

Exploration, Monetization, Disillusion:
A History of Upstream Oil Development
in the Onshore Algoa Basin

Thesis submitted for a degree of
MASTER of ARTS in HISTORY

at

RHODES UNIVERSITY

By

JONATHAN SCOTT JAMES

June 2015

Contents:

Glossary.....Pg. 5

Abstract.....Pg. 7

Introduction.....Pg. 8

Chapter 1: The Onshore Mesozoic Algoa Basin: Emergence as a

Potential Oil Field.....Pg. 14

- *Apartheid South Africa's General Economic Standing*.....Pg. 15
- *State Intervention & the Economic Role of Government*.....Pg. 22
- *Apartheid South Africa, Global Trade & Sanctions*.....Pg. 27
- *Fuel & Energy Supply in Apartheid South Africa*.....Pg. 30
- *Commencement of Onshore Oil Exploration in South Africa*.....Pg. 46

Chapter 2: Exploration Drilling: Its Findings, Its Failings, and

Its Potential.....Pg. 56

- *Soekor Exploration Efforts in the Onshore Algoa Basin and Subsequent Data Findings*.....Pg. 57
- *The AL 1/69 Data: Interpreting the Findings*.....Pg. 71
- *The State of the Global Oil Market*.....Pg. 75
- *Oil Trade & Market Liberalization*.....Pg. 87

- *Geological Reassessment of the Oil-Bearing Prospects within the Onshore Algoa Basin*.....Pg. 97

Chapter 3: Monetization & Disillusion: The New Investors, The

New Riches, and The Collapse.....Pg. 106

- *The New South African Economic & Commercial Model*.....Pg. 107
- *The Onshore Algoa Basin Lease*.....Pg. 113
- *Exxoteq: The Move towards Monetization*.....Pg. 121
- *The Exxoteq IPO and Disillusion*.....Pg. 133

Conclusion.....Pg. 145

Bibliography.....Pg. 150

To my family.

Glossary¹

- **Anticline-** A structural fold which is convex up and has its oldest beds at its core.
- **Basin-** A large low lying area which collects sediments.
- **Belt-** The crumpling of a continental plate which then pushes upwards in the form of mountains.
- **Cap Rock-** A impermeable rock layer at the top of a trapping mechanism.
- **Contact-** The point of contact between two different geological entities.
- **Core Samples-** A sample of a formation intersected by a drilled well.
- **Cretaceous Period-** The geological period between 72 million and 145 million years ago.
- **Drill Stem Test (DST)-** Is the process of testing the permeability, porosity and pressure of a geological formation during drilling.
- **East Gondwanaland-** The eastern portion of Gondwanaland, the most southerly of the two supercontinents that, collectively, made up Pangaea.
- **Fault-** A rock fracture various forces cause a relative displacement of rocks on opposite sides of the fracture.
- **Formation-** Consists of a number of rock strata which have similarly comparable lithology.
- **Group-** An aggregate of two or more formations that share particular lithological characteristics.
- **Half-Graben-** A geological structure bounded by a fault along one side of its boundaries.
- **Interbed-** Where rock layers of a particular type alternate and lie between different lithographic rock layers.
- **Interval Zone-** A stratigraphic interval between two specified biohorizons.
- **Member-** A lithologically distinct part of a formation (usually named).
- **Mesozoic Era-** A description of a geological era between 72 million and 252 million years ago.

¹ These definitions are meant to be used as guidelines for the purposes of reading this thesis. They are not necessarily the scientifically correct definitions of the terms.

- **Miospore-** A spore or pollen grain defined by palynology as less than 200 micrometres in diameter.
- **Permeability-** The measure of the ability of a porous material to allow fluids to pass through it.
- **Petroleum System-** A description of a unified view of all the various elements, processes and aspects of petroleum geology.
- **Platform-** A continental area covered by a relatively flat sedimentary strata.
- **Porosity-** The measure of voids spaces within a material.
- **Prospectivity-** Jargon used to describe the prospects of finding oil and/or gas within a prospective region.
- **Reservoir Rock-** Rock found within a trapping mechanism that has sufficient porosity and permeability to hold oil and/or gas.
- **Ridge-** A collective grouping of hills and/or mountains which form an elevated peak for a meaningful distance (see *Diaz Ridge*).
- **Rift-** A linear zone where tectonic plates move apart in the earth's lithosphere.
- **Source Rock-** Organic rich rock from which hydrocarbons have been (or are capable of being) generated.
- **Stratigraphy-** The description and study of rock layers and rock layering.
- **Supergroup-** An aggregate of two or more groups which share particular lithological characteristics.
- **Synrift-** An active rift.
- **System-** A composition of a succession of rock layers which were laid together during a geological period.
- **Tectonic-** A reference to the forces which cause movements of the earth's crust.
- **The Basin** – Shorthand for the onshore portion of the Algoa basin.
- **Trapping Mechanism-** A place in which petroleum accumulates.
- **Trough-** A linear structural depression within a geological formation which extends laterally over a distance.
- **Upstream-** The process of exploring and producing crude oil and/or gas.
- **Well Logging-** Refers to the data collected from drilling operations. This include geophysical logging.
- **Well Packer-** Used as a seal between the outer production tubing and inner casing. Use for various drilling processes.

Abstract:

The onshore Algoa basin has, since the mid-1960s, been an area of interest for oil and gas exploration. Despite the general lack of knowledge and publicly available information on the topic, a large amount of geological and geophysical data has been collected on the region owing to the oil and gas exploration. The intended aim of this thesis is to compile and construct a historical narrative of the oil and gas exploration that took place within the onshore Algoa basin, and to then contextualize that localized narrative within the greater macro-narrative of the global oil and gas industry.

This thesis is primarily concerned with the time period beginning in the early 1960s up to mid-2014, however reference is also made to events pre-1960. For the purposes of compartmentalizing the various areas of research covered, the thesis has been divided into three broad areas of interest: the geology of the onshore Algoa basin, the global oil market and its impact on exploration therein, and the attempts to monetize the leases that came to be purchased post-exploration. The narrative on the geology of the onshore Algoa basin is aimed at providing a summarized account of the most important details pertaining to the search for petroleum systems in simplified, yet accurate, language. The aspects of the geology which command the most attention are those which are necessary in functioning petroleum systems such as suitable permeabilities, porosities, reservoir rocks, trapping mechanisms and cap rocks. The global oil and gas market is also used to contextualize the search for oil and gas within the onshore Algoa basin and is explained against the backdrop of the global oil trade and the sanctions imposed on the apartheid state. Furthermore, the analysis of the attempts to monetize leases within the onshore Algoa basin will provide a financial reference point to the shortcomings of the exploration and monetization efforts.

The purpose of this thesis is to construct a historical narrative of the onshore Algoa basin which not only gives an accurate portrayal of the exploration efforts that have taken place thus far, but to also provide a enough detail of those exploration efforts to indicate the future of the onshore Algoa basin as an exploration play.

Introduction

South Africa is a country blessed with large natural resource reserves. However, one of the natural resources that is noticeably absent from the South African commodities mix is oil. Despite South Africa's small proven oil reserves, the country has a history of oil exploration. Although the bulk of oil exploration in South Africa has taken place offshore, there was one key onshore area which was the subject of intense oil and gas exploration beginning in the late 1960s. The onshore portion of the Algoa basin (also referred to as the 'Basin') from the Mesozoic era has, historically, been an area of notable upstream oil activity in spite of the fact that the region has yet to produce any oil in commercial quantities. Notwithstanding the fact that there is currently no oil production in the region, there are still promising signs that exploitable oil reserves do exist therein. These assumptions are based on the fairly extensive work carried out by Soekor and the geologists who worked to interpret and collate the data that the drilling operations produced.² Furthermore, there is a renewed interest in the onshore Algoa basin by both oil companies and the media. On 4 September 2013, Marc Hasenfuss (a financial journalist who followed commercial upstream oil activity in the Basin) penned an article for the *Business Day* newspaper under the title, 'Algoa Basin oil exploration to be revisited'.³ Although drilling activity has yet to begin, a concerted effort is being made to reinitiate the upstream activity in the Basin. As such, it would seem pertinent to examine what the prospects are of the Basin becoming a petroleum producer and why it has not become one up to the present point. This thesis should hopefully provide sufficient contextualisation to understand the prospects of the Basin as a potential liquid hydrocarbon play given its history.

From the outset it needs to be indicated that some highly technical language is used in explaining (amongst other things) exploration drilling processes and geological and geophysical concepts. Hence, it seems necessary to provide an explanation of the language that has been used given its technical nature. In order to give an accurate account of the successes and limitations of early drilling efforts and interpretations of the data obtained, it is

² Indeed, it is the data and reports that were borne from this process which serve to underpin this study of the onshore Algoa basin's oil prospectivity.

³ Hasenfuss, M. 'Algoa Basin oil exploration to be revisited', *Business Day*, 4 September (2013).

essential to frame these findings within their various disciplines. Thus, in order for the findings to be accurately portrayed, it is necessary to use the jargon associated with the discipline from which the findings were made. However, in order to make this thesis as readable as possible, a glossary of the major technical terms used is provided in order to help the reader navigate through the oil industry discourse with which they may not be familiar. This should allow for a deeper understanding of the various concepts addressed in this thesis, which should in turn allow for critical engagement.

