's energy mix.



**FIGURE 5-2: MAP SHOWING LOCATION OF REFINERIES IN SOUTH AFRICA**

Source: SAPIA (<https://www.sapia.org.za/Overview/South-African-fuel-industry>)

#### 5.1.1.2 Storage and Distribution Activities

Once the oil has been produced, it is transported to short-term storage. BP Southern Africa, Astron Energy (previously Chevron South Africa), Engen Petroleum, PetroSA, Sasol Oil, Shell South Africa and TEEPSA are the main players in the South African oil sector. They operate storage terminals and distribution facilities throughout the country, which provide ease of distribution to retail wholesalers and, ultimately, consumers.

Distribution activities involve the movement of petroleum from refineries to wholesalers and retail locations. In South Africa, liquid fuels are distributed from refineries by pipeline, road and rail to approximately 200 depots, 4 600 service stations and 100 000 direct consumers.

#### 5.1.1.3 Wholesale and Retail Activities

From the depots and storage facilities, liquid fuels are delivered to commercial customers. Oil companies distribute roughly half of their petrol, diesel and fuel oils to commercial and retail customers. Petroleum fuels are supplied directly to about 100 000 consumers. Oil companies also sell petrol, diesel and fuel oils to commercial segments, which include customers such as parastatals, commercial/passenger transport, agriculture, manufacturing, construction, mining, local communities and resellers.

Oil companies sell the other half of petrol, diesel and other liquid fuels to the retail segment through petrol stations. The South Africa Petroleum Retailers Association reported that retail stations sell about 950 million litres of petrol and 830 million litres of diesel per month through the approximately 4 600 service stations.

## 5.1.2 South African Energy Sector and Energy Mix

South Africa's energy sector is critical to its economy and is the centre of economic and social development, and is particularly important when economic growth and job creation are such high priorities in the country. As the country's economy grows, it is critical to ensure that energy resources are available, and that there is access to energy services in an affordable, reliable and sustainable manner, while minimising the associated adverse environmental impacts (DoE, 2019).

As noted in Section 5.1.1, South Africa has limited proved reserves of oil and natural gas and uses its large coal deposits to meet most of its energy needs, particularly in the electricity sector, with renewable energy playing an increasingly significant role. In 2016, the South African energy supply was dominated by coal, which constituted 69% of the primary energy supply, followed by crude oil with 14%, renewables with 11%, nuclear with 3%, and natural gas with 3% (DoE, 2019). There is something notable about the energy mix data from the 2016 survey, as in that year there was extensive use of diesel as the country relied on open cycle gas turbines at that time (Stats SA<sup>4</sup>). By 2030 (as per the IRP 2019), energy supply aims to be dominated by renewables (PV, wind, CSP, hydro and storage) which constitutes 46% of the primary energy supply, followed by coal with 43%, gas and diesel with 8.1%, and nuclear with 2.4%. Although the capacity allocations in the IRP 2019 sees a significant increase in renewables and a decrease in hydrocarbons (coal, oil and gas), it acknowledges that gas-to-power technologies are required to provide the flexibility required to complement renewable energy in the "just transition" to a net-zero and climate resilient society.

Owing to the lack of reserves, most of South Africa's liquid fuel requirements are imported in the form of crude oil (Stats SA<sup>5</sup>). In 2016, South Africa imported almost 100% of its crude oil requirements, with approximately 85% coming from Saudi Arabia, Nigeria and Angola. This reflects South Africa's vulnerability and dependence on imports for its petroleum requirements. Almost all the imported crude oil was used for the production of liquid fuels, with a small percentage used towards lubricants, bitumen, solvents and other petrochemicals.

