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Petrol price regulation in South Africa

Is it meeting its intended objectives?

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Abstract: The South African liquid fuels industry is a significant part of the economy. Historically, government policy focused on import substitution industrialization to support industry margins. This approach is called into question by the 2006 shift from net exports to imports and by inflated downstream regulated margins. This study focuses on the regulated petrol price. Import parity pricing regulation has not kept pace with market changes. A policy shift in 1998 towards market-related pricing has not materialized. Instead, regulated margins have increased over the last 20 years in real terms, partly attributable to methodological errors in the regulatory accounting system. The long-term excess of service stations persists despite declining petrol and diesel volumes between 2005 and 2019. Estimates suggest that the petrol price could be lower by 0.70–0.80 rands/litre. Price deregulation is inhibited by political regulation and social policies entangled in regulation.

Key words: petrol price, South Africa, deregulation, regulatory accounting system

JEL classification: K23, L59, D04, D40

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Acronyms: at the end of the paper

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1 Introduction

In South Africa, government has intervened in and/or regulated markets involved in the manufacture, distribution, and retailing of liquid fuels in various ways since the 1930s without providing formal reasons for doing so. By 1998, the White Paper on Energy Policy referred to 'a labyrinthine set of regulatory controls' (RSA 1998: 5). While the instruments used have changed over time, the evidence suggests that the primary reason for market interventions has been to support investors in various parts of the value chain. This has been achieved by limiting competition. To a lesser extent, there has been a wish to protect motorists from excessive pricing. In addition, over time social policy objectives have become entangled in petrol price regulation. These relate to the promotion of small businesses and job creation. More recently, Black economic empowerment has been added to the list. This mixture of reasons has made it difficult for government to implement its policy of deregulation.

Petrol was the most important liquid fuel in South Africa for many years. Interventions in the petrol market have had knock-on implications for the prices of diesel, illuminating paraffin, and liquefied petroleum gas (LPG) and their control or regulation.

Petrol price control or regulation has been intimately bound up with the structure of the industry and in particular the proliferation of retail outlets, or what are colloquially known as 'service stations' despite the fact that they ceased to be places where motor vehicles were serviced many years ago. The number of service stations and their size have implications for employment in the sector, a sensitive topic in South Africa due the enduring high levels of unemployment.

In the South African downstream petroleum sector, there are elements of the value chain that have natural monopoly characteristics, such as import terminals and pipelines that warrant economic regulation, while there are others that do not, such as refineries, some storage facilities, wholesaling, and retail outlets. This mixture of characteristics contributes to the often robust debate about price deregulation in South Africa. The implications for any reform include at least the need to educate key stakeholders about the different parts of the value chain and which elements warrant regulation and which do not. This paper aspires to play a small part in that regard, although its primary focus is on petrol pricing and how regulation has inflated this.

The paper sets out to answer the question: 'Is petrol price regulation in 2020 meeting its intended policy objective/s given the changes in market structure and demand?' It does this by providing a theoretical overview of economic regulation and an outline of the industry, and briefly exploring the origins and history of petrol price control and regulation in an endeavour to discover what ills it was intended to remedy. The remainder of the paper analyses two of the key regulatory pillars: the import parity pricing (IPP) methodology called the basic fuel price (BFP) and the regulatory accounting system (RAS) methodology which regulates wholesale and retail margins.

2 Economic regulation

There are two primary schools of thought in the economic literature on regulation: the positive and the normative (Jamison et al. 2004). The positive school of thought is concerned with why regulation occurs and includes theories of natural monopoly and market power, stakeholder interest group theories, and theories on the limitation of government power in the interests of efficient service delivery. These theories conclude that regulation occurs for one or more of the following reasons: to align the objectives of the regulated entities more closely to the government's objectives, to protect customers from market power, to protect regulated entities from competitors, and to protect regulated entities from undue government interference. It is recognized that the introduction of regulation occurs in a political context which influences the type of regulation introduced, continued, amended, or removed.

The normative school of thought is concerned with how regulation is performed. Its conclusions concern which type of regulation is most efficient, how to promote competition, how to incentivize regulated entities to perform better, how to improve economic efficiency, how regulators should be governed, and how they should engage with stakeholders.

Historically, regulation was introduced to deal with natural monopolies, which it was argued led to market failures that in turn required government intervention, in order to correct the market failures and to protect the public from monopoly pricing and rent-seeking (Biggar 2011). A natural monopoly exists when a single supplier can meet the entire market demand at a lower cost than two or more suppliers. This phenomenon is typically associated with network infrastructure that has high upfront capital costs and low connection costs for an additional connection. There is a distinction between a natural monopoly and a monopoly in what could be a competitive market. We do not deal with the latter, as the petroleum products value chain in South Africa has never been dominated by a monopolistic supplier.

Two solutions to natural monopolies are commonly used: public ownership, usually in order to capture the rents, or economic regulation (Bhattacharyya 2019). In this discussion we only consider economic regulation because the only remaining state-owned entity in the petroleum products manufacturing market is PetroSA, a small producer that will run out of natural gas in 2020 (Engineering News 2018).

In the neoclassical view, regulation should seek to constrain monopoly pricing—that is, attempt to set prices at the level at which an efficient market would have set them and that will thus maximize social welfare. Subsequently, the objective of economic regulation has become efficient production and efficient pricing (Biggar 2011). Albouy (1999: 1) casts the net wider and argues that the objective of regulation is three-fold:

(i) to protect the environment;
(ii) to protect consumers, workers, and the public at large; and
(iii) to foster investment, competition, and innovation while constraining the abuse of market power.

When governments introduce regulation of one form or another, it is usually with some policy objective/s in mind. It may be to protect customers or producers, to benefit one group over another, to protect certain producers from competition, or a combination of objectives. Often, regulatory interventions in markets are intended to improve welfare, which may be defined as 'the aggregate benefit that utility services provide, including benefits to consumers, benefits to operators, and externalities' (Jamison et al. 2004: 12). But it is also possible that politicians introduce regulations for less honourable purposes, such as to garner short-term electoral support at the expense of long-term optimization of the sector (Jamison et al. 2004). Regulation of a value chain allows a regulator to shift rent from one link of the chain to another or to favour some links in the chain over others. This appears to have happened in South Africa based on our comparison of margins along the value chain below.

The notion that economic regulation is the correct remedy for market failures was challenged by the Chicago School in a number of papers from the 1950s through to the 1970s. Stigler (1971) questioned why governments intervene in some sectors and not others. He argued that economic regulation was intended to support the interests of the regulated industries, through subsidies, controls on entry to the market, or direct controls on prices, rather than the public good. Biggar (2011) argues that Stigler drew policy-makers' attention to the fact that what they thought were interventions in the public interest were in fact not so. While there may be merit to Stigler's contention in a broad sense, it does not seem to apply to natural monopolies, which presumably would prefer not to be regulated but in many instances remain regulated to this day.

Priest (1993) argues that Stigler's paper was directly responsible for the deregulation movement that began in the 1980s. The movement sought to introduce more competition into regulated markets. Competition, it was argued, causes service providers seeking to maximize their profits to improve the quality and price of their service, on the assumption that informed consumers will seek to maximize their combination of quality and price (Jamison et al. 2004). Competition in the market enhances innovation and curbs the ability of a service provider to raise prices. It also makes it more difficult for politicians to influence markets for dishonourable purposes.

In promoting competition in the market, regulators often require unbundling or restrictions on vertical integration. In South Africa, the Petroleum Products Act has a limited restriction on vertical integration in that manufacturers and wholesalers may own, but not operate, service stations (with some exceptions, such as those used for training purposes). Some oil companies try to mitigate this restriction through the terms of their franchise agreements with independent operators. This may have contributed to the emergence of vociferous and combative service station associations (Fuel Retailers Association, South African Petroleum Retailers' Association).

In 1968, Demsetz introduced the notion of contestable markets or competition *for* the market where competition *in* the market is not possible. For example in natural monopoly markets, the deregulation movement proposes competition for the market through auctions or bidding for a concession to operate the natural monopoly in the market for a certain period. South Africa has introduced bidding rounds for renewable power generation. This approach has not yet found its way into the petroleum sector, which still uses licensing as the means to control access to the market, albeit not very effectively (discussed further below).

Incentive regulation seeks to improve the performance of the regulated entity towards the regulator's objectives. The most basic form of incentive regulation is rate-of-return regulation or cost-of-service regulation. Parts of the petrol value chain have been regulated by a rate-of-return-type methodology for many years. One of the concerns with rate-of-return regulation is the so-called Averch–Johnson effect—the favouring of capital over other inputs rather than an optimal mix of inputs. This has led to concerns about South Africa's 'gold-plated' service stations. The RAS methodology deals with this question by utilizing a form of benchmarking regulation which incorporates a rate-of-return methodology. The capital allowed into the regulatory asset base is that of a 'Benchmark Service Station' (BSS), at a value provided by an expert and adjusted annually for inflation. Legitimate questions can be raised about the quantum of capital allowed and also about the appropriateness of one estimate for a large and geographically diverse country like South Africa. A similar approach is used for operating costs and the same critique applies. Gearing also affects the cost of capital; this is discussed in detail below. Petrol price regulation has attracted capital to the service station market because, as we argue below, of the generous retail margin.

Another concern with rate-of-return regulation is its tendency to reward overspending on all inputs—so-called 'X-inefficiency'. Although there are grounds for this concern in the RAS methodology (as we demonstrate below), there are a number of elements in the RAS methodology that are valued on expert estimates of the costs involved. For example, we identify below the difference between the labour costs used in RAS and the applicable collective bargaining agreement rates. In both the BFP and the RAS methodologies, there are no explicit measures designed to increase efficiencies other than to do better than the BSS benchmark.

The notion of an inflation adjustment was introduced into regulatory economics by Baumol (1982). He argued that it should be accompanied by a 'productivity offset', which became known in South Africa as 'CPI minus X' regulation and globally as a form of incentive regulation. In the BSS benchmark case, rather than price-cap regulation, it is more of a cost-cap-type regulation in which the benefits of increased productivity are not welfare-enhancing and accrue only to the operator. Whether or not a single BSS is an appropriate methodology for a high-volume, low-margin type of business is questionable in such a diverse sector. At least it does incentivize service stations to increase volumes above the BSS level and in this way possibly deals with the long-running problem of proliferating service stations (considered further below). The BFP methodology suffers similar drawbacks in that efficiency gains do not increase welfare: they accrue only to the manufacturer.

A further regulatory problem is the variation in demand when fixed infrastructure has a limited capacity. Peak-load tariffs in the electricity and other network industries have been one response to this challenge, as there is widespread acceptance that prices should vary by time-of-use (Biggar 2011). The liquid fuels value chain is not a classic network industry, as there are parts of it that are not physically connected, such as transportation by water, road, and rail. South Africa's regulated petrol pricing system with its fixed retail price, deals with the peak demand problem (and security of supply) by obliging oil companies to keep 25 days' supply in coastal storage. Of course, this has been difficult to monitor and the regulator has acknowledged that none of the refiners do this (RSA 2018).

2.1 Regulatory process and institutional design

The National Treasury is concerned about high liquid fuel prices and called for 'a review of regulation in its entirety' (RSA 2019a: 33). The National Treasury may be alluding to some of the regulatory failures such as the long intervals between reviews of petrol pricing methodologies and other flaws (dealt with below); they may also be referring to the institutional design in its entirety.

The institutional arrangement within which regulation takes place affects its credibility, and the ability of stakeholders and the political system to influence regulatory outcomes. For example, if the regulator is subject to daily political pressures this may cause regulation to focus on short-term political goals rather than long-term industry development. For these types of reasons, together with the risk of regulatory capture, many countries have mitigated such risks by separating the policy-making and regulatory functions into separate institutions (Jamison et al. 2004; OECD 2016). South Africa partly achieved this with the establishment of the National Energy Regulator of South Africa (NERSA) in 2005. However petrol pricing regulation remains the responsibility of the minister of energy, who is both the policy-maker and the regulator. The principal–agent relationship between the government and the regulator is absent, as they are one and the same.

Modern infrastructure regulators typically have an independent commission or board or committee of experts as their decision-making authority. NERSA is designed on this basis. This type of structure protects politicians from having to make the difficult economic trade-off decisions that regulators face. Such a design is intended to give investors comfort that there will be less political interference and more focus on sound economic principles in regulatory decisions. A separate institution also makes it easier for the regulator to comply with what the World Bank refers to as the 'ten key principles for the independent regulator model of regulatory governance' (Brown et al. 2006). These include, independence, transparency and public participation, predictability, ethical conduct controls, and the right of review and/or appeal to a judicial authority. The Petroleum Products Act only establishes a right of appeal to the minister him/herself. The lack of these features politicizes regulation.

It may be that the institutional design leads to a structural inability of the ministry of energy to distance him/herself from hard regulatory decisions such as deregulation and that this contributes to poor policy implementation and regulatory performance.

2.2 Why does regulation continue?

Why do South African energy ministers continue to regulate petrol prices? The responsible officials believe that petrol price regulation was introduced in the past when petrol was used almost exclusively by private motorists (diesel use was mainly for industrial and commercial purposes), to protect motorists from high prices.[1] While there may be truth in that view, we show in this paper how regulation is not achieving that policy objective. In addition we question some of the explicit and implicit policy objectives underpinning ongoing petrol price regulation given the changed circumstances and market structure since the historic decision to regulate was taken. We also question the use of petrol price regulation as the appropriate instrument to achieve certain of the policy objectives.

The available evidence suggests that investment in refining capacity has been a long-running preoccupation among South African policy-makers, as we argue below. There has been a fascination with refining capacity, expressed in market interventions that have sought to advance and protect refining investments. There are obvious benefits to refining investments in terms of value added, investment, tax generated, and the development of the service industries that refineries require. But they are capital-intensive. Policy-makers' unquestioning assumption that promoting refining is welfare-enhancing is not supported by any cost-benefit analysis that we are aware of. The only cost-benefit analysis conducted in recent years was conducted for the Presidency in 2007 in regard to Sasol's proposal to build another coal-to-liquids synthetic fuels plant (project Mafuta), and it concluded that continued imports would be the better option. Just over a decade later, the National Planning Commission came to a similar conclusion: 'Importation of liquid fuels in the short- to medium term would likely prove more cost-effective than investing in a new large refinery, which may only be required in the medium- to long term' (RSA 2019b: xii). This was in the context of calls for a new oil refinery by successive energy ministers.

Regulation may be perceived to hinder foreign direct investment. The history (see below) suggests the opposite—that regulation has been intended to support foreign direct investment, or at least to retain it, in the belief that deregulation might lead to disinvestment. The next section explores this possibility.

If regulation is yielding prices above market prices, there is the possibility that deregulation may lead to capital flight from the sector and pose a threat to security of supply. The multinational oil

[1] Personal communication with DoE officials, 26 February 2020.

companies operating in South Africa also operate in many deregulated markets across the world and would probably adapt to deregulation in South Africa. If they did decide to exit the market, it is unlikely that they will simply abandon their assets. The large environmental rehabilitation costs associated with refinery closure would make closure a less attractive option. The more anxious an oil company is to disinvest, the lower the selling price should be and the more likely it is that another investor will acquire the assets. When Mobil disinvested during apartheid, local interests acquired its assets.

