

3. Background to the LPG sector in South Africa

- 3.1. This section provides a product description and an overview of the characteristics and uses of LPG, and compares pricing for different sources of energy. It also provides a summary of the government policy documents pertaining to LPG.

Product description

- 3.2. LPG is the abbreviation used to describe liquefied petroleum gas, a group of hydrocarbon gases typically containing three or four carbon atoms per molecule and often referred to as C₃ or C₄. The normal constituents of LPG are propane (chemical formula C₃H₈), propylene (C₃H₆), butane (C₄H₁₀) and butylenes (C₄H₈).⁸
- 3.3. Although there are many variations of LPG, it is primarily made up of propane (60%) and butane (40%) and it is compressed into liquid form for ease of transport, storage and handling.⁹ LPG is either produced as a by-product of the oil and gas refinery process or it is extracted “from oil or ‘wet’ natural gas streams as they emerge from the ground”.¹⁰ It is normally stored in liquid form in pressurised tanks and transported by road in tanker trucks or in cylinders. LPG is a homogenous good, as the physical features and the quality of the product supplied by each supplier are the same.
- 3.4. In South Africa, quality specifications for LPG are defined by South African National Standards (“SANS”) 1774:2007, outlining the requirements for LPG mixtures intended for use as fuel. LPG, as a liquid, is colourless, and as a vapour, cannot be seen. Pure LPG has no distinctive smell, but for safety reasons, a stenching agent is added prior to distribution to aid detection by the human nose at very low levels.

How is LPG produced?

- 3.5. Three main approaches are followed in producing LPG in South Africa, namely: (i) Crude oil refining; (ii) Gas to liquid (“GTL”); and (iii) Coal to liquid (“CTL”). The crude oil refining process is the most customary approach to producing LPG in South Africa. Shell and BP South African Petroleum Refineries (Pty) Ltd (“SAPREF”), Engen Petroleum Ltd (“ENREF”), and Chevron South Africa (Pty) Ltd (“Chevron”)¹¹ utilises crude oil refining to produce LPG. The Petroleum, Oil and Gas Corporation of South Africa SOC Ltd (“PetroSA”) and Sasol Ltd (“Sasol”) are the only refineries making

8 World LP Gas Association website

9 See World LP Gas Association (WLPGA) website at: <http://www.worldlpgas.com/>

10 Discussion document on the Review of the Maximum Refinery Gate Price of Liquid Petroleum Gas. Government Gazette, Notice 886 of 2012. Dated 24 October 2012.

11 Although Natref does not produce LPG, it also uses the crude oil refining process to produce other liquid fuels.

- 3.9. According to Sasol,
“Coal is gasified into raw gas in the gasification section using steam and oxygen. The raw gas is then treated in the rectisol unit into pure gas. The pure gas is then converted into synthetic oil in the synthol process. The synthetic oil is distilled and processed in the refining units. Propane and Butane are then recovered from the refinery process unit’s overhead streams and blended into LPG. Propane can also be routed to the propane cracker to produce ethylene or for sale to propane customers. Butane can also be routed and blended into the petrol pool.”
- 3.10. Sasol further states the CTL process does not compromise the quality of the LPG produced, but merely results in it having more molecules that are olefinic.¹² The difference in the number of olefinic molecules, it says, does not compromise the quality of the LPG produced as, regardless of the production process used, LPG must comply with the SANS 1774 requirements, as indicated above. Instead, the higher olefinic content from the CTL process produces butane, said to be more suitable for transport fuel blending. This explains why producers maximise butane in petrol blending rather than in LPG blending.
- 3.11. While the ingredients of LPG may be marketed on their own (or independently), they may also, depending on the configuration of the particular production plant, be used to produce other products. In particular, the propane and butane used to produce LPG can also be used to produce alternate products either consumed by the refinery or sold to generate revenue. The Commission has learned that the decision-making process in selecting which products to produce is driven by economic considerations like price and demand factors.
- 3.12. LPG is unlikely to feature as a product upon which a refinery will base its commercial and long-term investment decisions, given that it is produced as a by-product of the crude oil refining process and refineries derive negligible revenue from the production thereof. It is unlikely that a decision to construct a refinery or increase the capacity of a refinery will be driven by the expected return to be obtained when producing LPG. Instead, it will be driven by the expected return obtained when producing a range of petroleum products.