In 2016, natural gas domestic production amounted to 18%, whilst imports from the Temane and Pande gas fields in Mozambique amounted to 82% during the same period (DoE, 2019). While in the short-term the opportunity is to pursue gas import options, the use of local gas resources will allow for scaling up within manageable risk levels (refer to the South African Gas Masterplan Base Case Report in Section 5.2.12). DMRE's Annual Performance Plan 2020/2021 acknowledges that although exploration activities to assess the magnitude of local resources are being pursued, they must be accelerated, as currently the majority is imported (DMRE, 2021). The Plan (DMRE 2021) also states that 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 (e.g., coal-bed methane and ultimately shale gas), could form a central part of the strategy for regional economic integration within the SADC region.

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<sup>4</sup> <http://www.statssa.gov.za/?p=14643>

<sup>5</sup> [https://unstats.un.org/oslogroup/meetings/og-06/docs/6th%20mtg%20DAY\\_3\\_Paper\\_Energy\\_Accounts\\_Statistics\\_South\\_Africa.pdf](https://unstats.un.org/oslogroup/meetings/og-06/docs/6th%20mtg%20DAY_3_Paper_Energy_Accounts_Statistics_South_Africa.pdf)

## 5.2 CONSISTENCY WITH NATIONAL AND INTERNATIONAL POLICY AND PLANNING FRAMEWORKS

### 5.2.1 White Paper on the Energy Policy of the Republic of South Africa (1998)

The White Paper on the Energy Policy (1998) is an overarching policy document which was to guide future policy and planning in the energy sector. The policy objectives include the stimulation of economic development, management of energy related environmental and health impacts and diversification of the country's energy supply to ensure energy security.

The paper stated that the government will, *inter alia*, “promote the development of South Africa’s oil and gas resources...” and “ensure private sector investment and expertise in the exploitation and development of the country’s oil and gas resources”. The successful exploitation of these natural resources would contribute to the growth of the economy and relieve pressure on the balance of payments. Before the development of the country’s oil and gas resources can take place, there is a need to undertake exploration activities to determine their extent and the feasibility of utilising these resources for production.

### 5.2.2 New Growth Path (2011)

The New Growth Path (NGP) reflected the commitment of Government to prioritise employment creation in all economic policies and set out the key drivers and sectors for employment which was the focus of Government. The identified focus sectors were infrastructure, agriculture, mining, manufacturing, tourism and the green economy.

The NGP further identified the need to develop macroeconomic strategies and microeconomic measures to achieve sustainable expansion of work opportunities and output. The NGP stated that one microeconomic measure is South Africa being the driving force behind the development of regional energy, transport and telecommunications infrastructure. Priorities in this regard included strengthening the regional integration of energy by undertaking urgent improvements in electricity interconnectors and exploring other opportunities for enhancing clean energy across central and southern Africa, including natural gas.

### 5.2.3 National Development Plan 2030 (NDP) (2013)

The National Development Plan (NDP) 2030 provides the context for all growth in South Africa, with the overarching aim of eradicating poverty and inequality between people in South Africa through the promotion of development. It provides a broad strategic framework to address poverty and inequality based on the six focused and interlinked priorities. One of the key priorities is “faster and more inclusive economic growth”. To transform the economy and create sustainable expansion for job creation, an average economic growth exceeding 5% per annum is required. The NDP supports transformation of the economy through changing patterns of ownership and control.

Meeting the development initiatives goals represent a challenge, as the NDP emphasises, at the same time, the need to:

- Protect the natural environment;
- Enhance the resilience of people and the economy to climate change;
- Reduce carbon emissions in line with international commitments;
- Make significant strides toward becoming a zero-waste economy; and
- Reduce GHG emissions and improve energy efficiency.

The NDP makes numerous mentions of the need to act responsibly to mitigate the effects of climate change. Diversification of the energy mix away from fossil fuels will be key as energy generation makes up 48% of South Africa's GHG emissions. The NDP indicates that *"the country will explore the use of natural gas as a less carbon intensive transitional fuel"* and that there is a requirement for *"increasing exploration to find domestic gas feedstock... to diversify the energy mix and reduce carbon emissions"*. Thus, the ongoing exploration of local natural gas reserves is a key action required to ensure that natural gas is a viable transitional fuel for use in the national electricity generation mix.