It is more likely that oil companies will want to sell their assets. If they are offered at or below market prices, other investors may be attracted. The Department of Mineral Resources and Energy has been investigating and making announcements about possible new refining capacity for over 20 years without result thus far. Given the advent of and attractiveness for South Africa of electric vehicles (see below) and other new propulsion technologies, in the context of the COVID pandemic economic setback in 2020, it is uncertain that South Africa will ever need additional refining capacity. In the short term, the National Planning Commission has recommended continued imports of refined products, presumably because there is ample global refining capacity. Security-of-supply concerns can be addressed at much lower cost, and more usefully, by additional strategic stocks and port terminals than by refinery investment. These ideas are supported by the National Planning Commission (RSA 2019b).

Our assessment is that government's current interventions in the petrol market are in pursuit of the following combination of policy objectives:

- import substitution industrialization;
- security of supply;
- 'affordable prices' (RSA 1998);
- promotion of small businesses;
- Black economic empowerment;
- employment opportunities.

Market interventions in pursuit of each of these policy objectives have generated beneficiaries that have formed lobby groups intent on protecting and advancing their interests. The oil companies have historically been the most powerful of these forces, but in recent times they appear to have lost some of their power to the retailing and Black economic empowerment lobbies. In addition, there are government officials regulating liquid fuels who may see deregulation as a threat to their job security.

All of these concerns and interest groups have formed an ecosystem-like political economy in which they all have an interest in perpetuating the regulatory status quo. While there is jostling among the players for larger shares of the rent available, none of them want to see the system fundamentally reformed. The South African Petroleum Industry Association (SAPIA), the most outspoken advocate of deregulation between 1994 and 1998, has gone silent on the matter, as has the DoE. Albouy (1999: 5) notes that politicians tend to 'stress fiscal objectives and protection of the social equilibrium', and this may be why successive ministers of energy have not implemented deregulation as envisaged by the White Paper on Energy Policy.

Rodrik (2016) argues that cutting red tape and reducing regulation will not necessarily lead to increased private economic activity if other facets of the economy are constrained. While that may be true, curtailing the price of intermediate inputs such as fuel prices, or 'administered prices', has been a long-standing objective of the South African government. Despite South Africa's other economic challenges, there has been no shortage of private sector investment in the South African petroleum sector. Foreign investors have continued to invest in recent years. Glencore has acquired Chevron's assets, Puma Energy has entered the retail sector, and other large international firms such as Vittol and Oiltanking have entered the storage and terminals market.

For these reasons, together with the pressing need for lower-cost intermediate inputs such as liquid fuels in the aftermath of the COVID pandemic, deregulation has never been more propitious in the last 30 years than it is in 2020.

3 Industry outline

In this section we provide a brief outline of this large and complex industry known as the liquid fuels industry. The upstream industry dealing with finding and mining oil and gas has no real presence in South Africa and is not considered in this paper. Only the downstream industry from imports to retailing is considered.

Oil accounts for 22 per cent of South Africa's energy consumption (Dudley 2017) but is its single largest import by value. Coal remains the highest contributor at 70 per cent, with natural gas (4 per cent), nuclear (3 per cent), and renewables making up the remainder (Dudley 2017).

The petrol value chain in South Africa is heavily regulated, with no less than five different regulatory bodies involved in administering elements of the value chain—see Table 1.

Refining is the most capital-intensive element in the value chain. The currently operating refineries or liquid fuels manufacturing facilities are described in Table 2.

Manufacturing capacity has shown only incremental capacity creep, from 708,000 barrels per day (bpd) in 2007 to 718,000 bpd in 2018 (SAPIA 2019). No new refineries have been built since the PetroSA facility in 1992. Refining economies of scale have increased since these refineries were built and they are now considered small refineries, which means that they may struggle to compete with the large refineries in India and the Middle East—for example, the Reliance Jamnagar complex in India has a capacity of over a million barrels per day.

Table 1: Value chain and petrol regulation

Value chain element	**Market character**	**Economic regulation**	**Regulator**	**Regulatory methodology**
Shipping oil and refined products	Deep sea and coastal routes competitive	None	n/a	n/a
Import parcels	Natural monopoly	Competition Act exemption required	Competition Commission	n/a
Port Access	Natural monopoly	Right to construct facilities and to cross Admiralty Reserve	Ports Regulator + Transnet National Port Authority	Port user tariffs ROA + negotiated concessions
Import terminals	Crude oil natural monopoly Refined products limited competition	Entry—licence required Price cap	NERSA	ROA
Import tariffs	Competitive	No import tariff	International Trade Administration Commission (ITAC)	n/a
Import control (quantitative)	Competitive	Approval required for all imports and exports	ITAC and DoE jointly	n/a
Refining	Competitive with regional monopolies	Entry—light-touch licensing Price—price cap refinery gate	DoE	Import parity pricing (BFP)
Wholesaling (includes some retail assets)	Somewhat competitive—access to key infrastructure limited	Entry—light-touch licensing Price—price cap	DoE DoE	ROA (RAS)
Storage (coastal and secondary)	Limited competition	Entry—licence required Tariff cap	NERSA	ROA
Inland transport (interprovincial pipelines)	State monopoly – common carrier access	Entry—Licence required Tariff cap	NERSA NERSA	ROA
Inland transport to secondary storage and service stations (road)	Competitive	None	n/a	n/a
Inland transport (rail)	State monopoly—negotiated carriage	None	n/a	n/a
Inland transport secondary storage to service stations (road)	Competitive	Entry—none Price—price cap	 DoE	Cost recovery
Retail margin	Competitive	Entry—onerous licence required Price—price cap (petrol only)	DoE DoE	Cost recovery

Source: authors' construction.

Table 2: Liquid fuels manufacturing facilities

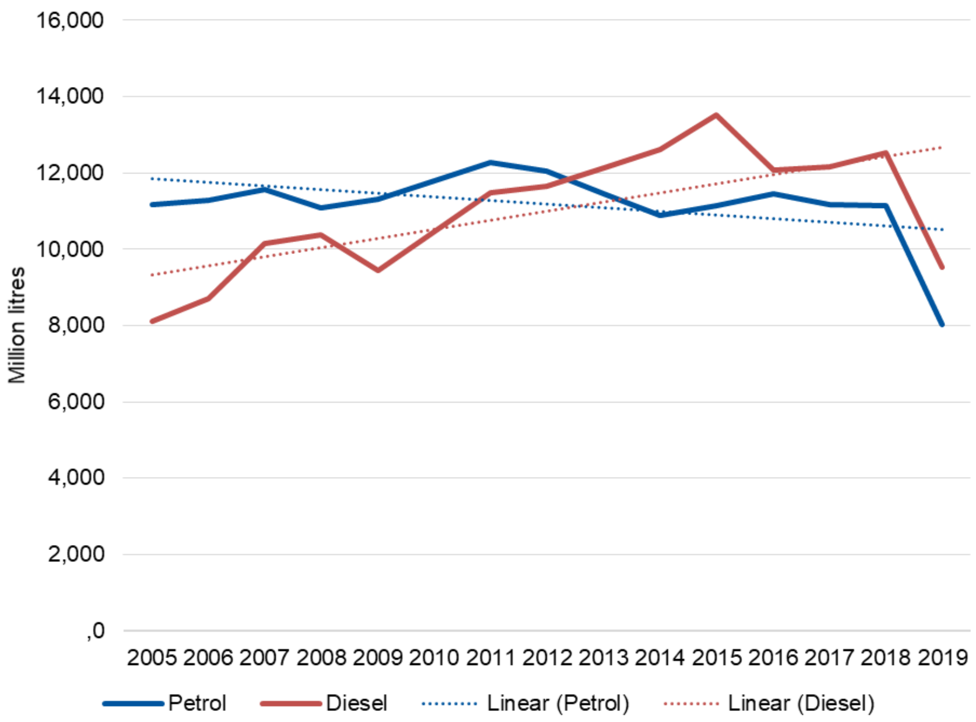
Name	Capacity '000 barrels per day (crude oil equivalent)	Ownership	Location
Chevref	100	Astron Energy	Cape Town
Enref	135	Engen Petroleum	Durban
Natref	108	Sasol/Total (64%/36%)	Sasolbrug
PetroSA	45	PetroSA	Mossel Bay
Sapref	180	Shell/BP (50%/50%)	Durban
Secunda	150	Sasol	Sasol
Total	718		

Source: authors' construction based on capacity data from SAPIA (2019).

3.1 Volumes

The domestic industry produces various types of petrols, diesels, bunker fuel, fuel oil, illuminating paraffin, jet fuel, aviation gasoline, LPG, and bitumen. A limited amount of base oils meeting group one specifications are produced locally for the production of lubricants. Refined lubricating oils are also imported and packaged. The largest products by volume and value are diesel and petrol. In recent years, as increasing numbers of vehicles with diesel engines have entered the vehicle parc, diesel has overtaken petrol as the largest-volume product and is on an increasing trend while the opposite is true of petrol—see Figure 1. The current demand for petrol equates to approximately 48 per cent of the total demand of petroleum products in South Africa (SAPIA 2019).

Figure 1: Consumption of petroleum products in South Africa (million litres)



Source: authors' calculations based on data from http://www.energy.gov.za/files/media/media _SAVolumes.html (accessed 25 February 2020).

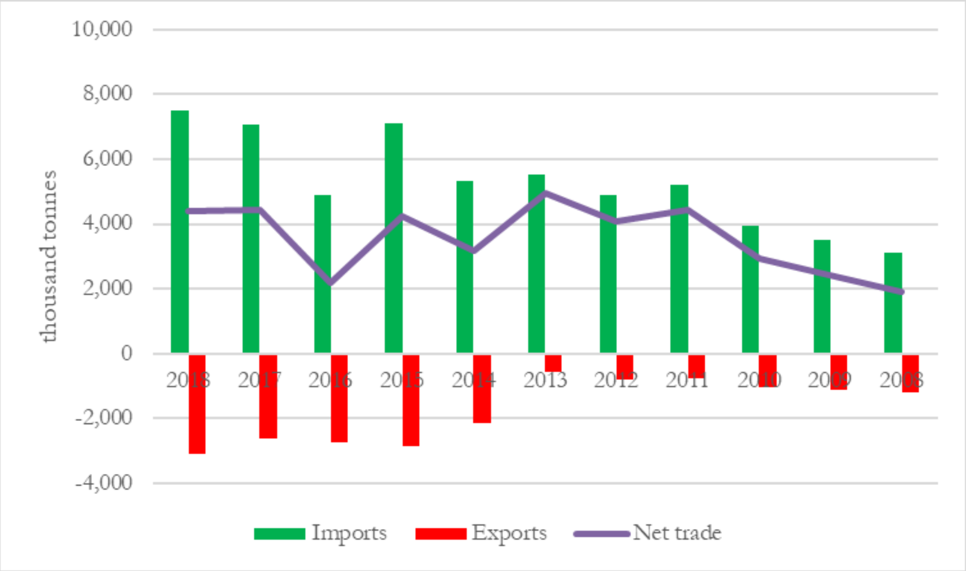
There are no official data in the public domain on the volumes of petrol and diesel sold through service stations. According to Esterhuizen (2011), approximately 37 per cent of diesel and approximately 95 per cent of petrol is sold through service stations.[2]

The market penetration by electric vehicles in South Africa is just over 1,000, a tiny fraction of the 12 million registered vehicles (Tyilo 2019). Consequently, it is expected that South Africa will continue to utilize petroleum-based fuels in the short to medium term.

3.2 Trade in petroleum products

After many years as a net exporter of petroleum products, South Africa became a net importer in 2006 (RSA 2018). Import volumes have more than doubled in the last ten years—see Figure 2.

Figure 2: Trade in petroleum products (petrol, diesel, jet fuel, and LPG)



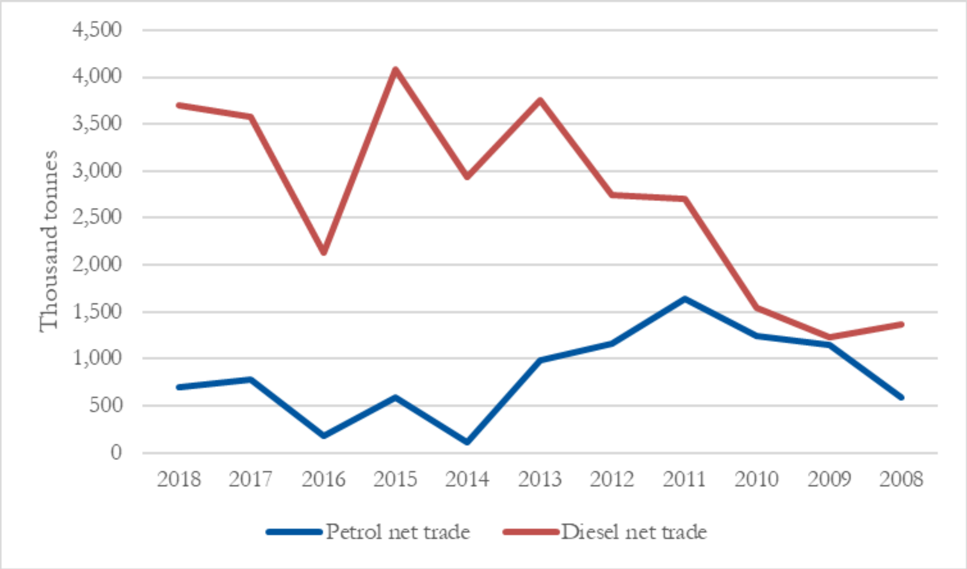
Source: authors' calculations based on data from SAPIA (2019: 35).

Approximately 20–25 per cent of South Africa's petroleum product requirements are being met by imports, with the preponderance being diesel rather than petrol—see Figure 3.

Is this level of petrol imports sufficient to influence deregulated prices towards a real market price? In considering this question, consideration must be given to the nature of the companies active in the market. All of the refining companies have international trading capabilities, although most would seek to protect their local refining assets. The exception is Astron Energy (previously Caltex), which has Glencore, a large global commodities trader, as a 70 per cent shareholder. Another recent development is Puma Energy's entry into the wholesale and retailing market. Its main shareholder is another large international trading company, Trafigura.

[2] These estimates are supported by a senior Astron Energy official, although he believes service stations account for 30% of diesel sales (personal communication, 17 February 2020).

Figure 3: Petrol and diesel net trade



Source: authors' calculations based on data from SAPIA (2019: 35).

Does the physical infrastructure exist for petrol imports to discipline domestic prices? Two potential bottlenecks require consideration: firstly, the capacity of the port/s to handle the required number of vessels; and secondly, the capacity of the loading facilities and associated storage tanks (terminals) to enable the vessels to discharge their cargoes. Durban is the main port of entry for petroleum product imports. The Transnet National Ports Authority, responsible for ports, has long-term plans for port capacity. It recently delayed its plan to expand Durban port by adding a dig-out port on the site of the old Durban airport. Ports are regulated by the Ports Regulator, which must, *inter alia*, 'regulate the provision of adequate, affordable and efficient port services and facilities' (National Ports Act 2005: section 30(2)(f)).

The petroleum product terminals are owned by the oil majors and private storage companies, both of which have added capacity in recent years. The terminals are regulated by NERSA. The Petroleum Pipelines Act requires the owners to make spare capacity available through common carrier and third party access obligations.