Despite the history of oil and gas exploration in the onshore Algoa basin, the fact is that the region does not produce any oil or gas at the time of this writing. Hence, this thesis speaks of a non-existent history so to speak. Moreover, unless one were to actually research the exploration efforts in the area, there are no signs that oil exploration had ever been pursued in the Basin. Indeed, notwithstanding the lack of general public knowledge of exploration efforts in the Basin (owing to the fact that the efforts has so far been fruitless), research carried out since the late-1960s has generated a fairly sizable body of scientific data. Although many of these datasets are incomplete and (in some cases) corrupted, they nevertheless provide valuable insights into the petroleum prospectivity of the Basin. This too is the case for the business activities that has surrounded the monetization of the petroleum plays which appear to be the most promising. However, most of the findings pertaining to the Basin are scientific examinations of the region and are not intellectually accessible to readers who are not trained within the various disciplines that were used to examine the region (specifically, geology, geophysics, and palynology as well as commerce specific disciplines such as accounting). As such, there is space for a more general history of the Basin which encompasses all the various disciplines and presents it to readers in an accessible, yet detailed, manner.

It is also necessary, at this point, to speak to the limitations of this research. Although great efforts were made to unearth and critically analyse information pertaining to the upstream activities within the Basin, there will almost certainly be gaps in the source material consulted. These gaps relate to both source material which has not been consulted and the lacunae within the cited sources. Due to the secretive nature of oil and gas exploration under apartheid and the obscure corporate practises that characterized the Basin exploration post-

apartheid, source deficiency is a near certainty. This is particularly true with regards to the lack of primary source material: all efforts made to contact employees from Soekor and Exxoteq (to name just two parties involved) have not received a response. Needless to say those who were active participants in the exploration of the Basin would undoubtedly provide information which may counter the views put forward in this thesis, but without responses from those contacted, there will be source limitations. Thus, the evidence is necessarily incomplete and thus the interpretation thereof is tentative. Even so it provides valuable accounts of the process given the extant information.

The history of the onshore Algoa basin also cannot be examined in isolation. The narrative of upstream oil activity within the Basin needs to be analysed within the greater macro-narrative of the upstream oil industry worldwide in order to provide sufficient context for understanding the Basin exploration efforts. This ultimately led to a two-pronged approach being taken towards the composition of each chapter. Within each chapter, there is at least one subsection which deals with the contextualization of the information pertaining to the Basin. Hence, one thread specifically deals with the contextualization of the core concern of the thesis, while the second thread aims to detail the specifics of exploration within the Basin. Due to the global nature of liquid hydrocarbon pricing and trade, such contextualization is not only necessary but essential. There has also been an active effort made to focus on global oil economics and politics which had a direct impact on South Africa which should make the contextualization as directly relevant to the Basin exploration as possible. It is also the case that the contextualization, at times, does not follow a chronological sequence. The reason for this is that locating an event within its chronological position is less important for this thesis than giving an explanation of the impact that an event had on the exploration of the Basin. This is not to say that chronology is not adhered to at all (indeed, most of this thesis is presented in chronological order), but rather that in the cases where chronological sequence is not adhered to it has been done deliberately in order to emphasis or locate the significance of a particular event within the context of this thesis.

Regarding the structure of this thesis, it has been divided into three periods which broadly reflect the distinct eras in the exploration of the onshore Algoa basin. The three periods correspond to the organisation of the chapters.

The first chapter focuses on the period from the mid-1960s up to the mid-1970s. Specifically, this chapter is dedicated to providing the context of oil exploration during the apartheid era and how the politics of the time had a significant impact on the creation of an upstream oil sector in South Africa. Owing to the economic complexities that apartheid created with regards to restricted global trade and a highly-regulated local business environment, it seems prudent to give an explanation of the general structure of the South African economy. Hence, the chapter begins with a broad outline of the type of ideology which governed the general principles of the South African economy and the relative purchasing power (and nature) of the consumer base within the country. This is supplemented by brief overviews of the country's core commercial sectors and their general operations. Due to the inextricable link between politics and business in apartheid South Africa, it is necessary to address the nature of this relationship. This analysis focuses largely on apartheid parastatals and how they were managed, how they were structured, and what their economic impact on the country was. From this point onwards, the chapter looks at the economic and trade limitations that apartheid policies and politics created for the South African business sector. In particular, the emphasis is on the nature and effects of global trade restrictions and sanctions on the country. This necessitates examining the nature of South Africa's relationships with its biggest trading partners and the role that sanctions (and potential sanctions) had on the country's economy. This analysis is supplemented by inquiry into the impact that oil sanctions had on the country's oil supply and storage structure. Finally, there is a brief introduction to the initial exploration efforts in the onshore Algoa basin in order to locate this exploration process within the apartheid economy.

The second chapter is concerned primarily with the actual exploration that took place within the Basin between the mid-1960s and the early-1980s. This is supplemented by a contextualizing commentary on the main events which took place in both the South African and global oil industry from the late-1950s to the mid-1980s. The contextualization during the drilling period is of particular importance: many of the events that took place within the global oil industry had a direct impact on South Africa and the oil supply structure of the

country.⁴ However, the majority of the content within this chapter relates to the technical finding of the exploration efforts within the Basin, particularly the forays by Soekor. In order to detail the exploration efforts adequately, the data obtained from the drilling processes will be explained in detail. These explanations will include analysing the reports that were written on the data findings obtained from drill stems as well as core samples (amongst others). The purpose of doing so is to provide an accurate illustration of the Basins' key petroleum system strengths and weaknesses. The will be set against the backdrop of the oil supply structure constraints which apartheid South Africa was experiencing at the time. Towards the end of this chapter, the renewed interest in the Basin in the early-1990s will be addressed and will essentially serve as a link to the third chapter.

The third chapter will look at the period from roughly the early-2000s up to the present day (although some reference will be made to some events during the 1990s). This periodization is primarily aimed at providing an account of the attempted monetization of the project within the Basin. Once again, contextualization is necessary in order to illustrate the economic operating and ideological environment in which this monetization took place. The main actors and agents who attempted to monetize the onshore Algoa lease are referred to and their roles in the various processes this included are mentioned. Following the folding of the onshore Algoa basin lease into Exxoteq, an attempt is made to track the course to Exxoteq's listing on the Johannesburg Stock Exchange. This includes interrogating the financial media's depiction of Exxoteq in the build up to its Initial Public Offering (IPO).⁵ This is followed by an account of Exxoteq's poor listing subscription and performance within its first month on the JSE. This narrative will then recount the collapse of the Exxoteq stock price in conjunction with the various rescue attempts made to support the company financially. This narrative will be concluded once the share trading halt, subsequent delisting and bankruptcy are dealt with.

Once again, the aim of this research and thesis need to be reiterated. The upstream oil and gas activity which has taken place in the onshore Algoa basin does not appear to have a

⁴ Events such as the Arab oil embargo and the oil sanction circumvention by players such as Johan Deuss and Marc Rich are but a few which are dealt with.

⁵ Marc Hasenfuss was the journalist at the forefront of the commentary on Exxoteq, hence he is the main source covered.

comprehensive account of the key events. Although this thesis is necessarily limited (particularly given the gaps in the source materials consulted), there is a great deal of value in constructing an historical account of the exploration efforts in the Basin notwithstanding the limits and strictures of the extant information. This thesis might not provide a definitive account of oil and gas exploration within the onshore Algoa basin, but it does offer the first comprehensive account thereof. As such, this thesis will best be understood within these boundaries.

Chapter 1

*The Onshore Mesozoic Algoa Basin:
Emergence as a Potential Oil Play*

Apartheid South Africa's General Economic Standing:

The nature of the South African economy under apartheid was a unique hybrid of free market capitalism and state intervention. It could probably best be defined as a type of state-directed capitalism. Because the primary objective of the apartheid government was the racial segregation of society, the economic policy of South Africa revolved first and foremost around enforcing this status quo. As a result of this racial segregation imperative, many of the economic requirements of South African society were sacrificed in order to serve the prevailing political segregation agenda. Ultimately, South African economic policies and commerce-driven programmes were only adopted insofar as they had a direct impact in continuing the apartheid system.⁶ It was rare then, as it would be now, to find a national economy where political agendas affect economic and commercial decision-making in such an unambiguous manner. It should be recognised, then, that apartheid South Africa's economy was inseparably linked to the politics of apartheid. To view economic policy in South Africa during this period without paying special consideration to the political agenda of the ruling Nationalist Party at the time would provide significant lacunae in the interpretation and comprehension of various economic and commercial decisions.

However, despite the need for the apartheid government to dictate (to a large extent) the way in which the economy functioned in order to ensure its own political survival, it was also necessary for it to create an economic system that was strong enough to produce enough goods and services to provide a sustainable tax base in order to fund the apartheid project. As a result of this need, the apartheid government placed a significant emphasis on economic growth. This emphasis on economic growth was also partially adopted by many business people in South Africa because they believed it could serve to loosen the social and economic strictures of apartheid: Others in the business community (considered to be the majority) saw it as a continuation of white economic entitlement which would have little or no value to non-

⁶ It should be noted that the narrative surrounding the role that racial segregation played in affecting economic growth in South Africa is a highly contested, and the position taken regarding this matter within this thesis needs to be understood within this context. Furthermore, it needs to be acknowledged that although not cited, Merle Lipton and Harold Wolpe's works were consulted in order to frame this debate. Thus, it needs to be acknowledged that although portrayed as one-dimensional in this thesis, the debate over the role that racial segregation played in apartheid South Africa's economic development is far more nuanced.

white people.⁷ Regardless of the views of South African society towards the economic ideals of the apartheid government, the impetus from a governmental policy standpoint was the growth of the South African economy. As such, it is necessary to contextualize the general state of the South African economy under the apartheid government and its various strengths and weaknesses. The remainder of this section will be dedicated to providing a general overview of the key features of the South African economy under the apartheid government (e.g. mining, agriculture, manufacturing and the role of government), which will include a detailed analysis of the energy sector as the primary vulnerability of the apartheid economic model.