12 Olefin molecules are in a class of hydrocarbons with a single double bond. The highly reactive double bond makes the olefin molecule ideal for conversion to many useful end products. The two most important olefins are ethylene and propylene (refer to <http://www.kbr.com/Technologies/Olefins/>, accessed 18 June 2015).

Uses of LPG

- 3.13. LPG is primarily used as a thermal fuel in numerous applications. It burns cleanly, releasing few sulphur emissions and posing no ground or water pollution hazards.
- 3.14. LPG is also used by refineries in their internal production processes. For example, Engen uses LPG to produce a range of products consumed internally by the refinery, like refinery fuel, gasoline blending feedstock, alkylate and polymerate. Chevron produces polygasoline, also being consumed internally. According to Sasol, the alternative use of propane is cracking it to produce ethylene in the chemical stream, while butane is blended into petrol in the fuel stream.
- 3.15. LPG is used by the following categories of end-users:
- 3.15.1. **Industrial users:** These customers use LPG for heating where a readily controlled temperature is needed (motor vehicle paint shops, or as fuel for fork lift trucks) within warehouses.
 - 3.15.2. **Commercial users:** These include, for example, a shopping centre with several restaurants that may have one bulk tank of LPG, reticulated to individual restaurants or stores.
 - 3.15.3. **Autogas users:** LPG can also be used to power motor vehicles. Vehicles that use autogas are fitted with two fuel tanks, one for autogas and another for petrol or diesel. The vehicle can switch between autogas and petrol or diesel at any time.¹³
 - 3.15.4. **Residential users:** Household consumers use LPG for cooking, space heating and water heating.

Direct employment by LPG producers and wholesalers

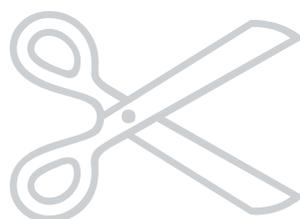
- 3.16. The LPG industry is known to be a labour-intensive industry as compared to other energy industries.¹⁴ The sub-section below assesses the extent to which the South African LPG sector may be described as being labour intensive.

13
14

See <http://www.autogassa.co.za/>
European LPG Association; The LPG sector Roadmap, 2009

- 3.17. Refineries like Chevron have indicated that none of their employees are designated to the LPG section of the business. This is likely due to the integrated nature of the crude oil refining process. Rather, Chevron uses employees from across various departments (operations, maintenance and planning) to account for the LPG business in their everyday activities. Chevron is not unique in its approach, as Sasol Oil submitted that it does not employ full-time employees dedicated to LPG. As shown, Sasol Oil uses the equivalent of [redacted] shift employees and one manager or clerk to run its LPG sections, tankage and loading systems. [redacted] Similarly, SAPREF has approximately [redacted] people out of a company staff of approximately [redacted] dealing with LPG. It is noted that these employees form part of the broader refinery operating team and are not specifically designated to work on LPG only. [redacted]
- 3.18. Figure 2 provides a summary of the employees involved in the LPG business of each refinery.

Figure 2: Total number of employees at the refinery level



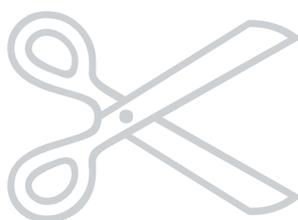
Source: SAPREF, Chevron, Engen and Sasol Oil submissions (March 2015 and August 2015)

- 3.19. The Commission found where a refinery has employed dedicated LPG staff, the number of employees is minimal when compared to the total refinery staff complement. In particular, Engen submits that [redacted] staff members are employed at the refinery (2010–2014) to deal with LPG; they account for just over 1% of the total number of staff at the refinery.¹⁵

15 Engen submission, response to Q13.1 dated 15 April 2015

- 3.20. Table 2 provides further evidence that LPG accounts for a small portion of refinery activities; hence the insignificant allocation of human resources to the area. The integrated nature of these facilities makes it unsurprising that staff overlap across different products.
- 3.21. Conversely, wholesalers designate a relatively larger number of employees to LPG supply activities, as displayed in Figure 3 in relation to a few selected wholesalers.¹⁶