#### 5.2.4 Draft Integrated Energy Plan (2013)

The Draft Integrated Energy Plan (IEP) (2013) considered how current and future energy needs can be addressed. The plan considered security of supply, increased access to energy, diversity in supply sources and primary sources of energy, and minimising emissions. The plan indicated that projected demand for natural gas between 2010 and 2050 would be second only to petroleum products, primarily due to increased growth in the industrial sector.

The Draft IEP stated that given South Africa is a net importer of oil, the liquid fuels industry and its economy is vulnerable to fluctuations in the global oil market. Current natural gas consumption exceeds production, with the majority of demand being met through imports from Mozambique.

The plan stated that the use of natural gas as an alternative electricity generator must be considered in moderation due to limited proven reserves, but that it has significant potential both for power generation, as well as direct thermal uses. The role of renewable energy to deliver the intended policy benefits of improved energy security and reduced GHG emissions is also acknowledged in the plan. The availability of untapped renewable energy resources within the country is highlighted. The DMRE (previously under the Department of Energy) has implemented the Renewable Energy Independent Power Producers procurement process to increase the share of renewable energy technologies in the energy mix but, due to the intermittent nature of renewable energy systems and the variability in electricity load requirements, storage remains the most important challenge to the widespread use of renewable energy. Consequently, the need to incorporate fossil fuels and nuclear power to ensure that there is both sufficient base-load electricity generating power to meet the minimum needs and peak-load power to meet the needs during peak periods is acknowledged. The use of natural gas for power generation is also considered as an option to assist South Africa to move towards a low carbon future given that natural gas has a lower carbon content than coal.

#### 5.2.5 Operation Phakisa (2014)

In July 2014, the South African Government launched Operation Phakisa, which is an innovative, pioneering and inspiring approach that will enable South Africa to implement its policies and programmes better, faster and more effectively. Operation Phakisa aims to, *inter alia*, unlock the economic potential of South Africa's oceans. In this regard four priority sectors have been selected as new growth areas in the ocean economy, including:

- (a) Marine transport and manufacturing activities, such as coastal shipping, trans-shipment, boat building, repair and refurbishment;
- (b) Offshore oil and gas exploration;
- (c) Aquaculture; and
- (d) Marine protection services and ocean governance.

In terms of offshore oil and gas exploration, the goal is to further enhance the enabling environment for exploration of oil and gas, resulting in an increased number of exploration wells drilled, while simultaneously maximising the value captured for South Africa. In this regard, a key target identified by Operation Phakisa is the drilling of 30 exploration wells in ten years.

As the proposal by TEEPSA entails the drilling of a number of wells, it provides an opportunity to further establish the extent and economic viability of the indigenous gas reserves and/or oil in Block 5/6/7 and contribute to the above-mentioned target of the drilling of exploration wells.

In terms of marine protection, the 2011 National Biodiversity Assessment noted that offshore ecosystems in South Africa were poorly protected. An offshore Marine Protected Area (MPA) project (2007- 2011) initiated plans to increase protection of offshore ecosystems, the project was advanced towards implementation during Operation Phakisa Oceans Economy. The process culminated in the gazetting of 20 new MPAs, which came into effect on 1 August 2019 and expand the protection of South Africa's mainland ocean territory to 5%.

### **5.2.6 National Climate Change Response White Paper (2014)**

The National Climate Change Response Paper presents the South African Government's vision for an effective climate change response and the long-term, just transition to a climate-resilient and lower-carbon economy and society. South Africa's response to climate change has two objectives:

- Effectively manage inevitable climate change impacts through interventions that build and sustain South Africa's social, economic and environmental resilience and emergency response capacity.
- Make a fair contribution to the global effort to stabilise GHG concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe that enables economic, social and environmental development to proceed in a sustainable manner.

The Paper acknowledges that South Africa has relatively high emissions for an emerging economy. The energy intensity of the South African economy, largely due to the significance of mining and minerals processing in the economy and the coal-intensive energy system, means that South Africa is a significant emitter of GHGs. The majority of South Africa's energy emissions arise from electricity generation.