Apartheid South Africa was characterized by the immense human injustices that took place in the name of racial segregation and white supremacy. Indeed, the only reason that the white supremacist government could survive (and, essentially, thrive) in a country whose majority population is black, was to create and enforce an economic and political system which allowed for the advancement of whites at the expense of blacks.⁸ Largely as a result of the political necessity for a robust economy to fund the apartheid project, the apartheid government placed a strong emphasis on economic growth.⁹ Despite the oppression and suffering that ultimately fuelled economic growth under apartheid, the South African economy itself was described as, “one of the success stories of Africa”.¹⁰ This ‘success’ was primarily built on the cheap labour supply provided by black South Africans which led to highly profitable industrialization in the country. The outcome of this industrialization fuelled by cheap labour was that in 1978, South Africa accounted for approximately 20% of Africa’s output of goods and services; second only to Nigeria which had a population three times the size of South Africa’s population and abundant oil supplies.¹¹ Furthermore, South Africa also

⁷ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 128.

⁸ The use of the term ‘black’ will, for the purposes of this paper and a need for brevity, include all those deemed to be ‘non-white’ under the apartheid government. The term ‘non-white’ will not be used due to its Eurocentric nature. The understandably politically sensitive nature of racial categorization is difficult to avoid in a paper that includes references to the apartheid political system. Hence, in order to avoid as much as possible any kind of racial bias and stereotyping, this paper will adopt the ‘white’ and ‘black’ (in place of ‘non-white’) categorizations that the apartheid government made use of.

⁹ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 128.

¹⁰ *Ibid.*

¹¹ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 129.

accounted for 86% of the continents' steel production, more than 50% of its electricity generation, 60% of all rail cargo movements, 43% of all legally registered motor vehicles, 42% of installed telephones, and 40% of industrial production.¹²

Despite the fact that South Africa was not considered to be a developed economy during the apartheid period (indeed, it is still not considered a developed economy), it did provide enough commercial activity to finance the apartheid project. As a result of the massively skewed relative economic progression between whites and blacks, the development of urban areas was largely characterised by this inequality. In the main metropolitan areas of South Africa (namely Cape Town, Johannesburg, Port Elizabeth, and Durban), the development of urban areas was too often characterized by racial segregation. Suffice to say that racial segregation gave way to a more rigid form of separation in the cities, which physically entrenched the economic divide that characterized apartheid. Indeed, the economic gap that clearly delineated the racial segregation in cities during the 1980s led to a dual economy; one which defined the substantial differences that existed between the income levels and living standards between the black and white South Africans.¹³

Although South Africa's initial economic development centred on colonial trade and resource exploitation, the apartheid economy came to be defined by a heavy reliance and focus on the mining industry; specifically the mining of gem quality diamonds and gold.¹⁴ In terms of the main economic drivers of apartheid economy, the mining industry served as its keystone industrial sector. In terms of sanctions, there were various attempts at sanctioning the ability of South Africa to trade its gold on the international markets.¹⁵ The primary attempt in this regard was the establishment of *The World Gold Commission* in June 1988, a syndicated organization intended to determine the viability of a sanction aimed specifically at stemming the gold exports of South African mining companies.¹⁶ Although many of the findings of the commission indicated that an international gold sanction on South African manufacturers of

¹² *Ibid.*

¹³ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 129.

¹⁴ Domingo, V. *South Africa* (New York, 2004), pg. 71.

¹⁵ Mensah, I. 'IIC 76-Record of Proceedings', *International Labour Organization*, (1990), pg. 20/10.

¹⁶ The syndicate members thereof were the ANC, SWAPO, End Loans to South Africa (ELTSAs), and the British Anti-Apartheid Movement.

the commodity could potentially be viable, there were significant obstacles to the implementation of the proposed sanctioning measures including the problems related to scrap gold and the jewellery industry; issues around the melting (and consequential restamping) of gold limited by the sanction; and potential collusions between South Africa and gold-dealing companies and/or countries with the intention of illegally trafficking sanctioned gold into the international gold market.¹⁷ In terms of sanctioning the South African diamond trade, many attempts were made at limiting the sale of diamonds mined in South Africa to international buyers which never really saw much success. Most sanctions which intended to force some form of political capitulation by the apartheid government never made the impact that was initially hoped for. Although many countries passed laws and implemented sanctions on South African goods (the most notable being the Comprehensive Anti-Apartheid Act in the US) most of these sanctions ruled out the sanctioning of 'strategic materials', gold, and diamonds.¹⁸ As a result of these concessions in the sanctions applied to South Africa, the mining industry remained the country's mainstay economic sector. However, other sectors of the South African economy were impacted more meaningfully by sanctions.

The agricultural sector was probably the most clear-cut depiction of the economic divide caused by apartheid and racial segregation. Commercial farming was typically dominated by white males who employed a great deal of black workers. Although the majority of farmers in South Africa during apartheid were black, these black farmers were largely subsistence farmers and mainly made use of communal and family land holdings.¹⁹ As a result of this racial split between white commercial farmers and black subsistence farmers, the main economic benefits gained were by white farm owners and operators. However, the agricultural sector (despite its significant role as an employer of black South Africans, and as a symbol of the racial segregation in South Africa) was not the main driver of the South African economy. Although the agricultural sector employed about one-third of the South African labour force, the sector only totalled about 7% of the South African GDP with the majority of this contribution coming from the white-owned commercial farms.²⁰ This gives an indication to the fact that although many black people were employed in agriculture, the

¹⁷ Mensah, I. 'I/c 76-Record of Proceedings', *International Labour Organization*, (1990), pg. 20/10.

¹⁸ Levey, P. 'Sanctions Against South Africa: What Did They Do?', *Economic Growth Center: Yale University*, (February 1999), pg. 7.

¹⁹ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 130.

²⁰ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 130.

commercial gains went primarily to white farm owners and left the majority of the black farmers/workers in exceptionally poor economic circumstances.

Although agriculture (commercial agriculture in particular) did not play as significant a role in the South African economy as mining, it played a centrally important strategic role in the sustainability of the apartheid political system. In order for South Africa to remain a functional state in the event of significant economic sanctions (a very real threat with very real consequences), the country would require a stable supply of food. This need ultimately led to South Africa becoming a net food exporter, a change from the importer status it had during the 1920s; although the exporting of food periodically occurred at a net loss due to the subsidization of food production.²¹ The aim of self-sustainability in food production was further bolstered by the significant mechanization that took place in the commercial farming sector. Despite the fact that employment in the agricultural sector rose in absolute terms, the rise did not increase concurrently with the population growth in white rural areas indicating that relative level of employment per farm did not increase with the productivity thereof.²² Ultimately the agricultural sector may not have provided the economic value that the mining sector did, yet it did provide a significant political advantage in that the country did not have to rely on foreign imports simply to feed its population. This would have been a significant achievement in the eyes of the apartheid apparatchiks.

Owing to South Africa's move towards industrialization (particularly so under apartheid governance), the apartheid era economy experienced a significant upsurge in the production of goods and services. In fact, when the apartheid government came to power in 1948, manufacturing was the single largest sector in the South African economy.²³ Furthermore, during the thirty year period between 1950 and 1980, the manufacturing sector increased its annual output by an average of 7%.²⁴ This growth was not coincidental: During the first term of apartheid governmental rule, the National Party government made its support of the

²¹ Hanlon, J. *Beggar Your Neighbours: Apartheid Power in South Africa* (Indiana, 1986), pg. 72.

²² Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 130.

²³ Mariotti, M. *White Control of Black Employment: An Analysis of the Effects of Apartheid Era Labour Legislation on Black Employment in South Africa* (California, 2008), pg. 15.

²⁴ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 131.

manufacturing sector a priority which reflected in the statistics associated therewith.²⁵ By 1970, 30.8% of the South African GDP was made up of manufacturing, water, gas, electricity, and construction (all primarily domestically consumed); whereas the mining sector only accounted for 10% of GDP illustrating the relative importance of manufacturing and affiliated consumer industries.²⁶ However, despite the strength of the manufacturing sector, the growth in the manufacturing sector began to slow when the apartheid system encountered more opposition in the form of strike action, the withdrawal of international capital and international sanctions. By the mid-1970s, the manufacturing sector (along with others) began to experience significant growth limitations owing to the politics that began to affect South African international trade relations and, by the mid-1980s, had almost stagnated completely from a growth perspective. Between 1981 until 1994, the South African manufacturing sector grew at a paltry annualized rate of 1%.²⁷

The decline of the manufacturing sector also manifested, to a certain extent, along racial lines. Although black workers comprised of 80% of the workforce employed in the manufacturing sector by 1985, the employment of black workers (in general and specifically related to the manufacturing industry) consisted of low-skilled occupations and, therefore, were paid the lowest wages by employers.²⁸ However, based on the statistical analysis of wage movements in the manufacturing sector by Martine Mariotti from approximately 1950 until 1985, the relationship between manufacturing wages and the general economic conditions that affected the South African economy by 1985 were largely dependent on the regulatory environment within the industry.²⁹ Ultimately, from 1985 onwards, the South African manufacturing sector had to adjust to global trading conditions which required the industry to become more competitive; an adjustment that the industry did not cope with well as illustrated by the poor growth rates between 1981 and 1994.³⁰

²⁵ Mariotti, M. *White Control of Black Employment: An Analysis of the Effects of Apartheid Era Labour Legislation on Black Employment in South Africa* (California, 2008), pg. 15.

²⁶ Mariotti, M. *White Control of Black Employment: An Analysis of the Effects of Apartheid Era Labour Legislation on Black Employment in South Africa* (California, 2008), pg. 18. Limitations of the data provided prevent a more detailed analysis of these figures.