Figure 3: Direct LPG labour employed by wholesalers



Source: [redacted]

- 3.22. Wholesalers employ personnel designated to work on LPG. The number of people employed by each wholesaler is significantly greater than those observed at the refinery level. As displayed in Figure 3, Afrox employs the largest number of people, namely [between 200-300], while Easigas employs [between 100-200]. KayaGas, at the time of its existence, employed [between 20-60] people. Both Afrox and KayaGas indicated some workers in their operations are outsourced elsewhere. KayaGas outsourced [between 50-100] employees, [redacted]. [redacted] indicated that most of their outsourced labour goes to the bulk distribution services.

16

These wholesalers were the only ones to provide the Commission with the requested employment information.

- 3.23. The figures provided by wholesalers and refineries highlight what priority LPG operations enjoy in their day-to-day business. Refineries designate only a small portion of their labour force to LPG, as it is a by-product for them, whereas wholesalers designate large numbers to LPG, given that it is their main sales product.

Revenue and profitability measures in the LPG sector

- 3.24. The financial performance of the LPG sector is assessed. Of particular interest is:

3.24.1. The revenue contribution of the LPG sector to total refinery profits; and

3.24.2. The profitability of the LPG sector in relation to wholesalers' activities.

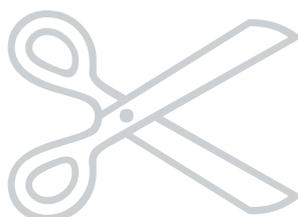
- 3.25. The sub-section elaborates on these factors.

Revenue contribution of LPG to total refinery profits

- 3.26. As already mentioned, a refinery is not constructed to manufacture only one type of product; costs are spread across the refinery business as a whole. More specifically, an optimal basket of products is produced, and given the insignificant or limited contribution of LPG to the overall refinery business, companies do not record the specific return on capital arising from LPG activities.

- 3.27. Although SAPREF is the third largest producer of LPG domestically, the product's contribution to turnover is minimal. All the molecules used to produce LPG contribute a very small proportion of the revenue generated by SAPREF. This is reflected in Table 2.

Table 2: Contribution of LPG to SAPREF's total revenue (FY2010/11–FY2013/14)

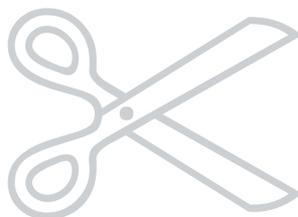


3.28. LPG similarly appears to contribute little to the overall revenue at [REDACTED]. The contribution of LPG to total revenue has consistently remained below 1%; by way of illustration, it fell from [REDACTED] in FY10/11 to [REDACTED] in FY13/14. [REDACTED] As with [REDACTED] and [REDACTED], the contribution of LPG to [REDACTED] revenue is minimal, accounting for around 2% of its total revenue. [REDACTED]

Profitability of LPG business for wholesale activities

3.29. LPG appears to be a profitable business venture for wholesalers. The profitability analysis is based on the four large wholesalers along with Reatile and KayaGas.¹⁷ In the 2012/13 financial year, [REDACTED] recorded the highest total profit compared to the other wholesalers (Figure 4). In the 2013/14 financial year, [REDACTED] profit contracted by [between 50-70%] while [REDACTED] experienced a growth of [between 50-70%]. The profits of other wholesalers like [REDACTED] and [REDACTED] remained low. [REDACTED] had not been profitable for either of the two consecutive years. [REDACTED] recorded a loss in 2012/13 but recovered to make a profit in 2013/14.

Figure 4: Wholesalers' gross profit for FY12/13 and FY13/14

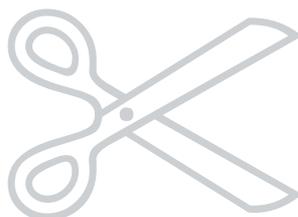


Source: Kayagas, Afrox, Totalgaz, Oryx, Easigas and Reatile Gaz submissions (2015) and financial statements (2014).