The Paper sets out South Africa's overall response strategy through strategic priorities, leading to a series of adaption, mitigation, response measures and priority flagship programmes. Policy decisions on new infrastructure investments must consider climate change impacts to avoid the lock-in of emissions intensive technologies into the future. In the medium-term, the Paper indicates that a mitigation option with the biggest potential includes a shift to lower-carbon electricity generation options. The Renewable Energy Flagship Programme is identified as possible driver for the deployment of renewable energy technologies. Renewable energy and not fossil fuel /gas is ultimately recommended for climate change mitigation.

### **5.2.7 Paris Agreement - United Nations Framework Convention on Climate Change (2015)**

The Paris Agreement is a comprehensive framework that aims to guide international efforts to limit GHG emissions and to meet challenges posed by climate change. The Paris Agreement was adopted on 12 December 2015 at the 21<sup>st</sup> session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC CoP21). The agreement was signed by South Africa on 22 April 2016.

The long-term goals of the Paris Agreement are:

- Limiting the global temperature increase to below 2°C above pre-industrial levels, while pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels.
- Increasing the countries' ability to adapt to the effects of climate change and to foster climate resilience.
- Encouraging low GHG emissions development that does not compromise food production.
- Making finance flows consistent with a pathway towards low GHG emissions and climate resilient development.
- Reaching a peak in GHG emissions 'as soon as possible', while recognising that the timeframes for achieving this will differ between developed and developing countries.
- Achieving carbon neutrality from 2050 onwards.

Each individual country is responsible for determining their contribution (referred to as the "nationally determined contribution") in reaching this goal. The Agreement requires that these contributions should be "ambitious" and "represent a progression over time". The contributions should be reported every five years and are to be registered by the UNFCCC Secretariat. As a signatory to the Agreement, South Africa will be required to adopt the agreement within its own legal systems, through ratification, acceptance, approval or accession.

As a signatory to the Paris Agreement, South Africa is required to investigate alternatives to existing industries which have high carbon-emissions. A shift away from coal-based energy production within the energy sector and increased reliance on alternative energy sources is therefore anticipated. *"Natural gas, and in particular liquefied natural gas, has potential to play a role for Africa as a rich and reliable source of energy, which can serve as a bridging fuel on the path to the carbon-neutral goal of the Paris Agreement (Source: <https://www.kslaw.com/blog-posts/the-paris-agreement-on-climate-change-implications-for-africa>).*

### 5.2.8 Integrated Resources Plan (2019)

The Integrated Resource Plan (2019) was gazetted in October 2019. In order to achieve the outcomes envisaged in the National Development Plan, the Integrated Resource Plan provides a path to meet electricity needs over a 20-year planning horizon to 2030 and identifies the preferred electricity generation technologies to meet projected electricity demand. It thus provides a mechanism for Government to drive the diversification of the country's electricity generation mix and promote the use of renewable energy and other low-carbon technologies. The plan aims to balance a number of objectives, namely, to ensure security of supply; to minimise cost of electricity; to minimise negative environmental impact (emissions), and to minimise water usage.

The Integrated Resources Plan (2019) notes that there is a requirement to pursue a diversified energy mix with respect to electricity production, which reduces the country's reliance on a few primary energy sources. This Plan also noted that Natural Gas is considered a transition fuel globally that can provide the flexibility required to complement renewable energy sources. It is further noted that there is currently a reliance for the importation of gas and that the use of local and regional gas resources will allow for scaling up within manageable risk levels. It is further noted that the *"exploration to assess the magnitude of local recoverable shale and coastal gas are being pursued and must be accelerated"*.

The potential availability of gas provides an opportunity to convert to closed-cycle gas turbines (CCGT) and run open-cycle gas turbine plants at Ankerlig (outside Cape Town), Gourikwa (Mossel Bay), Avon (Outside Durban) and Dedisa (Coega IDZ) on gas.