Both of the regulators involved have the necessary powers to regulate so as to minimize any potential bottlenecks. Also, the government appears to be well aware of the economic and strategic importance of liquid fuels and therefore it is likely that, one way or another, sufficient port and terminal capacity will be allowed to develop.

This study did not have the resources to fully answer the question posed concerning potential bottlenecks, but it can point to examples of recent investments by large international trading companies, such as Burgan Cape Terminals, which is 70 per cent owned by VTTI, in turn owned by Buckeye and Vitol, two well-known global traders. Oiltanking Grindrod Calulo (OTGC) commenced construction in 2019 of a 200,000 m^3 bulk storage facility that will have a final total capacity of 790,000 m^3 (Bulbulia 2019). The largest shareholder is Oiltanking, a global storage operator.

It does appear that there is sufficient international interest in South Africa's liquid fuels market that may only be expected to grow if it were to become deregulated. This would be a positive development, as South Africa has been struggling to attract foreign investment in recent years.

In weighing the protection of domestic refining capacity by regulatory mechanisms, South Africa needs to consider that there has been very limited expansion in refining capacity and sustained and growing net imports. This raises questions about the cost to the economy of protecting the domestic manufacturing facilities by regulation, and about whether South Africa would not be better off allowing imports at global market prices to discipline local prices.

4 Contribution to GDP and employment

The economic impact of the liquid fuels sector is difficult to determine, as it is not separately identified in official statistics. SAPIA does provide some information, although not consistently—see Table 3.

Table 3: Liquid fuels share of GDP and employment

Year of report publication	Share of GDP	Employment formal, direct and indirect (%)	Employment, direct and indirect (number)	Notes
2009	2%		>100 000	
2010	-		>100 000	
2012	6.48%	-	>100 000	
2014	-	-	750,300	
2016	-	4.9%		
2017	2%	5%	>700 000	*GDP contribution: ZAR300 billion to GDP
2018	8.50%	4.9%	750 000	

Source: authors' construction based on SAPIA annual reports, various years.

There are no reliable data on employment in the liquid fuels industry. SAPIA members employ just under 10,000 people directly (SAPIA 2019) and the Fuel Retailers Association (FRA) estimates that service stations employ about 70,000 people (BusinessTech 2018). Using the BSS assumed volumes and margins and the Motor Industry Bargaining Council prescribed wage rates, and assuming 4,600 fully fledged service stations (SAPIA 2020) and 7,000 retail outlets (Corinaldi 2019), we estimate that there should be between 96,600 and 147,000 forecourt staff, (see Appendix Table A1). Both estimates are considerably higher than the FRA's 70,000. This suggests that the BSS staff-related costs might be approximately 40–100 per cent higher than they need to be, i.e. 20 to 30 cents per litre (cpl) more than they need to be. We stress that these are estimates made in the absence of reliable data.

According to their websites, the major oil companies have between 4,115 and 4,317 service stations.[3] Assuming that they have 85–90 per cent of the total number of service stations, 100 per cent would be between 4,732 and 4,749, which is broadly aligned with the SAPIA number of 4,600 that we have used. Assuming ten forecourt attendants per service station, there would be between

[3] BP, Calex, Engen, Sasol, Shell, Total and Puma Energy websites, accessed 28 April 2020. The websites for two companies give two different numbers.

47,323 and 47,487, roughly half the number provided for in the official BSS numbers—unless they earn twice the prescribed minimum wages, which seems unlikely.

Sartorius et al. (2007) estimate the number or service stations at 4,500 to 5,000 and cite Thomas (2005) stating the number of pump attendants at approximately 58,000. Heistein (2013) estimates that there are 50,000 petrol attendants in South Africa. Although somewhat dated, these estimates point towards lower numbers than those we have extrapolated from the BSS.

4.1 Prices

In February 2020 the petrol price consisted of approximately 40 per cent BFP, 20 per cent RAS, and 40 per cent taxes and levies. The BFP is driven primarily by crude oil prices and the ZAR/USD exchange rate.

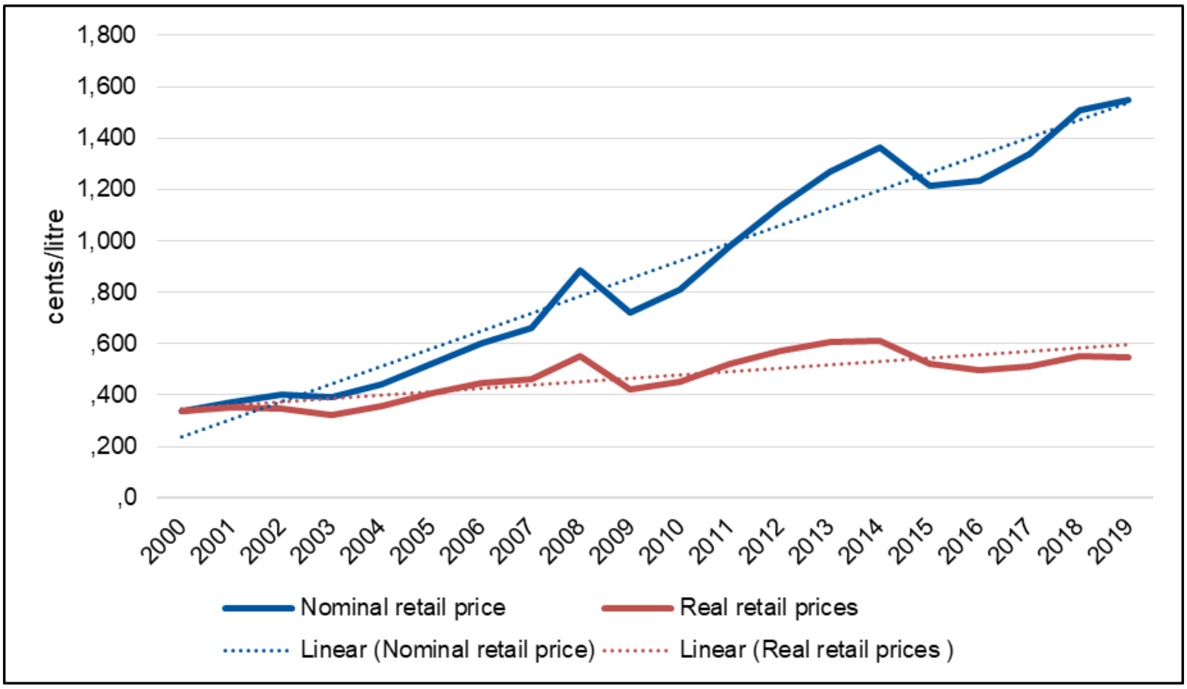
Regulated petrol prices are adjusted on the first Wednesday of each month. Real prices have been on an upward trend—see Figure 4. A part of this is attributable to the decline in the ZAR/USD exchange rate but a part of it is attributable to regulated margins, taxes, and levies—see Table 4.

Table 4: Petrol margins, taxes, and levies (2000 cpl)

	2000	2019	Increase (%)	CAGR (%)
Total taxes and levies cpl	110.1	196.8	179	3.10
Total regulated margins cpl	42.8	89.3	209	3.95

Source: authors' calculations based on data from http://www.energy.gov.za/files/esources/petroleum/petroleum_arch.html (25 February 2020).

Figure 4: Annual average retail price of 93 unleaded petrol, Gauteng (cpl)



Source: authors' calculations based on data from http://www.energy.gov.za/files/esources/petroleum/petroleum_arch.html (25 February 2020).

In South Africa, there is often a misconception that main fuel (petrol and diesel) prices are regulated (Droppa 2018). Diesel prices are not regulated, although the Department of Energy (DoE) does publish a wholesale 'list price' which many assume is a regulation. It is not.

4.2 Petrol price regulation

The Department of Mineral Resources and Energy (DoE) regulates petrol prices on an import parity basis, beginning with an IPP (BFP) to which various margins (wholesale, retail, secondary storage, or RAS margins) are added, together with inland transport costs and various taxes and levies—see Appendix Table A2.

4.3 Conclusions

The liquid fuels industry is a significant sector in the South African economy. It is complex and regulated by several different regulators. Petrol prices (in real terms) are steadily increasing. The market is shrinking while diesel demand is on an upward trajectory. Large increases in regulated margins and (regressive) taxes and levies are contributing to price increases of an important intermediate input into the economy.

5 The origins of petrol price control and regulation

The origins and nature of petrol price control and regulation in South Africa are complex and in many instances opaque. This led the International Energy Association (IEA) to observe in its 1996 review of energy policy that:

> from exploration through to retailing, [it] was enveloped in a complicated web of interdependent policies, informal arrangements, market sharing agreements, trade restrictions and pricing controls (only some of which were/are subject to 'regulation' in the strict sense of the term). (IEA 1996: 171, quoted in Marquard 2006: 247)

Much of the industry was enveloped in a shroud of secrecy from the 1940s until the end of apartheid in 1994.[4] This included the period when the anti-apartheid oil sanctions led to massive government investment in coal-to-liquids refineries owned by Sasol and gas-to-liquids (GTL) owned by Mossgas, now PetroSA, as well as crude oil storage—often referred to as 'strategic stocks'. In the 1970s and 1980s, government effectively took control of crude oil procurement—a period when anti-apartheid oil sanctions were in place. This period of secrecy was accompanied by many informal agreements between government and the oil companies and between the oil companies themselves.

Although the Liquid Fuels Industry Task Force (1993–95) did much to shed light on previously secret aspects of the industry and much is today in the public domain, the heritage of secrecy lives on in the manner in which the petrol price is currently regulated. For example, the composition of the RAS is still not in the public domain. The 'accommodation agreements' between oil companies that share storage depots are also not in the public domain, although the Petroleum Pipelines Act, 2003 (Act No. 60 of 2003) requires third party access to such facilities. In addition, the public

[4] See Liquid Fuel and Oil Act 49 of 1947, section 11.

record is sparse, and the literature on the history of the liquid fuels industry in South Africa is particularly thin. We concur with Marquard (2006) that a thorough history of the liquid fuels industry in South Africa remains to be written.

South Africa has never been a significant producer of crude oil or natural gas and has relied on imports of crude oil and refined products.[5] South Africa's minor contributions to crude oil supply came from the Oribi, Oryx, and Sable oil fields, which produced approximately 3 per cent of South Africa's requirements between 1995 and 2003 (SAPIA 2004, quoted in Marquard 2006). Natural gas production has been limited to offshore fields that have supplied PetroSA's small gas-to-liquids manufacturing facility (nameplate capacity: 45,000 bpd) in Mossel Bay since 1992. These fields are expected to run out of gas in 2020 (Engineering News 2018).

Liquid fuels were first imported into South Africa in 1884 (Marquard 2006). Between 1884 and 1954 prices were fixed between oil companies and retail associations with the aim of limiting competition between service station sites and brands (Marquard 2006). If this is correct, then the origins of market interventions in the industry were essentially anti-competitive. It was only in 1937 that government finally began to give formal support to this anti-competitive practice with the objective of curbing the proliferation of retail outlets and improving their profits (Marquard 2006). These two government policy objectives remain to this day, although in practice proliferation is allowed to continue. The pursuit of these policy objectives has curbed the impact that the various types of competition authorities over the decades might have had in influencing the nature and extent of competition and pricing in this market.

SATMAR commenced the production of oil from shale in the 1930s, and this led to a third market intervention in the form of import tariff protection (Rustomjee et al. 2006). This instrument was subsequently replaced by IPP instruments of various types. The current version is termed the BFP; this is discussed below in some detail. Import tariffs should not be confused with subsidies provided to the synthetic fuels manufacturers between 1954 and 1999, often referred to as 'tariff protection' in the oil industry (Rustomjee et al. 2006). Normally, import tariffs are introduced in order to protect domestic producers. The objective of imposing tariff protection for SATMAR is unknown, and so it is assumed that the objective was the usual limiting of competition from imports. South Africa has had a long history of import substitution industrialization, particularly in the period from the Second World War to the end of apartheid in 1994. Freund (2019) provides an excellent study of South Africa's developmental history.

Quantitative import controls were introduced during the Second World War and have remained in place since then. They were published for the first time in 2006 in the form of Gazetted Guidelines (RSA 2006). The preamble to the guidelines states that 'the control of imports and exports of petroleum products is an integral part of the regulatory dispensation of the South African liquid fuels sector'. The guidelines state that no person may import or export crude oil, petroleum products, or blending components without a permit issued by ITAC,[6] which in turn requires a recommendation by the DoE.

[5] As local refineries were built from the 1950s to the 1980s, South Africa substituted refined product imports with crude oil that was refined locally. After the wave of refinery investments and strategic synthetic fuels investments, South Africa had excess refining capacity and had to export the surplus until 2006, when local demand overtook local refining capacity and refined product imports commenced again to make up the shortfall.

[6] The International Trade Administration Commission established under section 7 of the International Trade Administration Act 2002 (Act 71 of 2002).

The primary intent of the guidelines appears to be the protection of local petroleum product manufacturers from import competition. The control of exports appears to flow from a concern about security of supply.

In the 1950s, government regulation morphed into a more formal mode (Marquard 2006).[7] This, in Maquard's view, is to be associated with the construction of the first crude oil refinery by Mobil in 1954 and the construction of the Sasol 1 (coal-to-liquids) plant in 1955. The latter was also the year in which an IPP formula (the Steyn formula) was introduced for domestic oil refining (Marquard 2006).

In 1960, government managed to wrest a measure of control of the retail sector from the industry through the introduction of a Retail Rationalization Plan (RATPLAN), which nevertheless remained a form of 'gentleman's agreement' between government and the oil industry (Marquard 2006).

In summary, from the 1930s to the present, government has intervened, using one instrument or another, in the liquid fuels markets in three ways: firstly, by protecting domestic fuel manufactures from import competition, under the general ambit of import substitution industrialization; secondly, by limiting the proliferation of liquid fuel retail outlets or restraining competition in the retail sector; and thirdly, by regulating retail prices. The policy objectives being pursued by these three types of market interventions are not documented (or remain to be discovered) for the early period and even in the democratic era are poorly documented, or are not in the public domain.

In considering these three interventions, it appears that the first and the second were intended to limit competition in an endeavour to improve or protect profit margins in the liquid fuels manufacturing sector and in retailing. This accords with the overarching policy stance of import substitution industrialization. What, then, is the purpose of regulating retail petrol prices? Has it historically been seen as an end in itself or as a means to protect consumers from price gouging, or is its purpose merely to act as an instrument designed to give effect to the policy of limiting competition in liquid fuels manufacturing and retailing? It appears to be the latter, for the reasons which follow.

Let us first consider the protection of local manufacture of liquid fuels. From its origins with SATMAR in the 1930s, the state could have used and did use import duties as the instrument of protection. However, in the mid-1950s, coinciding with liquid fuel manufacturing investments, the state changed the instrument to an IPP instrument, firstly the Steyn formula and later the In Bond Landed Cost (IBLC)—the precursor to the current BFP (Competition Tribunal 2006). Marquard (2006) claims that government's intention was to encourage import substitution and industrialization, and to provide oil companies with a form of guaranteed return on investment. Today, the BFP together with quantitative import controls make the liquid fuels industry one of the most protected industries in South Africa along with the sugar industry, which also has its own legislation.