¹⁷ The information for the profitability analysis was obtained from wholesalers' financial statements (2014) and submissions dated March 2015.

3.30. Figure 5 illustrates the operating profit margin of each wholesaler for FY12/13 and FY13/14. [redacted] experienced a negative operating profit margin of [redacted] and [redacted] respectively for the two financial years, indicating that costs for [redacted] were increasing faster than its sales of LPG. [redacted] and [redacted] both experienced operating profit margins of [between 10-20%] in the financial year of FY13/14. [redacted] and [redacted] operating profit margins remained lower than those of [redacted], [redacted] and [redacted]. [redacted] operating profit margin was [between 5-10%] for FY12/13 and [between 5-10%] for FY13/14 – lower than those of both [redacted] and [redacted]. [redacted] primarily sells LPG to bulk end-users (characterised by high volumes at relatively lower prices) whilst wholesalers like [redacted], [redacted] and [redacted] have focused the majority of their business on sales to cylinder end-users (having lower volumes at a slightly higher price).

Figure 5: Operating profit margins for wholesalers for FY12/13 and FY13/14



Source: KayaGas, Afrox, Totalgaz, Oryx, Easigas and Reatile Gaz submissions (2015) and financial statements (2014).

Government policy perspectives on LPG

3.31. Several policy documents emphasise the strategic importance of LPG in an economy struggling with rising energy prices and electricity supply pressures.¹⁸ These policy documents are discussed briefly.

3.31.1. The key document underlying South Africa's energy policy is the *White Paper on the Energy Policy of South Africa* of 1998 ("the White Paper"), identifying LPG as a viable alternative energy source. It further acknowledges that energy consumption is partly based

18 Department of Energy, (2013), Transformation of the Gas Sector. Presentation by Chief Director: Hydrocarbons Policy dated 13 August 2013.

on the availability of LPG and of possible LPG substitutes with a heterogeneous energy use across households with different incomes.¹⁹ The document recognises the lack of competitiveness at the time in the gas sector, and that regulation is required to ensure equitable access for consumers and to avoid the abuse of monopoly power.²⁰ This report not only highlights LPG as an important element in addressing South Africa's energy mix; it also recognises this fact in the context of competition and industrial policy.

3.31.2. A priority of the *New Growth Path* ("NGP") is to strengthen regional integration as regards energy, in particular the scope of energy sources and their ability to deliver energy reliably. The NGP is aimed at improving existing energy sources while at the same time exploring other opportunities like gas.²¹

3.31.3. LPG also forms part of the *DoE's 2011/2012 – 2015/2016 Strategic Plan*. One of the planned policy initiatives is to provide access to safe, cleaner, more efficient and portable fuels. Another initiative is to switch low-income households from using coal, paraffin and biomass.^{22,23} This is significant in the sense that 15 years after the White Paper, affordable access to energy for low-income households remains a priority for Government, and this concern can be addressed through departmental and national strategies.

3.32. Through various interactions with the DoE, the Commission is aware that the DoE is considering a switching strategy²⁴ that will outline how industrial, commercial and domestic end-users will be incentivised to use LPG.

19 White Paper on the Energy Policy of South Africa, 1998, p30.

20 *Ibid.* p34.

21 New Growth Path: Framework, p56. Available at: <http://www.economic.gov.za/communications/publications/new-growth-path-series>. Accessed on 3 February 2014.

22 DoE Strategic Plan 2011/2012 – 2015/2016, p13. Available at http://www.energy.gov.za/files/aboutus/DoE%20Strategic%20plan%202011_12%20-%202015_16.pdf. Accessed on 3 February 2015.

23 The DoE committed to several targets as part of an LPG pricing and licensing framework. This included developing an LPG strategy and revising the MRGP and MRP. DoE Strategic Plan 2011/2012 – 2015/2016, p38.

24 Commission received a draft switching strategy document from DoE.

3.33. It is within this policy context that the LPG market inquiry investigated those features of the market with the potential to lessen, prevent or distort competition. These features included the limited domestic production and supply of LPG, the incentives provided by the regulatory environment, and the existence of barriers to entry and expansion.