²⁷ *Ibid.*

²⁸ *Ibid.*, pg. 24.

²⁹ Mariotti, M. *White Control of Black Employment: An Analysis of the Effects of Apartheid Era Labour Legislation on Black Employment in South Africa* (California, 2008), pg. 25.

³⁰ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 132.

State Intervention & The Economic Role of Government

Supporting racial segregation from an economic perspective was a difficult task for the apartheid government. Due to the constant threat of sanctions and a noticeable deterioration in trade relations with erstwhile partners, the apartheid government needed to proactively find sources of sustainable revenue in order to fund the many apparatuses used to enforce racial segregation; a task that required a fair amount of monetary and capital resources.

Furthermore, many of the strategic sectors of the South African economy were vulnerable to sabotage in several forms, all of which would have a crippling effect on the economy. As a result of these issues, the apartheid government moved to create state-controlled corporations (and, in many cases, nationalized whole industrial sectors) in order to insulate themselves from the potential supply disruptions that could have occurred. These parastatals (as they came to be known as) served a significant role in the South African economic and political sphere.

Although it may not have been at the forefront of many international discussions on apartheid at the time, the South African government played a vital role in the economy. By the 1980s, nearly 26% of the South African GDP was generated by the public sector and nearly 58% of its fixed capital stock was in the control of government.³¹ Indeed, many of South Africa's largest most powerful industrial entities were government owned parastatals. Although there were many parastatals of significant economic clout under apartheid, four of them (Eskom will be excluded from this group because of its relative lack of international strategic significance from a resource perspective) held a particularly large amount of industrial sway during apartheid: these were Armscor (the Armaments Development and Production Corporation), Iscor (the South African Iron and Steel Industrial Corporation), Sasol (the South African Coal, Oil and Gas Corporation) and Soekor (the Southern Oil Exploration Corporation of South Africa).³² Each of these parastatals served different but essential roles to the apartheid government which helped white South Africa to withstand international economic pressures to dismantle the apartheid system, and to reinforce their policy of institutionalized racial segregation.

³² Horowitz, R. *Communication and Democratic reform in South Africa* (Cambridge, 2001), pgs. xviii, 30, 114.

Armcor came into existence as a reaction to a sanctions program instituted by the UN limiting, amongst other things, the ability for South Africa to buy weapons from the international market. In 1968, Armcor began producing armaments.³³ Between 1968 and 1977 (the year in which the UN Security Council passed Resolution 418, formalizing a mandatory arms embargo on South Africa),³⁴ Armcor experienced a significant historical period of weapons development which served as the foundation on which the apartheid government based its armament arsenal from 1977 to 1994.³⁵ As the limitations of arms importation became tangible in its significance to the apartheid government, Armcor moved away from buying imported (and partially assembled) products towards a process of licensing weapons production from foreign governments and businesses.³⁶ Armcor also functioned as the primary armaments supplier to the SADF and (in line with the Armaments Development and Production Act no. 57 of 1968) played the part of coordinator of arms production, standardization, maintenance and acquisition for the apartheid government.³⁷ Armcor also involved itself in the private arms production sector by aligning itself (through both shareholding and production-sharing agreements) with companies such as Ronden, Dassault and (most notably) Denel.³⁸ However, Armcor began a slow decline from 1989 until 1993 due to cuts that took place in the South African defence budgets. Although Armcor (along with Denel) exists to this day and still produces armaments, the true industrial power of Armcor is concentrated in the period between the mid-1970s and 1989.³⁹

Iscor, as a statutory parastatal, was not a product of the apartheid government. Due to legislation tabled in parliament in 1927 which allowed for the founding of a steel parastatal, Iscor was founded in 1928 with the intention of creating a centralized steel producing company in South Africa.⁴⁰ The first six years of Iscor's existence were fairly dormant;

³³ Batchelor, P & Willet, S. *Disarmament, Defence and Industrial Adjustment in South Africa* (Oxford, 1998), pg. 29.

³⁴ *Ibid.*, pg. 31.

³⁵ *Ibid.*, pg. 29.

³⁶ *Ibid.*, pg. 30

³⁷ *Ibid.*, pg. 30

³⁸ Batchelor, P & Willet, S. *Disarmament, Defence and Industrial Adjustment in South Africa* (Oxford, 1998), pgs. 30, 31, 65.

³⁹ *Ibid.*, pg. 75

⁴⁰ South African Iron and Steel Institute (SAISI). *Primary Steel Works History SA*. (PDF), Accessed at: www.saisi.co.za, pg. 2

however it was during this period that the strategic planning for Iscor's future production was put in place. This culminated in the establishment of production facilities in Pretoria in 1934 which, by 1943, had evolved into an extensive industrial complex housing (amongst many other things) South Africa's most recognizable heavy plate steel mill in Vanderbijlpark.⁴¹ Due primarily to the success of Iscor's heavy plate mill, the corporation expanded its operations to include the first phase of a green field integrated steel works and flat products mill in the Vanderbijlpark compound which was completed in 1953.⁴² Despite some complications, Iscor's Vanderbijlpark was largely successful in its initial production of steel and began to expand its operations after its fourth decade of existence. Between 1971 and 1977, Iscor completed substantial expansions to its Vanderbijlpark operations and opened an integrated steel works and long products mill in Newcastle.⁴³ From 1978 to 1989, Iscor operated as a parastatal for the apartheid government. Iscor ceased to exist as a parastatal after it publicly listed on the Johannesburg Stock Exchange on 8 November 1989.⁴⁴

Arguably the most important parastatal from the perspective of resource strategy was Sasol. Although South Africa could supply itself with the bulk of its domestic electricity demand as well as armaments and steel, the apartheid government did not have a local (or stable) supply of crude oil. Due to the fact that by 1970 no significant reserves of South African oil were known to exist (to be discussed more fully in the next paragraph), the apartheid government needed to secure an alternative source of oil supply. Due to South Africa's substantial coal reserves, the apartheid government pursued creation of a synthetic oil-producing plant. Although coal-to-liquids (CTL) oil production methods were developed in the 1920s by German chemists Franz Fischer and Hans Tropsch, the world had yet to see a large scale economically viable CTL production operation by the 1970s⁴⁵ While Sasol was producing oil from the CTL method from 1955, the actual importance of Sasol to the South African economy only became clear in the 1970s when oil prices began to rise (primarily as a result of the 1973 Arab Oil Embargo).⁴⁶ With a \$6 billion loan from the apartheid government,

⁴¹ *Ibid.*, pg. 2

⁴² *Ibid.*

⁴³ *Ibid.*

⁴⁴ *Ibid.*

⁴⁵ Schutze, E. 'Liquid fuel from Coal', [online], Accessed on 19/06/2014 from:

<http://www.medioclubsouthafrica.com/component/content/article?id=123:liquid-fuel-from-coal>

⁴⁶ *Ibid.*

Sasol built two more CTL plants in Secunda, dubbed Sasol II and Sasol III.⁴⁷ Because of the truly massive scale of the Sasol II and III construction, the cost of the operation escalated and required more capital: This led to Sasol listing on the Johannesburg Stock Exchange in 1979 in order to raise the necessary capital, with the government retaining a 23.5% stake in the company.⁴⁸ Thereafter, Sasol continued to produce CTL oil for the South African market, but not under the guise of a true parastatal.

As a partial response to the first voluntary sanctions imposed on South Africa by the UN via resolution 1761 on 6 November 1962, Soekor was established with the hope of finding commercially exploitable oil reserves in South Africa.⁴⁹ Although Soekor did carry out some onshore exploration (which will be examined at length throughout this thesis), the primary upstream activities carried out by Soekor revolved around determining the commercial viability of offshore basins that showed hydrocarbon potential.⁵⁰ In 1967, the South African government passed a revised Mining Rights Act which led to a number of offshore exploration concessions being granted to Total, Esso, Gulf Oil, Shell, CFP, ARCO and Superior Oil Company.⁵¹ Although there were a fair number of dry wells and other disappointing results, Superior did manage to find commercially viable deposits of gas and condensate in well Ga-A1 which was drilled in the Pletmos basin.⁵² As a result of the withdrawal of most of these international companies due largely to international political sanctions against South Africa, Soekor (in conjunction with Rand Mines) extended its efforts to further offshore exploration and the running operations where deposits were being exploited.⁵³ This role of Soekor in offshore operations remained the same until the relicensing of all offshore permits came about in after the 1994 elections.⁵⁴

⁴⁷ *Ibid.*

⁴⁸ *Ibid.*

⁴⁹ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 142.

⁵⁰ The term 'hydrocarbon' refers, in this particular case, to both oil and gas; hydrocarbon (i.e. oil and gas) exploration generally happen simultaneously.

⁵¹ Petroleum Agency of South Africa. 'History of Exploration and Production', [online], Accessed on 20/06/2014 from: <http://www.petroleumagencyrsa.com/index.php/petroleum-geology-resources/exploration-history>.

⁵² Petroleum Agency of South Africa. 'History of Exploration and Production', [online], Accessed on 20/06/2014 from: <http://www.petroleumagencyrsa.com/index.php/petroleum-geology-resources/exploration-history>.

⁵³ *Ibid.*

⁵⁴ *Ibid.*

All of these highly influential parastatals played a crucial role in the ability of the apartheid government to reduce its vulnerability to exogenous economic pressure which could have altered the political paradigm of South Africa. Without the existence thereof, the apartheid project would likely have encountered significant problems with regards to funding its racial segregation policies, as well as its security efforts used to ensure political stability.