Secondly, let us consider the limitation of competition in the retail sector. Before the construction of domestic oil refineries (excluding SATMAR), a price-fixing arrangement between the oil companies and the retailers associations prevailed 'with the aim of limiting competition between

[7] The Liquid Fuel and Oil Act 49 of 1947 introduced licensing and profit caps for manufacturers as well as refinery gate price caps.

service station sites and brands' (Marquard 2006: 262). The state gave official recognition to the practice in 1937 to 'improve profitability of individual service stations' (Marquard 2006: 262). It could be argued that the current petrol price regulation is a continuation of that price-fixing arrangement.

It appears, then, that in regard to domestic manufacturing and the retail sector, the predominant imperative over a long period of time has been to support manufacturing and retailing margins.

However, the picture changes when we examine the wholesale margin. In the aftermath of the Second World War, the War Measures Act 1946 (Act No. 49 of 1946) introduced a regulated wholesale margin 'to control excess profits by the oil companies' (Marquard 2006: 271). This is the first evidence of market failure resulting in a regulatory intervention in the liquid fuels industry. It was replaced shortly thereafter by a 'gentlemen's agreement' between government and the oil industry until 1964, when the Price Control Act 1964 (Act No. 25 of 1964) formalized it (Marquard 2006). This was later replaced by the Petroleum Activities Return (PAR) mechanism, until it too was replaced by the Marketing Petroleum Activities Return (MPAR) in 1984, which integrated the IBLC. Both instruments aimed to provide the oil industry with an average 15 per cent return on assets. The MPAR prevailed until it was replaced by the RAS system on 4 December 2013. The RAS system has a similar objective.

Marquard's claim, referred to above, that wholesale margin regulation was introduced 'to control excess profits by the oil companies' is not referenced, and it is not clear why he formed that opinion. This requires further research. If his claim is correct then government's response appears to have been rational, as a market intervention such as price regulation is typically introduced when a market fails to allocate resources efficiently, or, more succinctly, to address a market failure.

According to the Oxford Dictionary of Economics:

> The main sources of market failure are asymmetric information, externalities, imperfect competition, missing markets, and public goods. The various sources of market failure provide a prima facie case for considering government intervention in the economy. (Black et al. 2009)

The introduction of wholesale margin regulation cited above falls into the imperfect competition category as 'excess profits' flow from excessive pricing. The Competition Act 1998 (Act No. 89 of 1998) states that:

> (ix) 'excessive price' means a price for a good or service which –
>
> (aa) bears no reasonable relation to the economic value of that good or service; and
>
> (bb) is higher than the value referred to in subparagraph (a).

In reviewing the history of state interventions in the liquid fuels market, this is the only claimed instance of market failure leading to state intervention.

5.1 Conclusion

State interventions in the petrol market over a long period of time have been more concerned with industrial policy considerations, such as import substitution industrialization and limiting competition to improve returns to investors, than with protecting consumers from price gouging.

6 Government policy

6.1 Industrial policy

Freund (2019) has argued that South Africa in the twentieth century can be viewed as a developmental state. Indeed, President Mbeki's announcement of the democratic developmental state extends this strand of policy thinking into the democratic era as well (Freund 2019: 13). As we have seen in the foregoing, the underpinning industrial policy from the 1930s onwards was import substitution industrialization, and this remains an unacknowledged underpinning element in current energy policy by virtue of the continuation of similar regulation. This approach is also evident in other energy policy areas, for example government efforts to attract investment in local manufacturing to supply renewable power generation and government's local content directives to state-owned companies.

6.2 Social policy: indigenization and employment

Perhaps because the major oil companies operating in South Africa since the 1880s have been of European and North American origin, there has been a continuing effort to indigenize the industry along with import substitution.

South Africa has experienced two episodes of indigenization. The first, which may be called 'Afrikaner affirmative action', occurred during the apartheid years and is best represented by Mobil's divestment and the acquisition of its assets by Afrikaner interests.

The second has proceeded under many labels, such as 'affirmative action', 'Black economic empowerment', and more recently 'transformation'. This is discussed further in Subsection 6.4 below.

A third strand of social policy that is inextricably interwoven into liquid fuels policy is employment, and in particular that of service station forecourt attendants. At some stage along the regulatory trajectory, but certainly well before the advent of democracy, 'full service' became a requirement, and in 2003 the Petroleum Products Amendment Act (Act No. 58 of 2003, section 2A(5)(b)), made it a legal requirement—the only job category in South Africa enjoying such protection. 'Full service' means that motorists are not allowed to fill their own vehicles with fuel. It must be done by a forecourt attendant.

This is nothing less than a job creation programme, as the value added is very limited. Many countries survive easily without it. The costs of this job creation programme can be identified in the RAS margin but are not well known by the public at large. Advocates of continued regulation are quick to suggest that deregulation will lead to the loss of these jobs. How this would happen when it is a legal requirement is not explained.

In the context of the high levels of unemployment in South Africa, regulatory reform initiatives in the liquid fuels sector may encounter challenges regarding 'full service', notwithstanding its legally protected status.

6.3 Energy policy

In the pre-democratic era, energy policy in regard to the liquid fuels industry was unwritten and in many cases secret.

The White Paper on Energy Policy of 1998 remains the prevailing energy policy 22 years on, despite announcements by at least one minister of energy that it was to be reviewed. This White Paper concluded, following consultations with a wide range of stakeholders, that there was some consensus on the need to change the existing regulatory model to reflect 'current realities' (RSA 1998).

It states that:

> The cornerstones of the future policy framework will thus be:-
>
> - Deregulation;
> - The stable and continued availability of quality product throughout the country at internationally competitive and fair prices;
> - The preservation and promotion of formal sector employment;
> - The desire for commercially based retail pricing in which the industry does not engage in inter-fuel or rural-urban cross subsidies;
> - The preservation of retailing activities for small and medium businesses;
> - Black economic empowerment reflected in the composition of the industry at all levels and significant domestic Black ownership or control in all facets of the industry;
> - The maintenance and enforcement of adequate health, safety and environmental standards;
> - The promotion of a coastal refining and petrochemicals hub for future investments;
> - Adequate provision for national strategic considerations relating to security of supply; and
> - Tariff protection for vulnerable sectors where justified by cost-benefit analysis;
> - A low cost pipeline and storage infrastructure suitably regulated to encourage optimum investment, to prevent the abuse of these natural monopolies and to prevent the exclusion of new entrants. (RSA 1998: 56)

This is a mixed bag of South African policy objectives with something to appease all stakeholders. The key language regarding the petrol price is 'deregulation', the 'desire for commercially based retail pricing', and this is made clear in the policy statement on price control:

> The government believes that competitive market forces should determine prices.

and

> At the end of the transition phases the liquid fuels industry should be characterised by unrestricted market entry, allowed to develop in response to competitive forces, and subject to generally applicable legislation. (RSA 1998: 58)

The White Paper goes on to state:

> Government will introduce a deregulated oil industry as predetermined milestones are achieved.
>
> At the appropriate time, after the milestones have been achieved, Government will simultaneously remove retail price control, import and export control and its commitment to the Service Station Rationalisation Plan. (RSA 1998: 60)

The White Paper's key pronouncements on petrol price regulation relate to its deregulation and to 'milestones' that are to be achieved before deregulation can take place:

> The key milestones to be achieved in the first phase will be:-
>
> - The sustainable presence, ownership or control by historically disadvantaged South Africans of approximately a quarter of all facets of the liquid fuels industry or plans to achieve this.
> - Mutually acceptable arrangements between synfuels producers and the marketers of crude oil based fuels on the upliftment and marketing of synfuels.
> - The introduction of necessary legislation to give effect to the cornerstones of government policy including the protection of 'full service' and the equitable participation of small businesses in the industry.
> - The introduction of suitable transitional arrangements within the Service Station Rationalisation Plan.
> - The introduction of any necessary institutional and regulatory capacity required to enable Government to adequately monitor possible post deregulation distortions and to enable it to act against such distortions.
> - Suitable arrangements to address any labour related consequences of deregulation.
> - The introduction of suitable institutional capacity and measures to license and/or regulate oil and liquid fuel pipelines and possibly also storage facilities if this is found necessary. (RSA 1998: 61)

6.4 Black economic empowerment

All of the milestones referred to above are regarded as having been achieved except the first regarding Black economic empowerment. This milestone was given impetus by the first ever Black economic empowerment charter, the Charter for the South African Petroleum and Liquid Fuels Industry on Empowering Historically Disadvantaged South Africans in the Petroleum and Liquid Fuels Industry ('the Charter') signed voluntarily by industry participants in November 2000.

Interpretation of the policy is contested. Some interpret the phrase 'or plans to achieve this' to mean that achieving 25 per cent is not necessary so long as there is a plan to achieve it. Others interpret the phrase to mean that 25 per cent is an absolute that must be achieved before further reform can take place. There is similar contestation over the phrase 'all facets of the liquid fuels industry'. How, for example, are the state-owned parts of the value chain to be regarded?

All of the major oil companies have subsequently incorporated Black shareholders in one form or another. However, the element in the value chain that has the lowest barriers to entry, the retail or service station sector, has been more controversial and apparently difficult to reform, as many retail outlets and stations are owned by a single person or small business, making transformation difficult. Nevertheless, there has been progress in what is currently termed 'transformation'. In the Charter, the DoE committed itself to conducting annual surveys of the industry to evaluate progress in achieving the objectives of the White Paper on Energy Policy of 1998. Unfortunately the DoE has not honoured that commitment and has only done this intermittently, and so the true extent of progress is not known.

As will be seen in the analysis of margins below, the retail margin has grown faster than the others. This could be attributed to the growing power of the Black economic empowerment lobby in the retail sector. Further evidence in support of this view is the DoE's only attempt since 1998 to move towards the policy objective of deregulation, and this with respect to a petrol that enjoyed a market share of less than 20 per cent. In October 2018, the DoE wrote confidentially to various industry associations to consult them about the prospect of replacing retail price regulation for 93 octane petrol with a price cap, thus allowing price discounting for that fuel. This initiative was attacked by the retailer-type associations in the media (Steyn 2018) and presumably behind closed doors as well. The reform has not materialized.

The Charter was not intended to be law and was written in non-legal language, but in 2003 it was appended to the Petroleum Products Act by the 2003 amendment. The DoE recognized this challenge and recognized that empowerment charters for other sectors established under the Broad Based Black Economic Empowerment Act (Act No. 53 of 2003) are more advanced. Consequently, it set in motion a process of consultation intended to replace the Charter with a new one under the Broad Based Black Economic Empowerment Act. Discussions have been underway for several years.

This paper does not seek to address the question of whether or not the milestones in the White Paper have been achieved. Instead, it seeks to flag that social policy, as opposed to economic policy, in the form of Black economic empowerment is a contested policy arena in the liquid fuels industry and that any efforts to reform the regulatory dispensation will need to address it.

6.5 Failed orderly transition

The milestone approach adopted in the White Paper of gradual or orderly transition to deregulation was intended to avoid a sudden dislocation with possible unintended consequences. The extensive public consultation between 1994 and 1998 over the contents of the proposed White Paper identified that one of the key challenges in the industry was the proliferation of service stations. It appears that this was a consequence of both the relatively low barriers to entry and the regulatory support given to service station margins. The RATPLAN was designed to limit the proliferation of service stations but fell away—largely due to Sasol's endeavour to gain a market share commensurate with its fuel manufacturing capacity but also due to the advent of more stringent competition law. The competitive tensions between Sasol and the other oil companies is adequately covered elsewhere—see Competition Tribunal (2006) and Rustomjee et al. (2006).

In order to give legislative teeth to the White Paper's gradualist approach to deregulation, the DoE had the Petroleum Products Amendment Act 2003 (Act No. 58 of 2003) enacted. The intent was to use the licensing of service stations as a means to control access to the market and to gradually slow their proliferation to a number that a competitive market would have. Deregulating at that point would avoid a sudden reduction in the number of service stations and in the accompanying employment. Central to this idea was a strong and independent regulator. At the time, legislation was being drafted to create what is today the National Energy Regulator of South Africa (NERSA). Since the commencement of the Liquid Fuel and Oil Act of 1947 and with greater clarity since the Petroleum Products Act in 1977, the minister of energy has been and remains the *de jure* head of energy policy and the regulator of petroleum products. It was envisaged that the minister's responsibility for petroleum product regulation would shift to NERSA in 2006. However, that did not happen.

This meant that the person responsible for gradually reducing the flow of service station licences was a politician hoping for re-election and subject to political lobbying by many, but in particular by aspirant petroleum sector entrepreneurs. The more the retail margin increased, the stronger the lobby was for it to increase further, and so the vicious cycle has perpetuated itself since 2003.

The prospect of a politician gradually reducing the flow of service station licences in South Africa was doomed from the outset. The flow of new service station licences continues almost unabated. SAPIA annual reports cover a wide range of useful data. However, the one item SAPIA does not report is how many service stations are branded by each oil company. The DoE reports that approximately 166 new applications for service stations were received per year from mid-2016 to January 2020 (calculated from RSA 2020a). Corinaldi (2019) estimates that there were approximately 7,000 service stations in 2019, representing a CAGR of about 2.3 per cent per year (2016–19) if all applications were granted.[8] In the same period, petrol volumes decreased at a CAGR of −9.3 per cent. Petrol and diesel volumes shrank at a CAGR of −0.7 per cent between 2005 and 2019.

After the White Paper on Energy Policy of 1998, there were no major policy pronouncements on liquid fuels until the *National Development Plan 2030*, published in 2012, which is very weak in regard to the petroleum sector and is preoccupied with security of supply (RSA 2012: 56, 123, 164) and the next tranche of refining capacity. Its key concern is to delay a decision on investment in further refining capacity (RSA 2012: 173). However, it does make very brief mention of the need for better regulation of petroleum product prices (RSA 2012: 164). The only public response by the DoE thus far has been to commence a public consultation on possible changes to the BFP methodology in 2018. There have been no further developments.

The next significant pronouncement was a wide-ranging reform proposal, not a policy, by the National Treasury. Its concern with high transport costs led it to state that 'fuel price regulation should be reviewed in its entirety' (RSA 2019a: 33).

6.6 Policy consistency

In contrast to the regulated petrol price, the diesel price has never been regulated as far as we can ascertain, and certainly not since 1994. It is sold on service station forecourts from the same bowsers as regulated petrol. In this time, diesel volumes have outpaced petrol volumes (see below) and the proportion of diesel vehicles in the vehicle parc has increased. The question then arises: what market failure exists in the petrol market that does not exist in the diesel market? The policy-makers and regulators have been unable to provide a coherent response.

6.7 Price discounting

For as long as there has been clamour in the market for deregulation of the petrol price, there have been attempts by various parties to circumvent the prohibition on discounting the regulated price. These efforts include 'loyalty' or 'rewards' schemes. As the regulatory capacity of the DoE has declined in recent years and the regulatory structure has become more complex and less stable, so the desire to expand market share in preparation for the possible collapse of the regulatory system has led to various innovative schemes being introduced. De Villiers (2019) claimed that such schemes offered discounts ranging from 10 cpl to 50 per cent of the petrol price. In addition, there is common acceptance in the industry that licensed wholesalers are illicitly retailing petrol at discounted margins to private customers. It is apparent that the market sees opportunity in discounting and that the DoE does not have the capacity to police its own regulations. The

[8] Unfortunately, the DoE does not publish the number of licence applications granted.

imperatives to deregulate are growing. The policy objective was an orderly transition to deregulation. Currently, the trend appears to be more towards a disorderly transition.