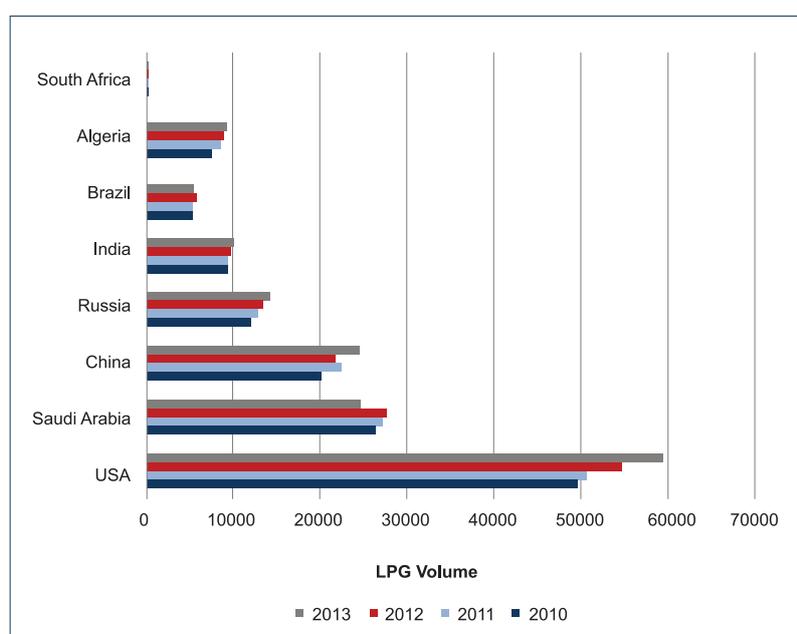
Global and domestic market dynamics of LPG²⁵

3.34. This section provides a detailed overview of the dynamics of the international and domestic LPG markets. The trends in LPG production are interrogated, followed by a description of the domestic LPG production processes in South Africa.

LPG global production trends

3.35. The top three LPG producers based on average production volumes for 2010 to 2013 were the United States of America (“USA”), Saudi Arabia and China, with Algeria representing the only African country to rank among the top ten LPG producers in the world (Figure 6). In recent years, a global surge was observed in LPG production, with volumes reaching over 282million tonnes per year in 2013. This sudden increase can be attributed to the development of US shale gas and the increase in demand from Asia-specific markets.

Figure 6: Selected countries – LPG production over time (2010 – 2013, thousand tons)