Apartheid South Africa, Global Trade & Sanctions

Despite the fact that many countries were under significant pressure to limit trade with South Africa, the apartheid state still managed to do a great deal of trade with the outside world and vice versa. In fact, international trade constituted such a large part of the economic activity that took place in South Africa during apartheid that the economy was still considered ‘open’; meaning that imports and exports comprised more than 50% of the South African GDP.⁵⁵ This meant that in spite of South Africa’s relative political isolation, the country was sensitive to the movements of global economic markets, changes in geopolitics and the dynamism associated with international relations between various countries and international alliances. For example, if the global economy slipped into a recession, or experienced a significant economic boom, South Africa would be impacted by such a change. However, because South Africa’s economic interconnectedness with the international trading community was not entirely linear, there was a lag of about twelve to eighteen months between changing international economic climates and its corresponding impact on the South African economy.⁵⁶ South Africa’s trade position with the international community was also largely determined by the price of gold, due to its status as South Africa’s primary export.⁵⁷ The latter half of the 20th century saw a fairly strong correlation between the price of gold and the health of the global economy (a trend that continues to this day); where, when the health of the world economy is good, the price of gold will fall and when the health of the world economy is poor the price of gold will rise.⁵⁸ The reason for this correlation is that when the world economy is in good health, there is often good financial/economic value in many assets and (assuming the economy keeps growing) other assets will increase in value.⁵⁹ However, when the world economy experiences a recession where asset values decline, investors look to buy assets that will hold their value: Gold is helpful in this case because the supply of gold in the world economy at any given point in time is fairly stable, especially when the majority of the world’s countries used the ‘gold standard’ monetary system which ensured that all

⁵⁵ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 137.

⁵⁶ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 137.

⁵⁷ The references to the role gold played in the global economy are no South Africa specific. Although not cited, work by Desmond Hobart Houghton was consulted in order to contextualize the discussion.

⁵⁸ Hill, M. *Gold: The California Story* (California, 2002), pg. 248.

⁵⁹ *Ibid.*

currency that was injected into the economy was backed by a certain amount of physical gold.⁶⁰ Furthermore, as a result of the constant demand for physical gold to fund monetary expansion under the gold standard, owning physical gold also had other value store uses. One of these uses was that when the gold standard was systematically abandoned after the ‘Nixon shock’ in 1971, gold came to be seen as an ‘anti-currency’ meaning it served as a hedge against currency movements and, most importantly, excessive inflation.⁶¹

In terms of South Africa’s trade with the international community, a handful of countries served as South Africa’s main trading partners. Five countries in particular dominated trade with South Africa; these countries were the United States, Great Britain, West Germany, Switzerland and Japan.⁶² By 1980, South Africa had established a fairly consistent goods roster for both imports and exports. Its main exports were gold, other minerals, and agricultural products; and its main imports were oil, machinery, electrical equipment, and transportation equipment.⁶³ Despite the political pressure applied by a great deal of US citizens and institutions hoping to force their government to intervene in apartheid South Africa, the US overtook the UK to become South Africa’s primary trading partner by the end of the 1970s.⁶⁴ During that same period, the US exported \$1.5 billion worth of goods to South Africa and imported \$1.9 billion therefrom.⁶⁵ However, despite the significance of this trade with South Africa, this trading relationship only accounted for 1% of US world trade in 1974.⁶⁶ It should also be noted that the US traded substantially more with the African continent than it did with apartheid South Africa, with African trade totalling \$13.7 billion in 1979 compared to the \$3.4 billion worth of trade with South Africa.⁶⁷ Indeed, South Africa

⁶⁰ *Ibid.*

⁶¹ *Ibid.*, pg. 226 This is an odd reference for a discussion of the importance of gold to the SA economy; rather access a source that relates specifically to the country’s economy, even if it is a standard work such as Houghton’s economic history..

⁶² Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 137.

⁶³ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 137.

⁶⁴ *Ibid.*

⁶⁵ *Ibid.*

⁶⁶ *Ibid.*

⁶⁷ *Ibid.*

was not even the US's largest African trade partner due to its imports of oil from Nigeria which totalled \$5 billion during the same period.⁶⁸

Businesses operating in South Africa during this period also recognized the need for diversification in terms of its trading partners. As a result, the late 1970s and early 1980s saw a rise in trade with particular countries. One of these countries was Switzerland which became a significant export market for South African diamonds, Krugerrands, and gold bullion.⁶⁹ South Africa also expanded its trade relationships with Israel, South Korea and Taiwan (known as 'sanction busters') during this time.⁷⁰ Although the apartheid government is known to have traded with other African countries during apartheid, the actual figures of how extensive this trade was remains a bit unclear due to the fact that the relationships were only acknowledged after 1994; however it does seem that this trade was worth about \$1 billion per year by the late 1980s.⁷¹

⁶⁸ *Ibid.*

⁶⁹ *Ibid.*

⁷⁰ *Ibid.*

⁷¹ *Ibid.*

Fuel & Energy Supply in Apartheid South Africa

Apartheid South Africa was a significant producer and consumer of energy at a residential and industrial level. As an illustration of the significance of this consumption, South Africa consumed almost eight times as much energy per capita as any other country in Africa during the early 1980s.⁷² During the apartheid era, South African society was primarily reliant on the bulk of its energy needs in the form of electricity which was mainly produced from coal-fired power stations. The electricity generated from coal met about 75% of South Africa's energy needs with the rest being supplemented by various other electricity generating projects, such as the Koeberg nuclear facility.⁷³ Coal played an instrumental role in South Africa's energy paradigm. Despite the fact that South Africa was for a period the second largest supplier of coal to Western Europe (first was Poland), the internal uses of coal for electricity generation was a vital aspect of the South African economic model: the ability for South Africa to generate relatively cheap electricity from coal served as the key underpinning of South African industrialization.⁷⁴ Due to the importance of coal to the most basic functioning of the South African economy, the apartheid government also imposed strict restriction on the uses and sale of coal. For example, the authorities played an interventionist role in limiting the amount of coal that could be exported out of the country in order to ensure that the supply for South African industrial requirements remained the priority.⁷⁵

One of the weaknesses in South Africa's electricity supply position was that by the late 1970s, the country was meeting 10% of electricity demand with supply from the Cahora Bassa hydroelectric station in Mozambique.⁷⁶ Although this supply route only met 10% of South Africa's electricity demand, it was a crucial 10% which (if cut-off) would have created a noticeable economic disruption to the apartheid economy, as warned by ESCOM (the precursor to Eskom).⁷⁷ As a result of the strategic significance of Cahora Bassa to apartheid

⁷² Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 138.

⁷³ *Ibid.*

⁷⁴ *Ibid.*

⁷⁵ *Ibid.*

⁷⁶ *Ibid.*, pg. 139.

⁷⁷ *Ibid.*, pg. 139.

South Africa, the hydroelectric station became one of the targets of anti-apartheid movements, particularly by FRELIMO. Because of the apartheid governments' support of the RENAMO 'rebel' group via arms supply, FRELIMO made it a priority to limit the relationship between the apartheid government and RENAMO leadership. As such, FRELIMO made it known that they were intent on sabotaging the proposed Cahora Bassa hydroelectric plant (if construction began) and, in 1968, launched an offensive in Tete, the home district of Cahora Bassa.⁷⁸ By the end of the decade, FRELIMO had amassed a sizeable armed force in an area which stood next to the proposed dam site; a particularly worrying sign to both South Africa and the Portuguese colonialists who withdrew from their colony, Mozambique, in 1975.⁷⁹

After Mozambique gained independence from Portugal and the Cahora Bassa hydroelectric station had been completed, the electrical infrastructure around the station began to experience fairly regular disruption via armed attacks. Strangely, it was apartheid-backed RENAMO that carried out the majority of these attacks, a contradiction to apartheid's reliance on Cahora Bassa.⁸⁰ The reason for this seemed to be that although Cahora Bassa was important to South Africa's electricity supply position, it was even more important to Mozambique as a whole and, more critically, to FRELIMO who had historically strong links with the ANC.⁸¹ Hence, the apartheid government took the strategic view that it was more important to affect FRELIMO negatively (who supported diametrically opposite political and economic ideologies to the apartheid government), and had strong links with the ANC and the struggle movement more generally) than it was to focus on Cahora Bassa's importance to apartheid South Africa.⁸² The destabilization policies of the apartheid government seemed to be, at that point in time, the foremost concern with regards to South Africa's foreign policy approach to Mozambique. Furthermore, due to the fact that Mozambique was a young nation when Cahora Bassa came online and hence quite politically unstable, the failure of Cahora Bassa to generate electricity for Mozambique and cash for the government would have been

⁷⁸ Isaacman, A. 'Portuguese Colonial Intervention, Regional Conflict and Post-Colonial Amnesia :Cahora Bassa Dam, Mozambique 1965-2002', *ICGC-McArthur Program*, pg. 8.

⁷⁹ *Ibid.*

⁸⁰ *Ibid.*, pg. 15

⁸¹ *Ibid.*

⁸² *Ibid.*

an attractive political point of leverage to the apartheid government.⁸³ Ultimately, although the dam was producing power and had the potential to be a significant economic driver in Mozambique's economy, the constant attacks (notwithstanding the Nkomati accord) undermined this potential turning the project into a white elephant up until the early- to mid-1990s.⁸⁴

Despite the fact that the South African electricity supply base did have weak points, the generating capacity within South Africa itself was sufficient enough to withstand import disruptions. The role of coal-fired power stations was central in the energy and economic paradigm of apartheid South Africa. Cheap and abundant electricity supply was crucial to South Africa's economic development, and it also served to aid the supply shortfalls in other systemically entrenched fuels such as oil; which will be discussed at length in the remainder of this subsection.