6.8 Political economy

The liquid fuels industry does not exist in a political economy vacuum. Real forces are active in this industry. One example will have to suffice to demonstrate this. The DoE sought to introduce and regulate cleaner fuels specifications from 2010 and did so in 2012, but these were later postponed. This was the so-called 'Cleaner Fuels 2 Programme'. The refiners have ignored the regulations. Instead they have insisted that the government provide them with a grant of funds to invest in their refineries—in order to improve the specifications of the fuels produced—and that they be allowed to make a return on this gift of capital. They also insist that should government make this investment, unlike ordinary investors, it would not be entitled to a corresponding share of the equity. The audacity of this stance starkly reveals the balance of power between the oil companies and the government. SAPIA hides these demands behind the phrase 'policy certainty'. The matter remains unresolved, with no prospect of resolution in the offing. What is *de facto* regulation by consent calls into question the advisability of regulation by a politician.

6.9 Technological change

Although the focus of this paper is petrol price regulation, it would be an omission if some contextual reference were not made, albeit briefly, to technological changes impacting the petrol market. Petrol's chief use is in vehicle propulsion, and in this area a number of competing technologies are beginning to enter the market, some of which flow from concerns about vehicle emissions and global warming.

Foremost among these, in 2020, is the advent of electric vehicles (EVs). They have entered the local market as either hybrid or full EVs. Some local vehicle manufacturers of petrol-powered vehicles have even called upon government to relax import tariffs on electric vehicles for fear that the South African market will be left behind global changes (Bowker 2019). This change is driven partly by recent declines in battery costs and partly by a more general concern the automobile manufacturers have with the volatility in oil prices. When automobile manufacturers shifted to mass production, epitomized by the Model T Ford of 1908, they sought a fuel that would have medium- to long-term price stability. They chose oil. However, oil price volatility since the oil price shock of 1973 is prompting a rethink, and electric vehicles are again a consideration.

The narrowing gap between the costs of petrol-powered vehicles and those of EVs, and the continuing decline of the ZAR/USD exchange rate resulting in rising liquid fuel prices, may prompt industrial policy reconsiderations. If South Africa switched from oil-based propulsion to EVs it would, in effect, switch primary energy from imported oil to local coal and renewable power, reflecting South Africa's comparative advantages, and with considerable benefit to the balance of payments. Support for such a proposition could come from the mining lobby, as many of the raw materials necessary for battery manufacture are mined in South Africa. The emerging battery manufacturing sector would presumably also support such a policy, as would the proponents of renewable power generation. Perhaps ironically, this confluence of factors presents a new opportunity for import substitution industrialization, this time based on domestic resources and capabilities. This prospect also increases the risk of refinery investments becoming stranded assets.

Hydrogen-powered vehicles, using different propulsion technologies, are also entering the South Africa vehicle market. For example, Anglo American is converting giant mining trucks to hydrogen power (Bloomberg 2020).

The penetration of diesel engines into the petrol market is discussed elsewhere in this paper.

The technological innovations briefly referred to here suggest that the *National Development Plan 2030* was prescient in seeking to delay a decision on the next tranche of oil-refining capacity. Is regulation retarding or promoting these innovations in propulsion? Artificially high petrol prices, as we demonstrate below, are likely to induce competition from other energy carriers.

7 The basic fuel price

This section examines the IPP methodology used by the DoE to determine the BFP. The BFP was introduced in 1999 and has been reviewed once, in 2004, since that time (RSA 2018). In November 2018, the DoE gazetted a discussion document on the review of the BFP for public comment but the BFP has not been altered (RSA 2018).

7.1 Import parity pricing

IPP, in simple terms, as it is generally understood in the South African petroleum sector, is the pricing of a fuel in the domestic market (in ZAR) at a price that is the same as it would be if that fuel was imported. It includes all the cost items incurred in delivering that fuel—for example, shipping costs, insurance costs, demurrage costs, etc. This concept underpins the BFP, the foundation element in petrol price regulation. The BFP is used synonymously with the term 'refinery gate price', i.e. the price at which fuel leaves a coastal refinery gate. The refinery gate price for inland refineries includes the costs of shipment from the coast to the inland refinery.

Parr (2005) defines IPP as a measure used to determine the price of goods by suppliers of products produced locally. It assumes that the alternative price a consumer would pay would be an imported price. The local price is determined using appropriate alternative market prices converted into ZAR, plus transport costs to South Africa from source locations, plus import tariffs (if applicable), plus any additional costs the consumer would pay if importing.

Holden (2005) and Malikane et al. (2000) state that IPP is a purely theoretical construct used by suppliers to quantify the price for their goods or services.

IPP has been used in various countries, including Australia, New Zealand and India (Australian Competition, and Consumer Commission 2007; Delpachitra 2002; Gargett 2010; Misra et al. 2005). It can be used in a regulated or deregulated market. In Australia, the petrol price is not regulated; however, the competition commission uses IPP as a proxy to determine if prices being charged to consumers are fair and reasonable (Australian Competition and Consumer Commission 2007).

The IPP methodology has supporters and detractors. The detractors argue that the methodology harms all local manufacturing and that the benefits do not materialize, as they are secured in other parts of the value chain (Roberts and Zalk 2004).

Since the introduction of the BFP in 2006, no refineries have closed. Indeed, a global trading company, Glencore, has purchased 70 per cent of the Chevron business in South Africa, strengthening the view that IPP acts as a generalized protection for investors (Steyn 2019). By using IPP as a methodology, regulation can be effectively used to attract and reward investments (Marks 1981), as has been the case in South Africa for many years. IPP can also be used to limit the market power of local producers (Holden 2005).

7.2 International markets and price data

Implementing an IPP methodology for petrol requires the DoE to select appropriate source markets. This involves two considerations. Firstly, from which markets is South Africa most likely to import petrol? And secondly, are there suitable price data available for that market? Factors that influence the selection of markets are the prospective security of supply for a substantial share of the anticipated import volumes and the suitability of the product specifications.

Petrol price data are available for certain markets from commercial data-reporting agencies, such as Platts and Argus Media, which report commodity prices for both physical and derivative (paper) markets. They have wide use and acceptability. The DoE uses the sum of Platts[9] free on board (FOB) prices, 50 per cent Mediterranean, and 50 per cent Singapore markets. The details of the calculation are set out in Annexure A to RSA (2008).

As there are many different specifications for petrols across the globe and because they influence price, it is important that import parity prices should be precise about such matters.

7.3 Petrol specifications in South Africa

The South African specifications for petrol are 93 and 95 research octane number (RON), 500 parts per million (ppm) sulphur according to SANS 1598 (Majaja 2017).

There are four grades of petrol available for sale in South Africa:

- Unleaded (ULP) 95 RON and unleaded 93 RON, 500 ppm sulphur;
- Lead replacement petrol (LRP) 95 RON and lead replacement petrol (LRP) 93RON, 500 ppm.

The South African specification has a higher sulphur share than the Mediterranean specification, which is only 10 ppm sulphur. The Mediterranean specification commands a better price than the higher sulphur specification of 500 ppm used by South Africa. Thus, by including a higher-graded and -priced fuel in the BFP for a lower-spec product, an indirect subsidy is given to local manufacturers. This is one of the reasons given by the DoE for proposing to change the source markets to 60 per cent FOB Singapore and 40 per cent FOB Mediterranean (RSA 2018). This has not been implemented.

7.4 Evaluation of the BFP for petrol

When the BFP methodology replaced the IBLC, the intent was that the methodology should set prices to reflect 'realistic, market-related costs' (RSA 2008).

The BFP methodology relating petrol price to costs is:

$$BFP = FOB + FC + I + D + OL + SF + CD + CS$$

where FC = freight costs, I = insurance, D = demurrage, OL = product loss, SF = stock financing, CD = cargo dues, and CS = coastal storage. Each of the components is explained below.

[9] Platts is a specialist data service division of the McGraw Hill Group.

FOB prices: FOB means the price of petrol delivered to the vessel at the port of lading. Platts publishes prices for three markets, namely Mediterranean (MED), Singapore, and Arab Gulf. For petrol, the BFP uses an average of 50 per cent Mediterranean and 50 per cent Singapore pricing. It also distinguishes between spot and contract prices. The BFP for petrol uses spot prices (RSA 2008).

Freight costs (FC): The BFP uses a theoretical freight rate from port of lading to South African ports. The intent is to provide pseudo-voyages from the Mediterranean (Augusta Port) and Singapore port on a 50:50 basis to a four-port weighted average of Durban, East London, Mossel Bay, and Cape Town harbours.

The applicable rate has three elements:

- Worldscale Flat Rate;
- Average Freight Rate Assessment (AFRA); and
- An additional 15 per cent premium added to the AFRA rate. The DoE has found that this 15 per cent can no longer be justified (RSA 2018) but its removal has not been implemented.

Insurance (I): Insurance is provided for at a rate of 0.15 per cent of FOB value plus freight.

Demurrage (D): The BFP allows three days of demurrage at the World Freight Rate Association, 50 per cent MED plus 50 per cent Singapore. The DoE has recommended that this be reduced to two days (RSA 2018) but this has not been implemented.

Ocean loss (OL): This caters for petrol evaporation while in transport. A rate of 0.3 per cent of the carriage insurance and freight (CIF) value is applied in the BFP. The DoE has recommended that this be reduced to 0.1 per cent (RSA 2018) but this has not been implemented.

Stock *f*inancing *(SF)*: The cost of financing the stock for a period of 25 days is accounted for in the basic fuel price.

Cargo dues (CD): Cargo dues (also known as wharfage) covers port charges in South African ports.

Coastal storage (CS): All product has to be stored somewhere when it is discharged from a vessel, and a storage fee is included in the BFP for the storage and handling cost of coastal facilities on the assumption of 25 days of storage (Maake 2014). The DoE has recommended that this be reduced to between 10 and 15 days (RSA 2018) but this has not been implemented.

7.5 Summary shipping costs

Had the DoE's proposed changes to shipping costs been implemented between September 2017 and August 2019, the saving would have been 10 cpl with savings per element as follows:

- Freight equating to a decrease in price by 3 cpl;
- Demurrage equating to a decrease in price by 3 cpl;
- Ocean loss equating to a decrease in price by 1 cpl;
- Coastal storage equating to a decrease in price by 3 cpl.

7.6 Review of global considerations

The global oil market is continuously evolving as new oil fields are discovered and refineries opened and closed, and as demand shifts for technological, environmental, and a host of other reasons. Ideally, the BFP should be revised regularly to take account of these market shifts. It is not.

Changes in global refining capacity are reflected in Table 5.

Table 5: Global oil refining capacity

	2000		2005		2010		2017	
	Refineries (no.)	Capacity (kbbl/d)	Refineries (no.)	Capacity (kbbl/d)	Refineries (no.)	Capacity (kbbl/d)	Refineries (no.)	Capacity (kbbl/d)
Europe*	148	17,058	137	17,476	128	16,807	111	15,295
Russia and Central Asia	58	8,133	61	7,448	67	7,619	73	8,445
Middle East	46	6,527	47	7,324	57	8,006	60	9,736
Africa	47	2,837	46	3,154	46	3,191	49	3,296
Asia	235	22,369	260	24,724	298	29,720	331	33,868
North America	182	19,947	175	20,696	167	20,676	164	21,866
South America	74	6,325	78	6,488	75	6,399	75	6,188
World	**790**	**83,196**	**804**	**87,310**	**838**	**92,418**	**863**	**98,694**

Note: kbbl/d = 1,000 barrels per day; Belarus and Ukraine are not include in Europe but in Russia and Central Asia.

Source: authors' calculations based on data from Eni Spa (2018: 72).

Growing investment in refining capacity in the Middle East and Asia looks set to continue into the next decade (Billing and Fitzgibbon 2019). This was not recognized by the DoE in 2018 in its discussion document on the BFP.

To take account of some of these shifts in the location of refining capacity, the BFP was remodelled based on two supply locations:

- Mediterranean (MED) and Arab Gulf (AG) (instead of Singapore)
- Arab Gulf only

7.7 Mediterranean and Arab Gulf pricing model

The standard BFP methodology was used except for the difference explained above. The spot price quotes used are:

- 50 per cent Mediterranean spot quote for premium unleaded petrol;
- 50 Arab Gulf (Fujairah Port) spot quote for 95 octane unleaded petrol.

The freight cost is based on two ports (Mediterranean and Arab Gulf) on a 50:50 cost basis to South Africa (consistent with BFP four-port weighted average methodology).

The freight cost compromises:

- Worldscale Flat Rate;
- AFRA;
- An additional 15 per cent premium added to the AFRA rate.

All additional costs were aligned to BFP methodology.

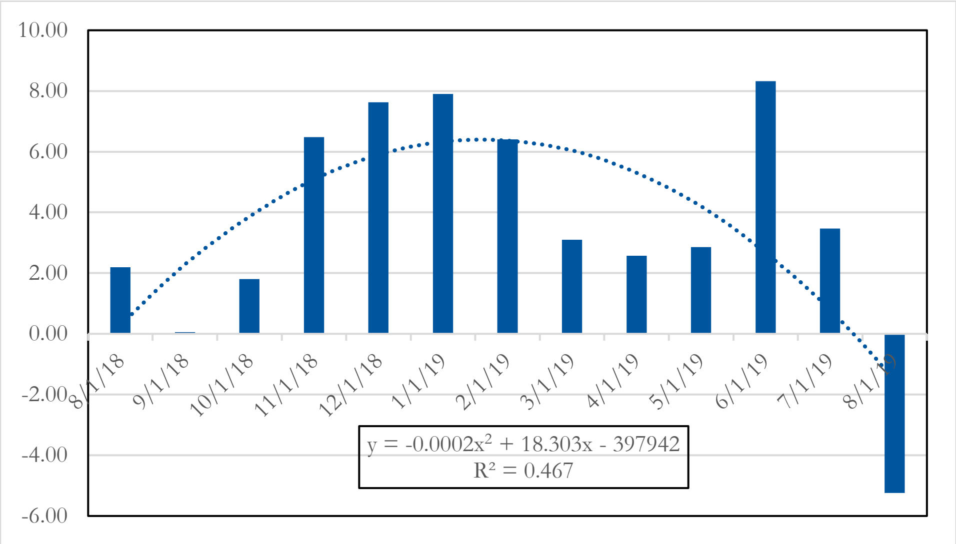
7.8 Arab Gulf pricing model

The standard BFP methodology was used except only one source market—AG—is used. The price basis is spot for 95 Octane unleaded petrol. The freight calculation is based on one AG to South Africa. Platts calculates a daily price for the route on a medium-range (MR) (35,000 mt) vessel. All additional costs were aligned to BFP methodology.

7.9 Results

The results are as follows. The MED and AG price averaged approximately 2 cpl above the current regulated price for the period 1 August 2018 to 31 August 2019 and/or the period 1 October 2018 to 31 December 2019—see Figure 5.