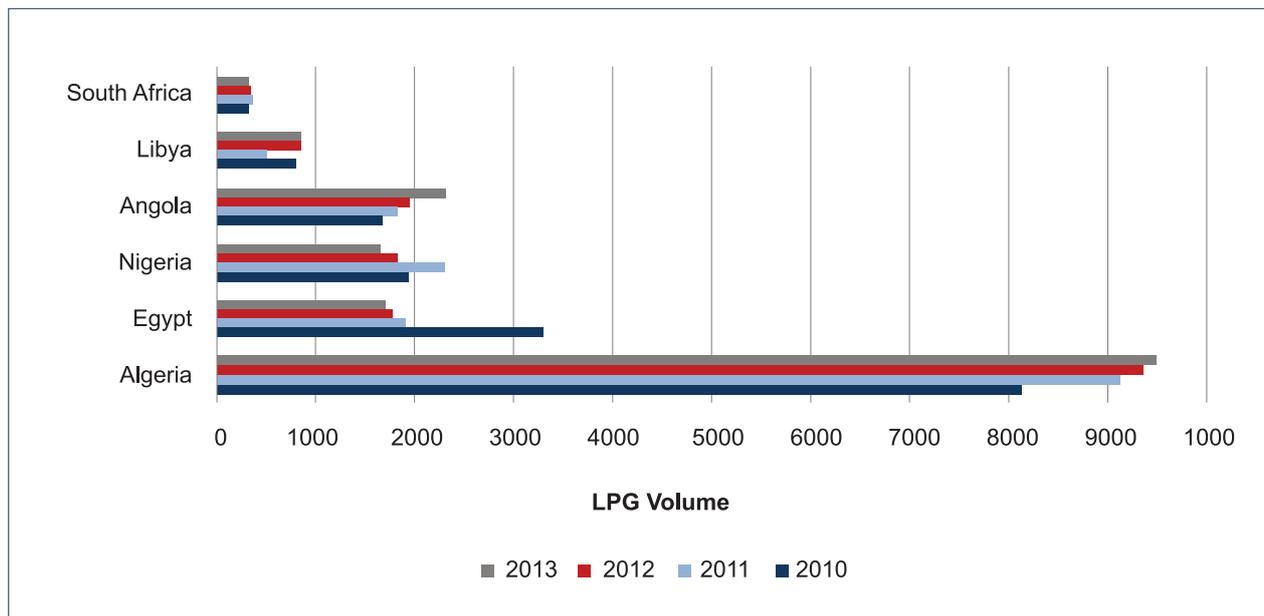


Source: Argus Statistical Review of Global LP Gas 2014

25 This section compares the market dynamics in South Africa to other international jurisdictions. The basis for the selected comparator countries is mainly the socio-economic structure of each country. A detailed profile of each country is provided in appendix B.

- 3.36. Due to the surge in USA shale gas production, and following the completion of USA midstream operator Enterprise Products Partners' export terminal expansion, the USA's exports began to rise in the first quarter of 2013. This expansion essentially resulted in the USA overtaking Qatar as the world's top exporter. This put pressure on the global market, with exporters fearing that the USA will become a dominant player and that pressure will be placed on the price, given this increase in competition.
- 3.37. As Asian markets strive to make LPG a primary fuel source, China has emerged as the second largest producer and consumer of LPG. Chinese, South Korean and Japanese importers continue to tie up contracts with major USA LNG exporters. While Asian markets have taken advantage of the increase in the USA LPG production, northwest Europe was given access to another LPG source in the form of Russia's Ust-Luga export terminal that opened in the summer of 2013.
- 3.38. In Africa, LPG represented 6.16% of total global production in 2013. South Africa's production of an estimated 352 000 tonnes in 2013 is relatively low compared to that of Algeria and Angola, as shown in Figure 7.

Figure 7: Top African LPG producers and South Africa (2010 – 2013, thousand tons)



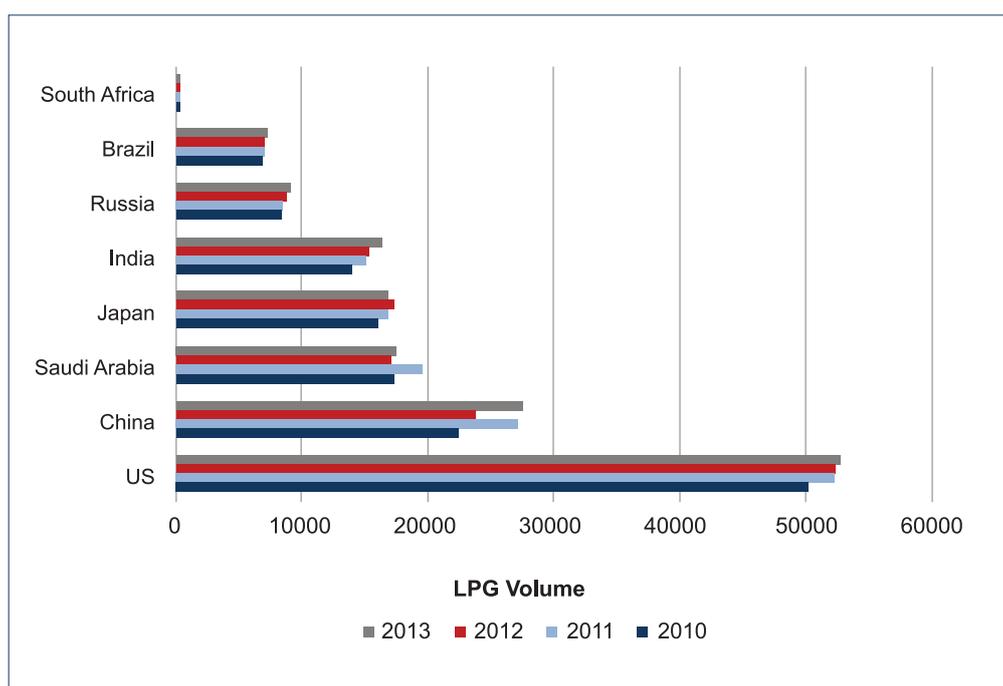
Source: Argus Statistical Review of Global LP Gas 2014