During the apartheid era, there were no known quantities of meaningful commercial oil and gas deposits in South Africa. However, gas deposits were found in the offshore Pletmos and Bredasdrop basins which were developed in conjunction with the Mossgas gas-to-liquids (GTL) refinery which had the capacity to produce and synthesize about 33 000 barrels per day of oil equivalent from the gas drawn from rigs located off Mossel Bay.⁸⁵ The Mossgas facility was a significant undertaking by any measure: The capital costs of the project amounted to \$2.4 billion, with the plant being completed in 1992 and production coming online in 1993.⁸⁶ Over 60% of the 33 000 barrels of oil equivalent that came out of the Mossgas plant was produced using the Fischer-Tropsch synthesizing method (the same method used in the CTL plants operated by Sasol), with the remainder of the production coming from associated Natural Gas-to-Liquid (NGL).⁸⁷ Although the Mossgas operations have, in hindsight, been a notable success, it was not clear at the time that this project would be so and received a great deal of public criticism. One of the largest issues that came about

⁸³ *Ibid.*

⁸⁴ Isaacman, A. 'Portuguese Colonial Intervention, Regional Conflict and Post-Colonial Amnesia :Cahora Bassa Dam, Mozambique 1965-2002', *ICGC-McArthur Program*, pg. 15.

⁸⁵ De Klerk, A. *Fischer-Tropsch Refining* (New York, 2011), pg. 217.

⁸⁶ *Ibid.*

⁸⁷ *Ibid.*

regarding the feasibility of the Moss gas facility was due to a significant drop in the price of oil. During the construction and early production period of the plant, the international price of oil declined to the \$20 per barrel range bringing the commercial viability of the plant into question.⁸⁸ However, despite the criticism of the project by the South African public as a waste of taxpayers' money, the plant had a breakeven point of between \$9-\$10 per barrel which meant that even at \$20 per barrel, Moss gas was making a significant profit margin on its operations.⁸⁹

Despite its strong electricity supply position, apartheid South Africa faced serious threats related to oil supply. Due to the fact that South Africa still depended on oil to supply 20% of its energy needs but had limited supplies of the fuel, importing oil was a priority for the apartheid government. Indicating the significance with which the apartheid government viewed the role of oil in the South African economy, the commodity was classified as a strategic material by the government.⁹⁰ Furthermore, all data related to energy use in the country was classified as confidential information creating a fair amount of guesswork as to composition of the data during the apartheid era.⁹¹ Oil's role in the South African economy related quite specifically to transportation in the country. Although only 20% of the country's energy needs were met by oil at the time (compared to 65% in other industrialized countries during the same period), the supply served as the main energy and chemicals provider to two of South Africa's key economic sectors: the transportation and agricultural sectors.⁹² Due to the demand for petroleum and chemical products (for various industrial and agricultural uses), it was imperative for the apartheid government to find an oil supply structure that was fairly stable and secure.

Although South Africa's oil supply was made up of two primary components (imports from fairly stable suppliers, and local CTL production by Sasol), securing stable imports was the most challenging aspect of the apartheid liquid fuels model. A stable supply of imports

⁸⁸ De Klerk, A. *Fischer-Tropsch Refining* (New York, 2011), pg. 217.

⁸⁹ *Ibid.*

⁹⁰ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 139.

⁹¹ *Ibid.*

⁹² *Ibid.*

seemed to be the most difficult obstacle to overcome with regards to South Africa's reliance on foreign oil. The 1973 Arab oil embargo led to drastic changes in South Africa's import position which, coupled with the growing threat of a total oil embargo on the country, led to a consolidation of its supply base. For all intents and purposes, for the six years that followed the 1973 oil shock, South Africa imported over 90% of its oil from Iran.⁹³ However, the hopes that the apartheid government would have had in securing Iran as a stable long-term supplier of crude came to an abrupt end when Ayatollah Khomeini came to power after the 1979 Iranian Revolution. Once he took power in Iran, Khomeini immediately stopped crude supplies to South Africa.⁹⁴ Although there had been fears prior to 1979 that a severe economic shock would follow a potential cutting off of supplies by Iran, these fears did not materialize post-1979. This was due to the stockpiling of oil reserves by the South African government. Although domestic South African oil consumption totalled approximately 250 000 barrels of oil per day, the apartheid government was importing between 300 000 and 400 000 barrels of oil per day providing a significant buffer to any potential oil shocks that may have occurred.⁹⁵ Despite the fact that the apartheid government did create a large enough reserve of oil to contain the supply fallout, the end of the oil trading relationship between Iran and South Africa still created economic difficulties for South Africa.

At the same time that Iran was experiencing a radical political change, the global oil pricing market was undergoing significant structural changes which heavily impacted oil consumers and suppliers. Due mostly to the creation of the NYMEX standardized oil trading contract (commonly known today as the West Texas Intermediate, or the WTI Crude), oil buyers began to move away from buying oil in bulk from oil companies at a price determined by the oil company in question.⁹⁶ The upshot of this trading change meant that all consumers were now being treated equally by the 'market' which meant that irrespective of whether a person or institution was buying a single barrel of oil or a million barrels of oil, the price would be the same for all purchasers. This change in the pricing model for oil took the pricing power out of the hands of the oil companies which was a significant blow for large buyers of

⁹³ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 140.

⁹⁴ *Ibid.*

⁹⁵ *Ibid.*

⁹⁶ McGrath Goodman, L. *The Asylum: Inside the Rise and Ruin of the Global Oil Market* (New York, 2013), pg. 87.

crude.⁹⁷ In the case of South Africa, it had previously been possible to get a discounted oil price per barrel so long as the bulk amount was large enough. However, now that South Africa had to purchase the oil on the open market, there was a lot less scope for such deals to be struck. Furthermore, the majority of the large over-the-counter oil traders which did large bulk deals often avoided dealing with South African buyers because of the sanctions that had been imposed on the country (such dealings would have likely had legal ramifications). As a result of this, it is believed that South Africa's oil bill doubled after Iran discontinued its oil supply to the country.⁹⁸

Although the South African oil industry was impacted significantly by apartheid and the international community, the global oil market itself had experienced significant change which also heavily impacted the South African oil supply position. After the founding of OPEC in 1960, the organization had grown to 13 member states which controlled approximately half of the world's oil supply by 1975.⁹⁹ Up until this point, the global oil price had primarily been determined by Esso (Standard Oil of New Jersey), Mobil (Standard Oil of New York), Chevron (Standard Oil of California), Gulf Oil, Texaco, Shell and BP; more commonly known as the Seven Sisters.¹⁰⁰ Because these companies were the main production controllers of global oil prior to the founding and subsequent expansion of OPEC, the Seven Sisters determined the price of oil in a loosely defined collusive relationship which was then largely accepted in the rest of the oil market as 'the price'.¹⁰¹ However, due to the liberalization of commodities markets chiefly in the US and subsequently in Europe the prices of oil moved towards being exchange determined and out of the Seven Sister's control. This was much to the chagrin of the newly formed OPEC cartel whose primary aim was to 'set' the price of oil at a production level and price which they determined to be satisfactory and sustainable for them.¹⁰² The persistence of the Middle East-dominated cartel in setting the price as they saw fit was understandable: The Iranian, Iraqi, Saudi and Venezuelan governments had spent the better part of a decade trying to gain control of their own oil

⁹⁷ *Ibid.*, pg. 104-106.

⁹⁸ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 140.

⁹⁹ Sampson, A. *The Seven Sisters: The Great Oil Companies and the World They Shaped* (Michigan, 1974), pg. 161-168

¹⁰⁰ *Ibid.*, pg. 1-11.

¹⁰¹ *Ibid.*, pg. 58-70.

¹⁰² *Ibid.*, pg. 158-161.

reserves from the Seven Sisters which had led to a bitter price war between all parties involved and substantial amounts of lost revenues.¹⁰³ Furthermore, the core members of OPEC were not particularly enamoured with apartheid ideology and South Africa's relationship with Israel (especially after the Yom Kippur War). As a result of this frosty relationship between OPEC and the apartheid government, which was formally acknowledged at the end of the Yom Kippur War, the Arab oil embargo was extended to include Portugal, Rhodesia and South Africa which led to South Africa having to pay a premium for bulk oil purchases.¹⁰⁴ Since South Africa was excluded from trading oil with non-OPEC nations (due to UN and other sanctions), and the embargo by OPEC on South Africa, it became imperative for South Africa to look inward for a solution to its liquid hydrocarbon fuel conundrum.

By the early 1960s, it started to become clear that apartheid South Africa was going to face increasing limited trade with the international community due to its political policies. This relative economic isolation pushed the apartheid government of the time (and subsequent years) to develop an economy that was largely self-sufficient, especially with respect to oil. Although apartheid South Africa had the internal capacity to generate 75% of its own energy demands (primarily through coal-fired power stations), the country relied strongly on oil to power the agricultural and transportation sectors. This commitment by the apartheid government to liquid fuel self-sufficiency (particularly in oil production) led to a number of key programmes being instituted to achieve this desired goal.

Oil stockpiling was one of the most attractive options in terms of securing oil supplies for apartheid South Africa. As early as the mid-1960s, the apartheid government began stockpiling oil and petroleum-based products as a contingency to a potential shock or supply-chain shock to oil imports.¹⁰⁵ Over the next decade and a half, the amount of oil that had been stockpiled was staggering: Between Israel and South Africa, the two countries had managed to stockpile an inventory of over 150 million barrels of oil by 1985.¹⁰⁶ In fact, there had been

¹⁰³ *Ibid.*, pg. 161.

¹⁰⁴ Davis, J. 'Squeezing Apartheid', *Bulletin of Atomic Scientists*, (November, 1993), pg. 1-5.