Figure 5: Delta price of MED AG pricing model versus petrol BFP

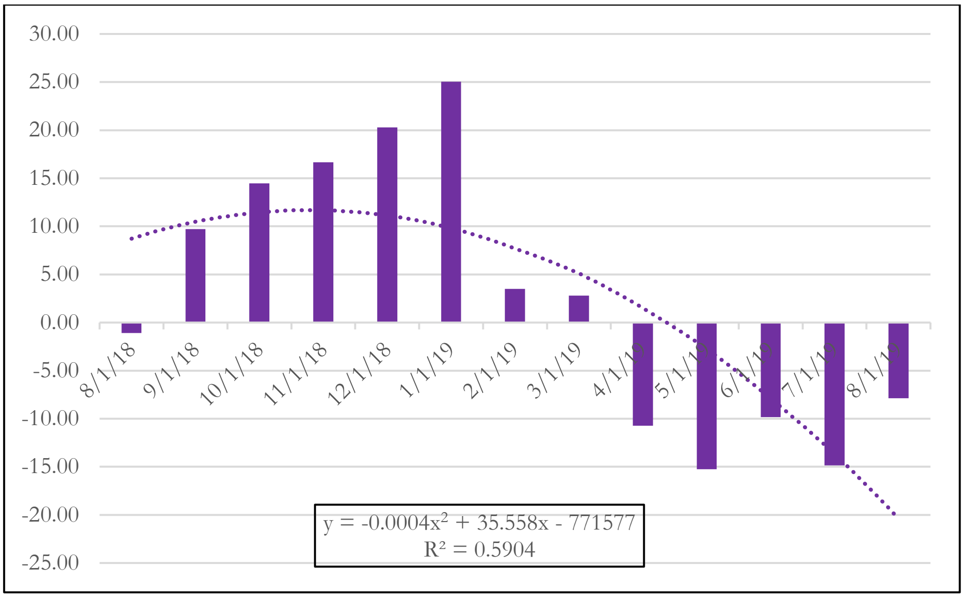


Note: amounts in ZAR cpl.

Source: authors' construction based on Sing (2020).

The Arab Gulf pricing model averaged 3 cpl above the current regulated price for the period 1 August 2018 to 31 August 2019. The polynomial curve is downward for the AG pricing model. Narrowing the dataset to 1 April 2019 to 31 August 2019, the average price is approximately 12 cpl below the current price—see Figure 6.

Figure 6: Delta price of AG pricing model versus petrol BFP



Note: amounts in ZAR cpl.

Source: authors' construction based on Sing (2020).

The R squared for the AG pricing model is 0.59, showing that this model can represent the data significantly. When one compares the R squared values for the AG pricing model with those of the MED AG pricing model, one can see that the AG model has a higher R squared and is therefore a better model.. The standard deviation for the series from 1 August 2018 to 31 August 2019 was 86 cpl for the AG pricing model, in comparison with the current BFP model, which came out at 90 cpl.

7.10 Conclusions

It is not possible to draw specific conclusions given the limited data used in this preliminary examination. Longer-term comparisons between the BFP and actual import data, together with various other models, are needed to reveal if the BFP is accurately reflecting a true import parity price.

It is recommended to continue evaluating the AG pricing model so as to determine if this model may be more appropriate to use as an IPP indicator in a regulated environment.

8 The regulatory accounting system

The RAS is the system and procedures used by DoE to determine petrol margins for secondary storage/handling, secondary distribution, and wholesale and retail (BSS) activities on an annual basis, and for the timeous adjustments thereof into fuel price structures. It was introduced on 4 December 2013, replacing the wholesale margin, the service differential, and the retail margin. The RAS incorporates four margins; a wholesale margin, a secondary storage margin, a secondary distribution margin, and a Benchmark Service Station retail margin (BSS) (RSA undated).

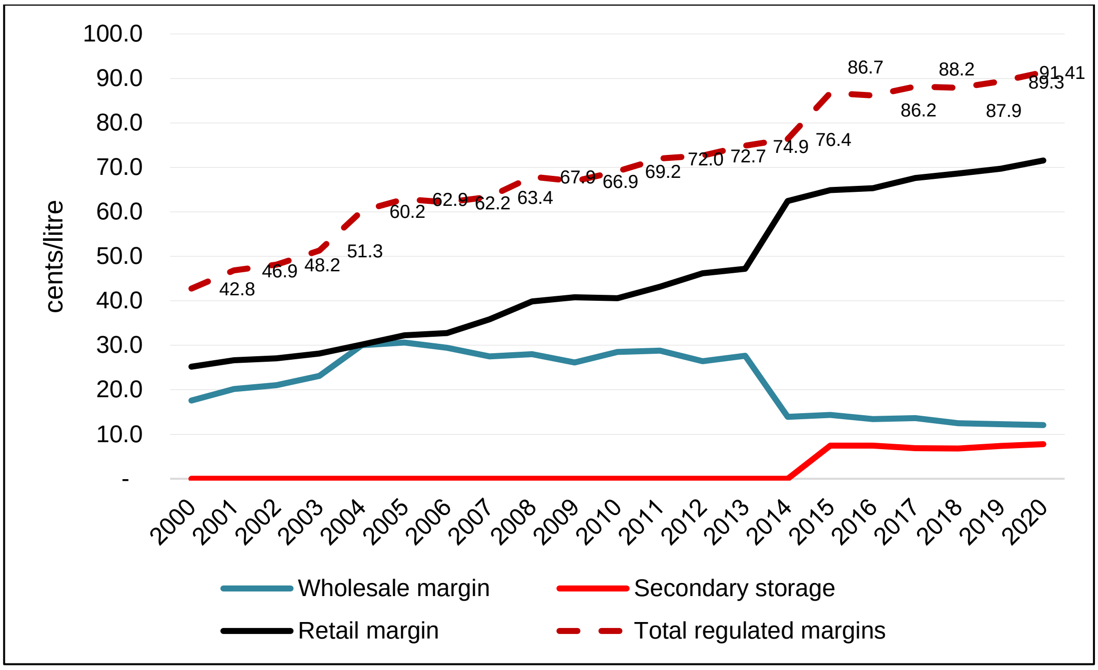
Detailed information about the RAS is kept secret by the DoE, notwithstanding policy promising increased transparency. This is extraordinary for a number of reasons. Economic regulation is supposed to be in the public interest. Liquid fuels are, by retail value, by far the largest contributor to energy prices in the economy. For example, electricity sales are estimated to be only 60 per cent of the value of liquid fuels sales. And yet there has been no public outcry. This may be a long-standing hang-over from the apartheid era, which shrouded the industry in a cloak of secrecy.

Despite the existence of the Promotion of Administrative Justice Act (Act No. 3 of 2000) and Promotion of Access to Information Act (Act No. 2 of 2000), the inner workings of the RAS methodology remain secret in contrast to the more transparent BFP.

In the light of the paucity of information in the public domain, this paper has had to rely on data obtained from other sources which we nevertheless believe to be reliable and in any event are the best available at this time.

The impact of the margins that today form part of the RAS methodology have increased from 42.8 cpl in 2000 to 91.4 cpl in 2020, a 113.6 per cent increase in real terms—see Figure 7. The reasons for this require further research. The RAS costs represent the costs of delivering petrol from the refinery gate to the final consumer that are paid for by petrol consumers. This is a massive shift in resources from petrol consumers to oil companies, wholesalers, road transporters, and retailers, and a massive increase in the costs in South Africa of supplying petrol to consumers. Pipeline costs are excluded from the RAS margin. It is no wonder that the government has called for 'administered prices' to be reviewed.

Figure 7: RAS regulated margin for petrol 93 ULP, real (2000 cpl)



Source: authors' calculations based on data from http://www.energy.gov.za/files/esources/petroleum/petroleum_arch.html (accessed 25 February 2020).

The objectives of this section are to:

1. Identify and analyse the biggest cost contributor/s to the RAS;
2. Analyse the weighted average cost of capital (WACC) used in the RAS methodology and suggest a better alternative;
3. Comment on certain of the operational cost items used in the RAS calculation;
4. Compare the current flawed RAS to two alternative RAS methodologies, one using 50 per cent debt funding and the second using 70 per cent debt funding.

8.1 Petrol retail margin and the BSS

The components of the February 2020 petrol price are shown in Appendix Table A2. The total RAS margin accounts for 17.8 per cent and 18.2 per cent of the retail price of petrols, 95 and 93 octanes respectively. Within the RAS margin the biggest component is the retail margin, which is analysed in further detail below.

The wholesale, secondary storage, and secondary distribution margins are of lesser consequence, but we believe the 'flaws' identified in the retail margin will also be found to be applicable in the other margins within the RAS margin.

The elements used by DoE to calculate these margins are the asset base (Capex), the operational expenditure (Opex), and the WACC.

Using the elements in the DoE RAS price determination model, the pro forma income statement of such a BSS is modelled in Appendix Table A3. This simplistic pro forma income statement and balance sheet demonstrates that the return on assets (ROA) is 27.47 per cent and the return on equity (ROE) is 22.88 per cent for the first year. The ROE will increase as the effect of inflating the BSS asset base produces higher margins.

8.2 BSS asset base

Within the retail margin, one of the elements that has a significant impact in this type of ROA methodology is the asset under consideration. In South Africa, service stations are often categorized by the volume of their sales or volume throughput. Measured by volume throughput, there are 'small' and 'large' service stations. Because service stations are a low-margin high-volume type of business and because a retailer receives a margin for each litre of fuel sold, it is obvious that the more litres sold, the higher the revenue. And because all the other costs are fixed costs, the higher the throughput, the more profitable the service station.

The challenge confronting the regulator has been how to provide a reasonable return to both 'small' and 'large' (by volume) service stations from a single regulated retail petrol price. The solution adopted by the DoE has been to construct a theoretical BSS to represent all the service stations in the country (RSA undated).

This BSS is based on the following elements:

- A 2009 survey undertaken by the Small Business Advisory Bureau of the University of North West was used as a basis for determining the volume range for the BSS asset base.
- A fuel volume range of 2,789,851 litres/year was used in 2009 to develop a concept BSS. An architect developed detailed plans that were used by a quantity surveyor to determine

the replacement cost of the BSS. The DoE undertook to review the fuel volume range on a three-yearly basis.

- The cost of replacing the retail petrol portion of the BSS asset base in 2009 was ZAR5.825 million (including land). The asset base consists of the fixed assets as determined by the physical design plus the working capital. The working capital is made up of the physical stock (as determined by the survey) multiplied by the average wholesale list price for all grades of petrol for the particular calendar year.
- The BSS asset base is supposed to be adjusted on an annual basis through:
    - (i) adjusted on an annual basis through re-evaluation of the asset value of the BSS; or
    - (ii) inflated by the average Producer Price Index for the year under construction.

Information on adjustments made to the BSS asset base value since 2009 is kept secret by DoE.

If the original 2009 value of ZAR5,825 million is inflated by 6 per cent per year, the value by 2019 is ZAR10,432 million. Informal discussions with industry experts suggest that the value used by the DoE in its calculations is ZAR9,352 million. That value is used for the purposes of this exercise—see Appendix Tables A3, A4, and A5.

Anecdotally, we have been told that a service station used in the original study does not exist, as it is a small basic layout. Although this might be true, it is our opinion that using this as a base point to set and regulate prices would not negatively affect the larger service stations, as the 'economies of scale principle' would reduce unit costs and benefit the larger retailer. The BSS assumptions therefore protect small-throughput service stations. If they were reliant only upon petrol margins (most are not) then market forces might have excluded them from the market were they not sheltered by DoE regulation. Market forces would have yielded a more efficient industry and price outcome, to the benefit of the consumer.

8.3 Conclusions on the BSS

The BSS asset base is not reviewed regularly and does not reflect recent market developments.

It protects service stations with a smaller throughput volume. It discourages efficiency and capital productivity. All other things being equal, it imposes a cost on the economy that is higher than a market outcome is likely to yield.

Notwithstanding the flaws pointed out above, in the further analysis conducted below, the BSS asset value of ZAR9,352 million is used. The implication of this is that the estimates that follow are conservative, as they are based on this conservative value estimate. Where data are not available, other values have been 'reverse calculated', with the consequent conservative bias.

8.4 RAS weighted average cost of capital

In the previous subsection the asset value was reviewed. In its calculation, the DoE multiplies the asset value by the WACC in order to estimate the return on capital for the investor in a service station. In this subsection, the WACC is reviewed.

The DoE keeps its WACC calculation secret. Informal sources say that the WACC used by the DoE is 18.77 per cent.

The normal formula (PWD 2012: 122, 123) for calculating the WACC (assuming only debt and equity capital) is:

$$WACC = kd\ x\ (d\%) + ke\ x\ (e\%)$$

where $WACC$ = weighted average rate of return on invested capital, kd = after-tax rate of return on debt capital, $d\%$ = debt capital as a percentage of the sum of the debt and ordinary equity capital (total invested capital), ke = rate of return on ordinary equity capital, and $e\%$ = ordinary equity capital as a percentage of the total invested capital

The normal formula for calculating the Capital Asset Pricing Model (CAPM) is:

$$E(Re) = Rf + \beta\ x\ MRP$$

where $E(Re)$ = expected rate of ROE capital, Rf = risk-free rate of return, β = beta or systematic risk, and MRP = Market Risk Premium.[10]

Our information is that the DoE uses the data in Table 6 to determine a WACC. This is not official information, as that is kept secret. This is the best available information.

Within the WACC formula, one of the most controversial elements is the cost of equity (Ke), which is dealt with in the next subsection.

8.5 Discussion on cost of equity

The accepted economic valuation theory is that if the value of the asset base is in nominal values (inflated to current value), then a real (after inflation) WACC should be used when calculating the ROA.

The formula used by the DoE appears to be a combination of both real and nominal values. The risk-free (Rf) rate is nominal inclusive of taxation (pre-tax), as these rates are quoted before taxation. The Market Risk Premium (MRP) is real excluding taxation (post-tax), as the market investors receive their return after corporate taxes. The cost of debt (Kd) is nominal pre-tax.

When CAPM and WACC calculations are performed, it is paramount that the various elements in the calculations should be consistent regarding real or nominal values, and that the taxation treatment should also be consistent. In Table 6, the DoE RAS elements are converted to real pre-tax rates.

Based on these calculations, we conclude that the WACC as calculated by the DoE RAS methodology is 2.56 per cent higher than it should be due to the DoE's inconsistent treatment of nominal and real values and pre- and post-taxation of the elements in the CAPM and WACC calculations. This in itself converts to 8.57 cpl in the retail margin.

[10] 'MRP' is substituted for 'E(Rp)' in PWC (2012) as MRP is the terminology used by the DoE.

Table 6: Comparison of DoE RAS calculation with proper treatment of tax, nominal and real

	Formula	DoE RAS	DoE RAS; convert all elements to nominal	DoE RAS; convert all nominal elements to pre-tax	DoE RAS; convert all nominal pre-tax to real pre-tax
CAPM					
Risk-free rate	Rf	9.04%	9.04%	9.04%	2.87%
Equity MRP (real post-tax)	MRP	5.50%	11.83%	16.43%	9.84%
Beta	B	0.94	0.94	0.94	0.94
Small stock premium	SSP	5%	5%	5%	5%
Marketability adjustment	M	12.50%	12.50%	12.50%	12.50%
Cost of equity pre-tax	Ke = (Rf + (MRP * β) + SSP) * (1+M)	21.61%	28.31%	33.17%	19.26%
WACC					
Proportion of equity	E	80.00%	80.00%	80.00%	80.00%
Proportion of debt	D	20.00%	20.00%	20.00%	20.00%
Cost of debt (nominal)	Kd nom	7.38%	7.38%	10.25%	4.01%
Tax rate	Tax	28.00%	28.00%	28.00%	28.00%
CPI	CPI	6.00%	6.00%	6.00%	6.00%
WACC (real)	WACC = Ke * E + Kd * D	18.77%	24.12%	28.59%	16.21%
Difference					−2.56%

Source: authors' calculations based on data provided by industry expert.