3.39. South Africa also lags behind other African countries. As illustrated in Figure 7, Algeria accounts for 54.65% of all LPG production in Africa, followed by Angola and Egypt at 13.39% and 9.96% respectively. Much of Algeria’s success in the market is largely due to its infrastructural investments and possibly the decision to commit to this investment early in the 1990s.

Global LPG consumption trends

3.40. Global LPG consumption reached just under 267million tonnes per year (t/yr²⁶) in 2013. Although North America is an important LPG consumption centre, collectively the Asian countries also account for a considerable portion of LPG consumption. In the international context, South Africa consumes very small amounts of LPG, ranking 61 in global consumption.²⁷ Figure 8 demonstrates how minimal LPG consumption is in South Africa relative to the top global consuming countries.

Figure 8: Consumption of LPG in South Africa relative to selected countries (2010-2013, thousand tons)



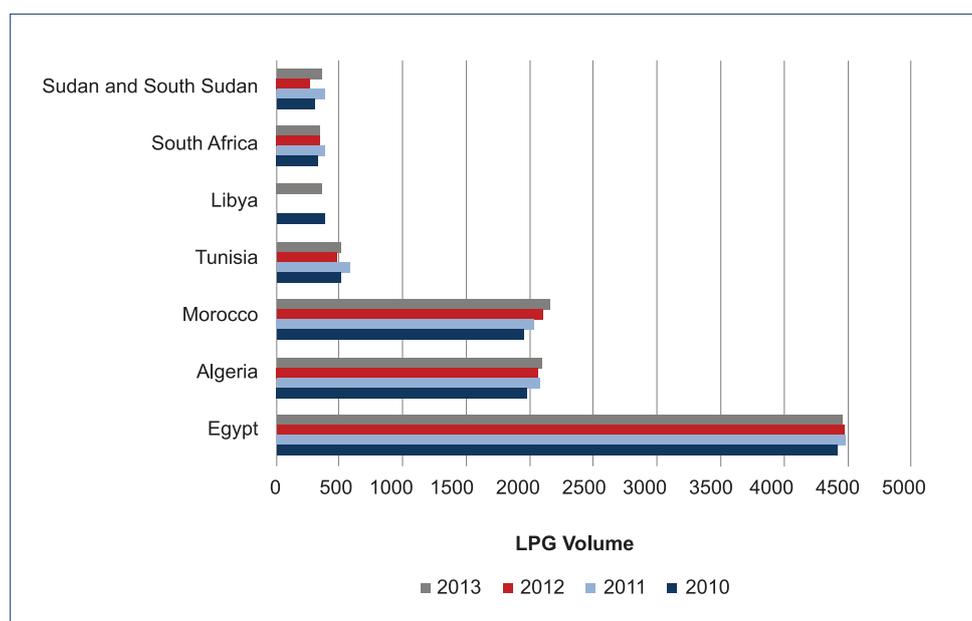
Source: Argus Statistical Review of Global LP Gas 2014

3.41. LPG consumption in Africa remains low compared to other countries, representing a latent potential demand.

26 Argus Statistical Review of Global LP Gas 2014
27 *Ibid.*

3.42. Many of the challenges faced by African countries relate to both infrastructure and funding. Figure 9 illustrates the consumption of LPG by South Africa and other African countries. Relative to its African counterparts, South Africa ranks sixth on the continent. Egypt's consumption is more than 12 times that of South Africa.