¹⁰⁵ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 141.

¹⁰⁶ United Nations Centre Against Apartheid. **Notes & Documents: 1985**, pg. 48.

claims that this reserve was as large as 400 million barrels, although it seems that this estimate is too generous.¹⁰⁷ Indeed, creating oil inventories of this size was a truly mammoth industrial undertaking. To put the size of these stockpiles into context, the gulf state of Bahrain (whose economy is based almost solely on the oil production and processing industry) has total proven oil reserves of approximately 120 million barrels.¹⁰⁸ Although these oil stockpiles were distributed across a number of storage facilities, the size of individual facilities were nonetheless substantial. For example, the government coordinated Strategic Fuel's Fund reworked the disused Klippoortjie coal mine outside Ogies into an oil storage facility that, at its peak, contained over 118 million barrels of oil; which, at the price levels of the time, was worth approximately \$1.8 billion and could have fuelled the country for over a year.¹⁰⁹ The South African government also required the oil companies operating in the country at that time to hold their own petroleum reserves to last approximately 13 weeks.¹¹⁰ The oil companies were also required to hold a 12 month supply of a number of lubricants, catalysts and essential chemical inputs that were required for the processes involved in refining crude oil.¹¹¹ These measures that were put in place to limit the potential economic, social and political effects of an oil supply shock proved to be a potent short-term solution to a very real threat. However, despite creating a significant oil supply buffer, the apartheid government were acutely aware that oil inventory was not a long-term solution and required that the state diversify their oil suppliers.

Due to the lack of conventional oil reserves in South Africa, the apartheid government needed to focus on producing synthetic fuel (i.e. oil and its derivatives) from coal. As has been mentioned, the development of a commercial synthetic fuels plant was carried out through the parastatal Sasol using the Fischer-Tropsch method. Although hindsight has proved that it is possible to profitably produce oil via the CTL process, this was most certainly not the case when Sasol first embarked on the development of its first commercial

¹⁰⁷ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 141.

¹⁰⁸ EIA, Oil reserves by country. <http://www.eia.gov/countries/index.cfm?view=reserves>.

¹⁰⁹ United Nations Centre Against Apartheid. 'Notes and Documents', *Department of Political and Security Council Affairs*, 1985, Pg. 56. & Mail & Guardian (Unnamed Staff Reporter). 'Shah of Ogies and his field of black gold', [online], Accessed on 23/06/2014 from: <http://mg.co.za/article/1996-10-25-shah-of-ogies-and-his-field-of-black-gold>.

¹¹⁰ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 141.

¹¹¹ *Ibid.*

plant in what would become Sasolburg. In fact, South Africa's attempts at producing oil via the CTL method predates the creation of Sasol and the apartheid system.¹¹² During the 1930s the South African mining house Anglovaal produced (for a short period of time) oil from an oil shale deposit that was believed to be associated with the geological formation in which there was also a vein of coal.¹¹³ Although this shale deposit was depleted fairly quickly, the success of the operation prompted Anglovaal to explore the possibility of producing oil from coal using Fischer-Tropsch technology.¹¹⁴ In order to produce oil using said technology, it was necessary for Anglovaal to buy a license allowing them to using the technology, which would have likely included some type of royalty agreement,¹¹⁵ which they duly purchased.¹¹⁶ However, owing to the outbreak of World War II in the 2 years following the purchasing of the license, the proposal to build a Fischer-Tropsch plant in South Africa did not materialize. Furthermore, the building of the proposed plant after the end of World War II also proved to be commercially unviable because of the significant change in the dynamics of the post-War oil market: Because of the general lifting of various oil sanctions after WWII and the consequential competitiveness of pricing coming into play, CTL oil plants became uncompetitive from a pricing perspective which also led to a number of CTL plants being decommissioned in Germany.¹¹⁷ This essentially served as the death knell for the Anglovaal project which was abandoned thereafter. Nevertheless, the Anglovaal attempts still proved useful to the South African government particularly after apartheid was implemented in 1948. The apartheid government realized early on that a number of key advantages in the South African coal mining sector could largely mitigate issues around the price competitiveness of CTL plants in the country. The primary advantage in this regard was that the coal deposits that would be used in a South African CTL plant could be mined at a very low cost due to the fact that the thick coal seams could be mined at a shallow depth.¹¹⁸ The transportation cost would also be low due to the proximity of the coal deposits to the refining facility: The coal that was to be used in the CTL process was close to Johannesburg and Sasolburg, making it cheaper to move the unprocessed material.¹¹⁹ There was also an assumption at the time that the price of oil would continue to rise in the future allowing for more profitability for CTL

¹¹² Dry, M & Steynburg, A. *Fischer-Tropsch Technology* (Amsterdam, 2006), pg. 411.

¹¹³ *Ibid.*

¹¹⁴ *Ibid.*

¹¹⁵ It is not clear what type of compensation plan defined the commercial nature of this relationship.

¹¹⁶ *Ibid.*

¹¹⁷ *Ibid.*

¹¹⁸ *Ibid.*

¹¹⁹ *Ibid.*

projects in the future (including Sasol). All of these factors led to the conclusion that contrary to the unprofitable precedent set by past CTL projects, a CTL plant in South Africa may have been commercially viable. Ultimately, this thinking led to the creation of Sasol which ended up producing approximately half of apartheid South Africa's total domestic oil demand. Although Sasol and the CTL processes used to produce synthetic oil were ultimately in support of, and helped to perpetuate an unjust system, the significance of the engineering achievements related thereto should not be underestimated. The South African CTL operations led by Sasol are, to this day, the only large scale commercially viable CTL operations in the world.¹²⁰

Although synthetic fuel production was soon recognized as a significant strategic asset to the apartheid government, there was still considerable interest in exploring for conventional oil and gas deposits in South Africa due to its relative cheapness compared to synthetic fuel production. As mentioned previously, in order to carry out meaningful exploration for domestic oil reserves the apartheid government formed the parastatal Soekor. However, despite significant exploration in the country during that period, Soekor experienced very limited success: Although the parastatal (in conjunction with various oil companies) drilled hundreds of wells in the search for oil, the majority of its attempts were deemed to be unsuccessful. After nearly two decades of unsuccessful drilling, the Soekor budget was cut substantially and the apartheid government began to focus more closely on its synthetic fuels research and production which was yielding good results with the Sasol I project in Sasolburg. It should be emphasized that the lack of significant findings of local oil and gas reserves in South Africa was a noteworthy strategic blow to South Africa. The international tide of opinion had begun to turn strongly against apartheid South Africa and the limiting of international trade with the country was starting to put meaningful pressure on the ability for growth in domestic production. If Soekor had found reserves that could have supplied even a small amount of oil into the South African system, it would likely have provided an important supply cushion; something that would have been valuable to the apartheid government inasmuch as it accorded it a greater degree of energy self-sufficiency.

¹²⁰ There are other plants which use the Fischer-Tropsch method to produce the same results with gas (such as the Shell SMDS in Bintulu, Malaysia), but there are no notable examples of this with coal as the base fuel.

Energy conservation also played a notable role in the apartheid-driven push for energy self-sufficiency. Although the synthetic fuel programme carried out by Sasol was achieving significant gains in the CTL process and oil stockpiling had created enough of a buffer to mitigate an oil shock for about a year, the apartheid government also pushed to decrease the demand for fuel by implementing a rationing programme and implementing new restrictions on the fuel consumption of motor vehicles.¹²¹ Although the exact impact of the fuel consumption restrictions on demand is not entirely clear due to the lack of appropriate data on the matter (an inheritance of the secrecy imposed by the apartheid government on sensitive state-collected data), it seems that a reduction of approximately 10-20% on oil demand is an acceptable guesstimate.¹²² Fortunately for South Africa, many countries had started to move towards paying closer attention to fuel consumption and efficiency after the 1973 Arab oil embargo. The US auto manufacturers in particular were required to pay closer attention to the fuel efficiency of their cars. Given the fact that most early-1970s cars could only achieve about 11 miles to the gallon (mpg) and the oil price had risen nearly 7 fold from 1972-1979, it became a priority for customers to buy motorcars that were fuel efficient enough to be affordable to run.¹²³ The US government in particular made a point of trying to reduce the US consumers' dependence on foreign oil through various measures and included government agencies in this regulation. In 1977, the US Department of Energy released a guidebook on the efforts of federal authorities in trying to increase the fuel efficiency of motor vehicles.¹²⁴ This kind of foreign regulation was largely in line with what the apartheid government tried to achieve in South Africa, hence they were able to adopt and adapt ideas developed by other countries pertaining to fuel efficiency.

The apartheid government also made a pronounced effort to govern the behaviour of oil companies that operated in South Africa. The five foreign oil companies that had operations in South Africa (BP, Mobil, Caltex, Shell and Total) were operating under difficult conditions

¹²¹ Berridge, G. *International Politics: States, Power and Conflict since 1945* (London, 1996), pg. 127.

¹²² This guesstimate was made on the assumptions which are made in : Time Running Out : the Report of the Study Commission on U.S. Policy Toward Southern Africa. For the intended purposes of illustrating the general aims of the fuel conservation project, this data is believed to be sufficiently suitable.

¹²³ Oil price history: http://inflationdata.com/Inflation/Inflation_Rate/Historical_Oil_Prices_Table.asp . & Young, A. 'Forty Years Ago The 1973 Arab Oil Embargo Battered The Global Economy, But It Also Helped Expedite Better Fuel Economy', *International Business Times* (2013).