8.6 Debt/equity ratio

The cost of debt represents the interest paid on debt funding. Interest is a tax-deductible 'expense'. Valuation theory therefore uses the post-tax cost of debt, as this is the actual cost of debt. The DoE does not adjust the cost of debt for taxation.

The proportions of equity and debt represent the capital structure of an enterprise and how the enterprise is funded. The DoE assumes that equity accounts for 80 per cent and debt just 20 per cent of the funding. This is extraordinary: there are very few businesses that are structured in this way. The impact of this assumption is that returns to the investor are inflated. This is because the cost of equity is usually higher than the cost of debt. That is why so many businesses gear their capital structure to take advantage of the lower cost of debt. Our, albeit limited, interviews with retailers suggest that most businesses are geared to and have a greater proportion of debt than equity, and that this almost certainly applies to new entrants.

If economic regulators wished to promote economic efficiency (which most claim to) then they would look to capital productivity and the efficient use of capital. They would then use an 'efficient' gearing and use an appropriate 'target' or 'optimal' debt ratio. A 50 per cent ratio would probably be more appropriate, as a new operation would probably be 70–80 per cent debt-funded and as it runs through its life cycle would average out at about 50 per cent.

In real life, retail investors will use gearing to enhance their returns. The use of cheaper debt funding will enhance the equity investor's yield substantially.

Anecdotal information suggests that a 70 per cent debt structure is typically used when new stations are built. This effect of this assumption is demonstrated in a simplistic discounted cash flow model in Appendix Tables A4 and A5, which demonstrate the substantially enhanced ROE.

In Appendix Table A4, a debt equity ratio of 50:50 is assumed. Note that in year 1 the intended ROE of 32.2 per cent is achieved. The reason for this is that the asset base is inflated and the WACC has elements of nominal values in it, and this rewards the investor for inflation both in the asset value and in the WACC rate. In this case, the equity internal rate of return (IRR) is 39.3 per cent.

In Appendix Table A5, a debt equity ratio of 70:30 is assumed, which is believed to be a more realistic market-related assumption. Note that when using this assumption, the equity returns increase to 48.7 per cent in the first year and continue to increase thereafter. In this case, the equity IRR is a massive 56.5 per cent.

8.7 Small stock premium and marketability adjustment

In the literature there is sometimes confusion on these two adjustments. Some commentators combine the two elements, and some evaluate them separately.

In the RAS methodology used by the DoE, a 5 per cent small stock premium (SSP) is factored in by the addition of 5 per cent and a 12.5 per cent marketability adjustment is factored in by using a multiplier of 1.125: $Ke = (Rf + [MRP * \beta] + SSP) * (1 + M)$.

Certainly, the type of business represented by the BSS is a small business and would warrant a SSP adjustment; in our judgement, 5 per cent is a reasonable assumption based on Table 7.

Table 7: Average small stock premium – adding

Company size in R'000s	0–250	251–500	501–1,000	1,001–1,500	1,501–2,000	2,001+
2012	6.7%	4.4%	2.8%	1.7%	0.9%	0.1%
2010	4.9%	3.7%	2.8%	1.3%	0.7%	0.1%
2007	5.2%	4.0%	2.7%	1.7%	1.3%	0.4%

Note: R refers to ZAR.

Source: reproduced with permission from PwC (2012: 48).

The products sold (fuels) are widely used, which reduces the risk. On the other hand, the location of a service station is a critical factor in determining its prosperity. The sales that can be extracted from the area surrounding a service station can vary over time as changes in property values or roads and other infrastructure shift, which has the effect of increasing the risk. In an unregulated market, larger-volume service stations would have a lower SSP. But in the current regulated market the price is based on the BSS. Consequently, larger-volume service stations benefit from the regulator classifying them as smaller service stations. Thus, the regulator is building in an inefficiency at the expense of the consumer.

The marketability adjustment is intended to reflect the ability of a service station to be sold. The lower the ability of a service station to be sold, the more the investor should be rewarded, and vice versa. This is a valid and normal adjustment to make to a cost of equity. In South Africa, many service stations are covered by franchise agreements which bind them to sell the particular brand it has contracted. A service station can only convert to another brand at the expiry of its current franchise agreement, and then only with investment in branding at the site, as well as other possible costs such as tanks, pumps, and bowsers, depending upon the nature of the franchise agreement. This increases marketability risk.

In the BSS case, it is a small business that would in all probability be 100 per cent owned by one owner. One also has to consider whether there is a market for the sale of the asset and how active the market is. The chances of selling the asset, a service station in South Africa, seem fairly regular and would not warrant a large adjustment. If the operator is part of the franchise, this would enhance the marketability.

The DoE assumes a 12.5 per cent marketability adjustment. In its 2012 valuation methodology survey, PwC reports the results reflected in Table 8.

Table 8: Size of discount applied

Size of interest	1–24%	25–49%	50–74%	75–100%
Average 2012	15%	13%	10%	8%
2012 2nd quartile	15%	15%	10%	8%
2012 3rd quartile	20%	15%	15%	10%

Source: reproduced with permission from PwC (2012: 76).

When compared to the values in Table 8, it appears that the 12.5 per cent assumed by the DoE is on the high side and that an 8 per cent assumption would be more appropriate.

8.8 Entrepreneurial compensation

The RAS model also allows an 'entrepreneurial compensation' amount (of 29.20 cpl) effectively which is an enhancement of the yield to the retailer over and above the WACC of 18.77 per cent already assumed. It adds 8.71 per cent to the WACC of 18.77 per cent yield—a total of 27.50 (rounded) per cent.

It seems that the regulatory history of the entrepreneurial compensation was as an 'owners salary'. In the operational cost, the line item 'owners remuneration' is valued at ZAR436,797 per year, which translates to 15.66 cpl in the petrol price build-up.

WACC has already rewarded the owner for risking their capital by giving a return on the capital invested. Why would the owner be entitled to a salary in addition to that? It is not clear. It could be that the DoE assumes a passive owner that employs a manager to manage the service station. If so, is that a fair assumption? The owner is rewarded by receiving a return on their capital. Why wouldn't the owner of a small business operate it themselves?

In our view, this is a luxurious assumption and a duplication in costs. This entrepreneurial compensation is unfair on consumers and should be scrapped. The RAS model allows an 'entrepreneurial compensation' amount (of 29.20 cpl) which is effectively an enhancement of the yield to the retailer over and above the WACC of 18.77 per cent already assumed. It adds 8.71 per cent to the WACC of 18.77 per cent to yield—a total of 27.47 (rounded) per cent (see Appendix Table A3 for calculations).

8.9 A more appropriate WACC

In the light of the foregoing critique of the BSS methodology and its assumptions, what would be a more appropriate WACC? This question is answered in Table 9, which suggests a more appropriate WACC for the BSS.

Table 9: A more appropriate WACC

CAPM	Formula	DoE RAS	DoE RAS 'corrected' real Pre-tax	Real Pre-tax to More appropriate WACC
Risk-free rate	Rf	9.04%	2.87%	2.87%
Equity MRP (real post-tax)	MRP	5.50%	9.84%	9.84%
Beta	B	0.94	0.94	0.94
Small stock premium	SSP	5%	5%	5%
Marketability adjustment	M	12.50%	12.50%	8.00%
Cost of equity pre-tax	Ke = (Rf + (MRP * β) + SSP) * (1 + M)	21.61%	19.26%	18.49%
WACC				
Proportion of equity	E	80.00%	80.00%	50.00%
Proportion of debt	D	20.00%	20.00%	50.00%
Cost of debt (nominal)	Kd nom	7.38%	4.01%	10.25%
Tax rate	Tax	28.00%	28.00%	28.00%
CPI	CPI	6.00%	6.00%	6.00%
WACC (real)	WACC = Ke * E + Kd * D	18.77%	16.21%	14.37%
Difference			−2.56%	−4.40%

Source: authors' calculations based on data from RSA (undated).

Based on Table 9, we conclude that:

- WACC as calculated by the DoE RAS methodology is 2.56 per cent higher than it should be due to the inconsistent treatment of nominal and real values and pre- and post-taxation of the elements in the CAPM and WACC calculations;
- The 20 per cent debt ratio assumed by the DoE is not an appropriate or efficient ratio and should be changed to a more market-related capital structure;
- The entrepreneurial compensation should be removed, as it is a duplication.

8.10 BSS operating costs

The BSS methodology includes certain operating costs, which is reasonable. These operating costs were based on a 2009 survey conducted by the Small Business Advisory Bureau of the University of North West (RSA undated: 32).

Cost elements such as oil company rates and taxes and oil company repairs and maintenance are extracted from the wholesale data templates and added to the BSS operating costs.

According to the RAS Working Rules,[11] the BSS cost base is to be adjusted on an annual basis through:

(i) A survey of the actual operating costs of 100 service stations; or

(ii) Adjustment of the operating expenses in line with the following:

1.	Staff related costs	Annual increase in line with MIBCO agreement
2.	Rates and Taxes	CPI*
3.	Utilities and Communications	Based on the latest NERSA approved electricity tariff increase (e.g. approved April 2020 electricity tariff applied in 2020 operating expenses update)
4.	Repairs and Maintenance	CPI*
5.	Other physical operations	CPI*
6.	Insurance, Bank charges	CPI*
7.	Professional Fees	CPI*
8.	Other cash costs	CPI*
9.	Rates and Taxes—Oilcos	Collective amount of Rates and Taxes as recorded by RAS participants divided by collective number of service stations × petrol retail share of total petrol, diesel and IP sales
10.	Repairs and Maintenance—Oilcos	Collective amount of Repairs and Maintenance as recorded by RAS participants divided by collective number of service stations × petrol retail share of total retail petrol, diesel and IP sales
11.	Evaporation allowance (0.25%)	Average annual coastal (zone 1A) and inland (Zone 9C) wholesale list prices (Rands) × BSS annual petrol volumes (2,789,851 litres) × 0.25%.
12.	Operational gains & losses allowance (0.25%)	Average annual coastal (zone 1A) and inland (Zone 9C) wholesale list prices (Rands) × BSS annual petrol volumes (2,789,851 litres) × 0.25%.

Notes: * for margin adjustment on first Wednesday of December 2020, adjust by average annual CPI in 2019/average annual CPI in 2018 × 100.

Since the DoE keeps the workings of the RAS system secret, we are not sure if these annual adjustments are made at the intended intervals or not.

[11] RSA (undated: 33); table reproduced with permission.

We have not conducted a comprehensive review of the schedule of operating costs used in the RAS Working Rules. Instead, we have used the data currently used by the DoE—see Appendix Table A6. However, we have identified certain line items which appear to be questionable, as reflected in Table A6 together with our reasons for regarding them as questionable. These questionable items together add 6.35 cpl to the price of petrol.

8.11 Overall impact of revised RAS on the petrol price

Based on the preceding discussion on the RAS methodology, we have generated two scenarios of adjusted RAS elements and compared them with the February 2020 RAS constituent elements—see Table 10.

Table 10: Overall impact of revised RAS on the petrol price (cpl)

RAS retail margin	RAS Feb 2020	Corrected WACC calculation	More appropriate margin (50% debt)	More appropriate margin (debt 70%)
Operational expenditure	119.04	119.04	112.69	112.69
Total RAS yield retail margin	92.11	83.54	48.17	42.65
Yield (BSS Capex * WACC)	62.91	54.34	48.17	42.65
Entrepreneurial compensation	29.20	29.20	0	0
Total RAS retail margin	211.15	202.58	160.86	155.34
Difference cpl		−8.57	−50.29	−55.82
WACC (real pre-tax)	18.77%	16.21%	14.37%	12.72%
Debt ratio	20.0%	20.0%	50.0%	70.0%
Cost of equity (post-tax nominal)	22.5%	20.7%	20.1%	20.1%
Nominal equity IRR (40 years)	39.3%	27.0%	21.3%	23.6%

Source: authors' calculations based on data from RSA (2020b).

These calculations show that with a 50 per cent gearing, together with the other recommended adjustments, the petrol price could be lowered by 50.29 cpl. Using a 70 per cent gearing, the petrol price could be lowered by 55.82 cpl. If the possible saving of 30 cpl in staffing costs is included then there is a possible 80 cpl reduction in petrol prices.

Note that the equity IRR achieved with a 50 per cent gearing is 21.3 per cent, which is higher than the nominal cost of equity (post-tax) concluded above, and that with 70 per cent gearing it is 23.6 per cent, which we regard as generous.

9 Further research

We are not aware of a body of theory that can adequately explain the phenomenon of petrol price regulation in South Africa. What would be of considerable benefit would be a more detailed analysis of the industry utilizing a modified type of 'Political Economy Analysis of Climate Change Policies' methodology, customized for the unique dynamics of the liquid fuels sector (Schmitz 2012). Such a methodology could be further modified to include an analysis of the drivers of the value chain dynamics, the constraints faced by actors at different levels in the value chain, and the struggles between the different actors in the value chain. A structural periodization would introduce historical dynamism into the analysis, as the changing power of the actors, groups, and institutions through history have influenced the historical trajectory. Such an analysis would provide a clearer picture of forces determining where the industry is today and where the best prospects for reform might lie. The impact of unintended consequences and the spaces that they open up, how those spaces have been exploited, and by whom, historically, may assist in revealing spaces that are now open and what opportunities they may present.

10 Conclusions

Government policy in the petrol market over about 90 years appears to have been consistently driven by import substitution industrialization objectives and the desire to support profitability for investors along the downstream value chain rather than the protection of consumers against excessive pricing. These policies have been successful. There has been investment in refining capacity historically, but in recent decades refinery capacity has fallen behind domestic demand. There has also been investment in other infrastructure, no refineries have closed, and there has been a proliferation of service stations. New entrants, many of them large multinational companies, have entered the industry in recent years despite South Africa's flagging economic growth.

South Africa shifted from being a net exporter of refined products to being a net importer in 2006. This shift calls into question the appropriateness of continuing an import substitution policy approach, partly because it is a blunt instrument which appears to be inflating petrol prices across the economy without, since 2006, achieving the intended policy objective of expanding refinery capacity in line with domestic demand. It is also wasteful in that it provides benefits to all refiners, including those that do not need protection. In addition, such cost-benefit analysis as exists indicates that import growth is preferable to refinery investment, at least in the short to medium term. The advent of EVs risks refinery investments becoming stranded assets.

Alternatives to IPP exist. If South African refineries were exposed to market forces and if a refinery was as a result no longer financially viable, a cost-benefit analysis could reveal a clearer picture. If it was deemed advisable to keep that refinery afloat, more refined, targeted, and cost-effective instruments than economy-wide IPP could be used to do so. The cost to society would be precisely known. The same approach could be adopted for any proposed new refinery.

The White Paper on Energy Policy (1998) set the objective of market-related pricing. However, increases in regulated margins, taxes, and levies, in real terms, have contributed to significant increases in the price of petrol, unrelated to market price trends, over the past 20 years and lend urgency to the need to implement the policy objective of market-related pricing. The one attempt by government since 1998 to move regulation in the direction of market-related pricing, in 2018, was still-born in the face of opposition from industry players.