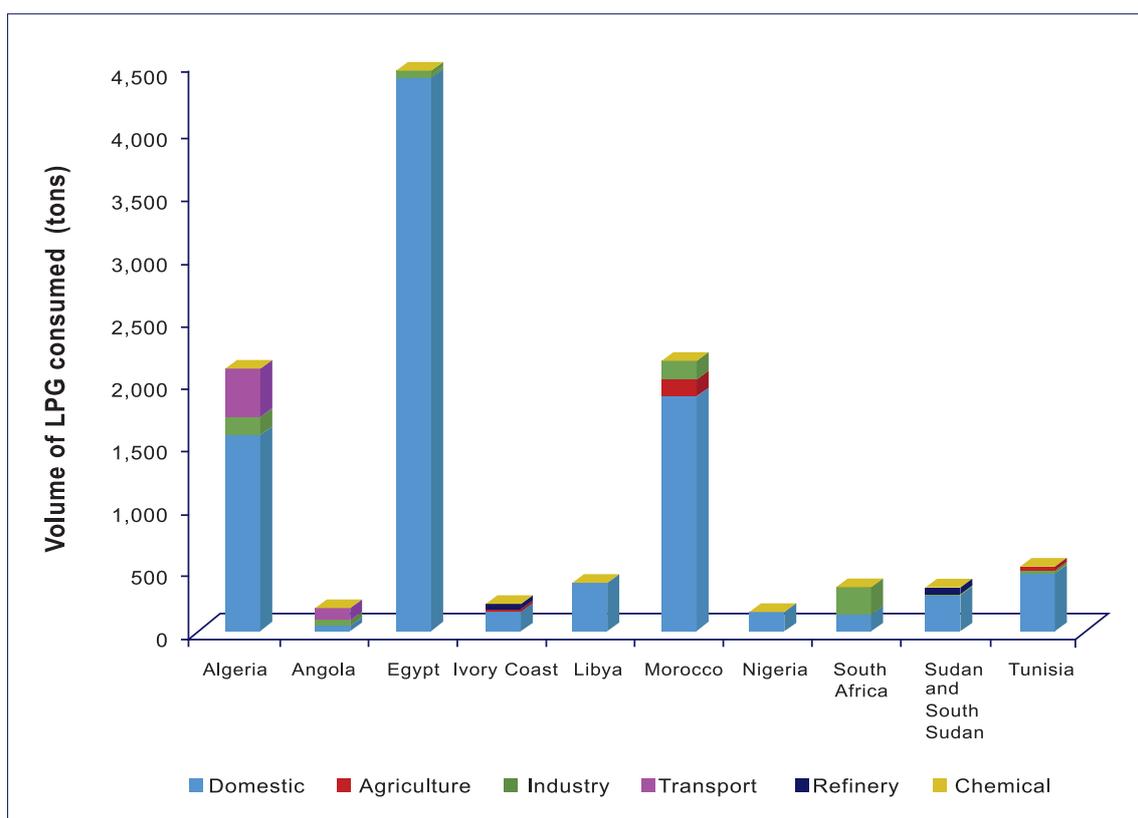
Figure 9: Consumption of LPG in Africa (2010-2013, thousand tons)



Source: Argus Statistical Review of Global LP Gas 2014

3.43. An analysis of the pattern of consumption across various sectors in African countries also reveals the lack of diversification in using LPG in South Africa. Figure 10 indicates that LPG consumption across sectors is not as diversified in South Africa as it is in Algeria or Morocco. Sectors like transport (autogas) and agriculture are not using LPG in South Africa.

Figure 10: LPG consumption by sector across the top ten African consumers of LPG (2013)



Source: Argus Statistical Review of Global LP Gas 2014

3.44. Concerning the split between the industrial sector and domestic sector LPG consumption, data sources reveal conflicting results. Data from the Argus Statistical Review of Global LP Gas 2014 reveals South Africa consumes the bulk of its LPG in the domestic sector relative to the industrial sector,²⁸ while other sources like the DoE estimate domestic consumption to be 17% of total consumption. Market players like [redacted] maintain that commercial users account for approximately 85% of LPG consumption, with households consuming the remaining 15%. [redacted] These mixed results reveal a lack of reliable data available on this sector.

28 Specifically, the split between industry and household consumption is weighted towards domestic use: in 2013, households accounted for 52% of South Africa's total LPG consumption while industry consumed the remaining 48% (source: Argus Statistical Review of Global LP Gas 2014).