There are worrying signs that a practice of regulation by consent has emerged. The reasons for this probably lie in the institutional design of the regulator. The regulator is a politician, the minister of energy, who is both policy-maker and regulator, an undesirable combination by modern standards. The international literature suggests that politicians are susceptible to political pressures that independent regulators are sheltered from.

The BFP has not been regularly reviewed as global markets have shifted. There is some evidence to suggest that it does not yield a true import parity price. There are indications from our limited research that suggest that to switch sourcing to the Arabian Gulf would lower prices, but more data is required to confirm this. If the DoE's proposed changes to the shipping and handling charges in the BFP had been implemented, there would have been a price reduction of 10 cpl.

The RAS fails to deliver market-related pricing, as it contains methodological errors, apparent double counting in places, and apparently over-generous margins. The corrections modelled suggest that petrol prices could be lower by about 70–80 cpl. Including the modifications to the shipping and handling charges to the BFP proposed by the DoE in 2018 would increase this to 80–90 cpl. The lack of reliable data in the public domain, in such a heavily regulated sector, is evidence of poor regulation and makes more precise estimates impossible.

Government social policy interventions, primarily focused on jobs, small business promotion, and Black economic empowerment, have become entangled in the regulated petrol price over a long period. A move to competitive market pricing will require these social policy elements to be untangled to some extent, which may be politically challenging given that the minister of energy is the regulator. An institutional reform that would assist in remedying this would be the creation of an independent regulatory body separate from the Ministry of Energy, or the shifting of responsibility for regulation to NERSA, as originally intended.

Regulatory errors are incentivizing the misallocation of capital. Excessive regulated margins in retailing are attracting over-investment, leading to an inefficient allocation of capital to a service sector in an economy that is short of investment capital. Petrol is the main fuel used to propel the minibus taxis that transport the majority of workers to and from work. Transport costs are an important element in the cost of living in lower-income families and an important cost driver in a spatial geography in which the legacy of apartheid is still very evident.

In the pursuit of welfare, there is a policy trade-off between the economic benefit from fuel intermediate inputs at market-related prices on the one hand and, on the other hand, the benefits flowing from industrial and social policy interventions. This paper has gone some way in quantifying the possible reductions in petrol pricing that could lower the prices of fuel intermediate inputs.

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Acronyms used in the paper

BFP	basic fuel price
BSS	Benchmark Service Station
CPI	Consumer Price Index
cpl	cents per litre (ZAR)
CAGR	compound annual growth rate
CAPM	Capital Asset Pricing Model
DoE	Department of Energy, Department of Minerals and Energy, or Department of Mineral Resources and Energy
IBLC	In Bond Landed Cost
IPP	import parity pricing
ITAC	International Trade Administration Commission
LPG	liquefied petroleum gas
MPAR	Marketing Petroleum Activities Return
NERSA	National Energy Regulator of South Africa
RAS	regulatory accounting system
RATPLAN	Retail Rationalization Plan
RSA	Republic of South Africa
SAPIA	South African Petroleum Industry Association
WACC	weighted average cost of capital

Appendixes

Table A1: Estimates of number of forecourt staff

Petrol ULP 93 Inland February 2020					
Using BSS assumptions		**Source**			
BSS litres /annum	2,789,851	RAS assumption			
Total attendant wages ZAR/litre	0.4133	DoE BSS Matrix 1 January 2020			
Cashier Wage ZAR/litre	0.0975	DoE BSS Matrix 1 January 2020			
Admin Salaries ZAR/litre	0.0812	DoE BSS Matrix 1 January 2020			
Staff uniforms ZAR/litre	0.0044	DoE BSS Matrix 1 January 2020			
Staff welfare ZAR/litre	0.0083	DoE BSS Matrix 1 January 2020			
Total staff costs R/l	0.6047				
Forecourt salary costs per year	ZAR1,687,022.90				
Forecourt salary costs per month	ZAR140,585.24				
	Per week	**Per month**	**No. of staff**	**Cost to company**	**Source**
Forecourt attendant wage	ZAR1,418.85	ZAR6,147.88	17	ZAR104,513.91	MIBCO (2020)
Cashier wage (ZAR)	ZAR1,493.10	ZAR6,469.60	1	ZAR6,469.60	MIBCO (2020)
Char wage (ZAR)	ZAR1,123.20	ZAR4,866.83	2	ZAR9,733.65	MIBCO (2020)
Administration		ZAR18,877.99	1	ZAR18,877.99	Admin salaries × volumes pm
Subtotal			21	ZAR139,595.16	
Available forecourt salary costs				ZAR140,585.24	
Difference				ZAR990.09	
			No. of staff	**No. of staff**	
Number of forecourt employees per BSS forecourt			21	21	
Estimate number of service stations in RSA			7,000		Corinaldi (2019)
Estimate number of service stations in RSA				4,600	SAPIA (2020)
Number of BSS forecourt employees in RSA			147,000	96,600	

Source: authors' calculations based on data from Corinaldi (2019), MIBCO (2020), and SAPIA (2020).

Table A2: Gauteng petrol price components at 5 February 2020

	Petrol 93 ULP cpl	%	Petrol price elements
BFP	665.0	42.3%	60.5%
Wholesale margin	35.7	2.3%	
Secondary storage	23.0	1.5%	
Secondary distribution	15.2	1.0%	
Retail margin	211.6	13.5%	
			Taxes and levies
Zone differential in Gauteng	57.4	3.7%	39.5%
Fuel levy	361.0	23.0%	
Customs and excise duty	4.0	0.3%	
RAF levy	198.0	12.6%	
NERSA levy	0.3	0.0%	
Pump rounding	-0.2	0.0%	
Retail price	1,571.0	100.0%	100.0%

Source: authors' calculations based on data from http://www.energy.gov.za/files/media/fuelprice/2020/Fuel-Adjustment-February-2020.pdf (accessed 4 February 2020).

Table A3: Pro forma income statement and balance sheet—BSS

BSS Pro forma income statement		Feb 2020 cpl	Revenue flow	WACC
Volume (litres)	a	2,789,851		
Capex	b	9,352,959		
Debt ratio	b1	80%		
Equity ratio	b2	20%		
Operational expenditure	c	119.04	3,321,095	
Total effective yield	d = e + f	92.11	2,569,719	27.47%
Yield (BSS Capex * WACC)	e	62.91	1,755,083	18.77%
Entrepreneurial compensation	f	29.20	814,636	8.71%
Total RAS	g = c + d	211.15	5,890,815	
Operational expenditure	–-c	(119.04)	(3,321,095)	
EBITDA	h = g − c	92.11	2,569,719	27.47%
Depreciation	i	-	-	
EBIT (ROA)	j = h − i	92.11	2,569,719	27.47%
Interest	k	(6.87)	(191,736)	
Taxation	l	(25.79)	(665,835)	
EAT (ROE)	m = j − k − l	59.45	1,712,148	18.3%
BSS pro forma balance sheet				
Asset BSS	n = b − i		9,352,959	
Bank balance	o		1,712,148	
			11,065,107	
Equity injected (80%)	p = b * b1		7,482,367	
Retained earnings	m		1,712,148	
Debt	q = b * b2		1,870,592	
			11,065,107	
			-	
ROA	r = j/n		27.47%	
ROE	s = m/p		22.88%	

Note: EBITDA = earnings before interest, taxes, depreciation, and amortization; EBIT = earnings before interest and taxes; EAT = earnings after taxes.

Source: authors' calculations based on data from RSA (2019a, b, c, 2020b) and ISPR (2009).

Table A4: Discounted cash flow (DCF) model for BSS at DoE WACC 50% debt ratio

Valuation DCF model		**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 38**	**Year 39**	**Year 40**
CPI			6%	6%	6%	6%	6%	6%	6%	6%
Original Capex (BSS inflated)			9,352,959	9,914,136	10,508,985	11,139,524	11,807,895	80,772,967	85,619,345	90,756,506
Opex			(3,321,095)	(3,520,361)	(3,731,583)	(3,955,478)	(4,192,806)	(28,681,269)	(30,402,145)	(32,226,273)
Opex cpl			119.04	126.18	133.76	141.78	150.29	1,028.06	1,089.74	1,155.13
Volume per annum			2,789,851	2,789,851	2,789,851	2,789,851	2,789,851	2,789,851	2,789,851	2,789,851
WACC			18.77%	18.77%	18.77%	18.77%	18.77%	18.77%	18.77%	18.77%
Entrepreneurial compensation (cpl)	On		29.20	30.95	32.81	34.78	36.86	252.17	267.30	283.34
Yield (BSS Capex * WACC) (cpl)			62.91	66.68	70.69	74.93	79.42	543.29	575.89	610.44
Taxation rate			28%							
Debt			50%							
Cost of debt			10.25%							
Discounted cash flow BSS		**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 38**	**Year 39**	**Year 40**
Capital expenditure		(9,352,959)								
Loan capital received		4,676,479								
RAS revenue		-	5,890,815	6,244,263	6,618,919	7,016,054	7,437,018	50,873,588	53,926,003	57,161,563
Yield (BSS * WACC)			1,755,083	1,860,388	1,972,011	2,090,332	2,215,751	15,157,047	16,066,470	17,030,458
Entrepreneurial compensation			814,636	863,515	915,326	970,245	1,028,460	7,035,272	7,457,388	7,904,831
Opex			3,321,095	3,520,361	3,731,583	3,955,478	4,192,806	28,681,269	30,402,145	32,226,273
Opex		-	(3,321,095)	(3,520,361)	(3,731,583)	(3,955,478)	(4,192,806)	(28,681,269)	(30,402,145)	(32,226,273)
Interest on loan			(479,339)	(479,339)	(479,339)	(479,339)	(479,339)	(479,339)	(479,339)	(479,339)

Taxation	-	(585,306)	(628,478)	(674,239)	(722,747)	(774,164)	(6,079,634)	(6,452,465)	(6,847,666)
Net cash flow	(4,676,479)	1,505,074	1,616,086	1,733,758	1,858,491	1,990,708	15,633,345	16,592,054	7,608,284
Equity IRR	39.3%								
ROE		32.2%	34.6%	37.1%	39.7%	42.6%	334.3%	354.8%	376.5%

Source: authors' calculations based on data from RSA (2019a) and RSA (2020b) and from industry experts.

Table A5: DCF model for BSS at DoE WACC 70% debt ratio

RAS model									
Valuation DCM model	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 38**	**Year 39**	**Year 40**
CPI		6%	6%	6%	6%	6%	6%	6%	6%
Original Capex (BSS inflated)		9,352,959	9,914,136	10,508,985	11,139,524	11,807,895	80,772,967	85,619,345	90,756,506
Opex		(3,321,095)	(3,520,361)	(3,731,583)	(3,955,478)	(4,192,806)	(28,681,269)	(30,402,145)	(32,226,273)
Opex cpl		119.04	126.18	133.76	141.78	150.29	1 028.06	1 089.74	1 155.13
Volume per annum		2,789,851	2,789,851	2,789,851	2,789,851	2,789,851	2,789,851	2,789,851	2,789,851
WACC		18.77%	18.77%	18.77%	18.77%	18.77%	18.77%	18.77%	18.77%
Entrepreneurial compensation (cpl)	On	29.20	30.95	32.81	34.78	36.86	252.17	267.30	283.34
Yield (BSS Capex * WACC) (cpl)		62.91	66.68	70.69	74.93	79.42	543.29	575.89	610.44
Taxation rate		28%							
Debt		70%							
Cost of debt		10.25%							

Discounted cash flow BSS	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 38**	**Year 39**	**Year 40**
Capital expenditure	(9,352,959)								
Loan capital received	6,547,071								
RAS revenue	-	5,890,815	6,244,263	6,618,919	7,016,054	7,437,018	50,873,588	53,926,003	57,161,563
Yield (BSS * WACC)		1,755,083	1,860,388	1,972,011	2,090,332	2,215,751	15,157,047	16,066,470	17,030,458
Entrepreneurial compensation		814,636	863,515	915,326	970,245	1,028,460	7,035,272	7,457,388	7,904,831
Opex		3,321,095	3,520,361	3,731,583	3,955,478	4,192,806	28,681,269	30,402,145	32,226,273
Interest on loan		(671,075)	(671,075)	(671,075)	(671,075)	(671,075)	(671,075)	(671,075)	(671,075)
Taxation	-	(531,620)	(574,792)	(620,553)	(669,061)	(720,478)	(6,025,948)	(6,398,779)	(6,793,980)
Net cash flow	(2,805,888)	1,367,024	1,478,036	1,595,708	1,720,441	1,852,658	15,495,296	16,454,004	17,470,235

Equity IRR	56.5%								
ROE		48.7%	52.7%	56.9%	61.3%	66.0%	552.2%	586.4%	622.6%

Source: authors’ calculations based on data from RSA (2019a) and RSA (2020a) and from industry experts.

Table A6: BSS operational cost

RAS matrix	ZAR	February 2020 cpl	Questionable expense items	Comments
BSS Opex/volume	*2,789,851*			
Staff-related costs	2,123,796	76.13		
Owners' remuneration	436,797	15.66		This is 'duplication' on entrepreneurial compensation; propose to scrap EC
Staff welfare	23,293	0.83		
Total attendants' wages	1,153,055	41.33		
Staff uniforms	12,139	0.44		
Total cashiers' wages	272,113	9.75		
Total admin salaries	226,398	8.12		
Utilities and communications	*285,387*	*10.23*		
Electricity and water	203,342	7.29		
Internet costs	7,553	0.27		
Telephone and fax	74,492	2.67		
Repairs and maintenance	*50,529*	*1.81*		
Other physical operations	*101,836*	*3.65*		
Computer expenses	7,057	0.25		
Cleaning materials	17,663	0.63		
Stationery	14,760	0.53		
Security	24,227	0.87		
Travel and accommodation	9,356	0.34		
Motor vehicle expenses	28,774	1.03		
Insurance and bank charges	*212,061*	*7.60*		
Bank charges	99,110	3.55		
Credit card commissions	4,737	0.17		
Credit card losses	2,580	0.09		
Credit card swipe machine	4,222	0.15		
Cash collection fees	40,158	1.44		
Insurance	61,256	2.20		
Professional fees	*33,190*	*1.19*		
Audit fees	19,481	0.70		
Legal costs	2,778	0.10		
Membership fees	2,704	0.10		
Subscriptions	4,984	0.18		
Professional fees	3,243	0.12		
Other cash costs	*122,597*	*4.39*		
Entertainment	12,941	0.46	0.46	Would this be an allowable expense?

Donations	6,218	0.22	0.22	Would this be an allowable expense?
Advertisements	27,935	1.00		
General expenses	13,233	0.47	0.47	'Other' and 'General expenses' are 'catch-all' line items: it is questionable what is included here
Other	53,119	1.90	1.90	
Cash shortages	9,151	0.33		
Rates and taxes	*35,537*	*1.27*		
Rates and taxes oil company	27,361	0.98		
Rates and taxes landlord	8,176	0.29		
Repairs and maintenance (Oilcos)	*172,634*	*6.19*		
Evaporation allowance	91,764	3.29	3.29	This seems to be duplication: most service stations now have vapour recovery equipment; this should be included in Capex
Operational gains and losses	91,764	3.29		
Total Opex	*3,321,095*	*119.0*		
'Questionable' Opex items	*177,275*		*6.35*	

Source: authors' construction based on RSA (2020b).