¹²⁴ US Department of Energy, 1977 Gas Mileage Guide: http://www.afdc.energy.gov/pdfs/1977_feg.pdf.

in apartheid South Africa by the late 1980s.¹²⁵ Probably the most significant of these moves with regards to oil companies (mentioned previously) was the US Comprehensive Anti-Apartheid Act which had put a total ban on new investment in South Africa by US companies.¹²⁶ For US oil companies such as Mobil (which, in essence, operated the Engen brand), this meant that funding for new downstream oil processing activities could no longer come from the US. This was also the case for Caltex which is owned by the company now known as Chevron (it had previously been connected to Texaco as well). For Engen and Caltex, their ability to build new refineries, filling stations and pipelines were significantly hampered by the new lack of funding that these companies could get from their parent companies based in the US.¹²⁷ In order to counter the new measures put in place by the international community on the oil companies operating in South Africa, the apartheid government moved to ensure that these companies operated in the national interest (which is to say, the interests of the apartheid government).¹²⁸ The apartheid government required foreign oil companies to operate in a manner that was not encouraged by their home countries created the foundation for the legal strictures which would enforce behaviour that was in the 'national interest'. This culminated in the Petroleum Producers Act in 1977 which gave the South African minister of economic affairs the power to control the "purchase, sale, or use of any petroleum product" in the country.¹²⁹ Foreign oil companies were also not allowed to disclose sales and distribution data relating of their operation in South Africa to any entity as governed by the then applicable South African Official Secrets Act¹³⁰

Arguably the weakest point in apartheid South Africa's economic dependencies was its reliance on foreign oil imports. Although the apartheid government put in place programmes to manage its reliance on foreign oil through Sasol and other programmes with success, the international community still prioritized the limiting of oil supplies to South Africa during sanctions. Due to the apartheid government taking active measures to allow the South African economy to function largely as an insular and isolated entity (with the notable exception of

¹²⁵ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 143.

¹²⁶ Knight, R. 'Sanctions, Disinvestment, and U.S. Corporations in South Africa'. Originally a chapter in Edgar, R. *Sanctioning Apartheid* (Africa World Press, 1990).

¹²⁷ *Ibid.*

¹²⁸ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 143.

¹²⁹ *Ibid.*

¹³⁰ *Ibid.*

the exporting of gold, platinum, diamonds, chrome and other such minerals), any attempts to impose meaningful sanctions upon the apartheid government would have needed to include a comprehensive embargo of oil supplies reaching South Africa. Furthermore, such an embargo would most likely have had a relatively limited impact on South Africa's main trading partners due to the fact that most of South Africa's oil came from Iran. Indeed, there was also a fair deal of willingness by South Africa's main trading partners (namely the US and the UK) to commit to sanctions owing to local and global political pressure to do so; and, if possible, these trading partners would be far more willing to commit to sanctions that had a relatively limited impact on their own trade with South Africa.¹³¹ The 1973 Arab oil embargo had a limited impact on South Africa's economy, but it did highlight the significant potential exposure that the apartheid government had to oil supply shocks. For instance, prior to the inclusion of South Africa on the oil embargo list (along with then Rhodesia, and Portugal); some of the country's main suppliers had been Saudi Arabia (23.9% of total supply), Iraq (18.3% of total supply), the remaining Gulf States (approximately 32.8% of total supply).¹³² However, post-Arab embargo, South Africa could not buy oil from these countries which, in essence, comprised 75% of its total oil supply base. An issue that complicated matters further was the new demand pressure on Iran for larger oil sales to other countries affected by the embargo (which included the US).¹³³ This was a problem for South Africa due to its relative reliance on Iran as a prime supplier. In 1972, Iran supplied South Africa with 40% of its total oil supply which slowly dwindled to 25% in 1974 which was put under further pressure in subsequent years.¹³⁴ Although apartheid South Africa managed to work through the embargo with limited economic difficulties, issues pertaining to the oil trade between Iran and South Africa provided a worrying precedent for what might happen in the future. As a result, the apartheid government aggressively began building strategic stockpiles of crude and establishing its synthetic fuels projects which (as alluded to earlier) yielded meaningful results.

The intended aim of all implemented and potential future sanctions was to disrupt the sound economic functionality of apartheid South Africa. However, due to the fact that the apartheid government put a great deal of emphasis on taxing the country to fund the continuation of the

¹³¹ Clarke, D. *Economic Sanctions Against South Africa* (Natal, 1974), pg. 133.

¹³² Rogers, B. 'South Africa and the Oil Embargo', *Africa Today*, 21, 2, (Spring 1974), pg. 3.

¹³³ *Ibid.*

¹³⁴ *Ibid.*

apartheid state, both businesses and workers in the country were under considerable economic pressure but managed to create economic growth nonetheless: Between 1950 and 1979, apartheid South Africa grew economically at an annualized average rate of 4.4% (adjusted for inflation).¹³⁵ Ultimately, this rate of growth could not have been achieved if it were not for the reserves of cheap black labour that the apartheid system ultimately created. Thus, although the growth figure of 4.4% inflation adjusted is significant for any developed country (even to this day), the reality is that the accrual of the monetary gains from this growth ended up almost exclusively in white hands with the black workers yielding very little from their efforts.¹³⁶ Furthermore, although white business owners and skilled white workers gained substantially more economically and monetarily than black workers did, they too were expected to pay various types of taxes to the states to reinforce the apartheid structure. The economic demands of strengthening the apartheid system were usually at the forefront of South Africa's economic policy, thus meaning that white people and the apartheid state were necessarily the ultimate beneficiaries of this growth.¹³⁷ One of the outcomes of this racially based unequal monetary distribution was that although apartheid South Africa did experience fairly sound economic growth until the mid-1980s, the unemployment during that period grew as well, with the homelands being the primary areas of unemployment (this is understandable considering that the homelands had very little control over their own internal affairs).¹³⁸ A larger complication in the South African labour system was that although there was a significant surplus of cheap black labour (created by the apartheid system); by the 1980s the country was beginning to experience labour shortages in skilled labour jobs.¹³⁹ This was both institutionalized and market driven: on one hand black South Africans were actively kept out of skilled labour market because of laws that limited the numbers of black skilled workers that could operate in higher competency job levels, most of which were reserved for white workers (this discriminatory situation was especially stark in the mining sector).¹⁴⁰ On the other hand, black people as a whole were given highly inferior education which left them ill-equipped, from both a financial and skills perspective, to enter the skilled labour force in the event that positions were available (a situation which was very uncommon

¹³⁵ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 143.

¹³⁶ *Ibid.*

¹³⁷ *Ibid.*, pg. 144

¹³⁸ *Ibid.*

¹³⁹ Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981), pg. 144.

¹⁴⁰ Crankshaw, O. *Race, Class and the Changing Division of Labour Under Apartheid* (Oxford, 2002), pg. 44.

to begin with⁰. The labour position of South African society, coupled with low productivity growth in the country, led to claims by authors such as Terence Moll, that the apartheid economy had actually ‘failed’ despite the fact that it was experiencing economic growth.¹⁴¹

Although the intention of international sanctions on apartheid was intended to pressure the National Party government to repeal some of its apartheid laws, the reality is that this was not always the case. It seems that although many of the sanctions that were proposed initially intended to, in some way, cripple the apartheid governed economy; yet these sanctions were often dominated by foreign interest-group politics.¹⁴² The inclusion of these groups meant that, in some cases, the interests of foreign business and political entities seemed to trump the actual intention of the underlying sanctions.¹⁴³ It is also believed by some that the sanctions that were ultimately implemented had the perverse effect of strengthening apartheid by intensifying the base of National Party supporters while further alienating anti-apartheid groups in the country due to their collective lack of ability to form a strong opposition within the country.¹⁴⁴ Furthermore, those individuals that had close ties with the National Party and governmental structures in South Africa could often times use their political leverage to help the National Party get around sanctions which benefited both the individuals involved and the apartheid government; a process which further helped to entrench the status quo.¹⁴⁵

From a strictly economic perspective, the apartheid system was (for the whole of South Africa) economically damaging, but benefited those in power and their beneficiaries (i.e. the white population) enough that the system survived to 1994. At its core, the role of the apartheid government was to ensure that white privilege and economic wellbeing was at the forefront of the country’s national agenda. This required the apartheid government to play an active role in setting up economic structures that would entrench the white-supremacist system which apartheid South Africa was politically aligned to (e.g. creating parastatals, developing weapons capacity, ensuring fuel reserves etc.). However, as stubborn as white

¹⁴¹ Moll, T. ‘Did the Apartheid Economy Fail?’, *Journal of Southern African Studies*, 17, 2, (June, 1991), pg. 271.

¹⁴² Lowenberg, A & Kaempfer, W. *The Origins and Demise of South African Apartheid: A Public Choice Analysis* (Michigan, 1998), pg. 194.

¹⁴³ *Ibid.*

¹⁴⁴ *Ibid.*

¹⁴⁵ *Ibid.*

society and the apartheid government were in creating a self-sufficient and insular economic system notwithstanding the success it did have, the entitlements and costs that came with developing and sustaining such a system were enormous and created serious damage to the continuation of the apartheid regime. White South Africa could also not escape the reliance that the country had on foreign commodity markets and the difficulties that universal sanctions in this market could have had on the country. For an export perspective the demand for gold, platinum, chrome, diamonds and other precious metals played a vital role in the economic viability of apartheid South Africa; without which the South African economy would have struggled immensely. From an import perspective, South Africa could not escape its relative dependence on foreign oil: Although the apartheid government did much to limit this reliance, the costs of their actions were large and put significant pressure on the South African economy. It was also significant that oil, as a largely consumed commodity, served as one of the most difficult obstacles for the apartheid system to overcome. It was an obstacle that it would never be truly overcome.

The Commencement of Onshore Oil Exploration in South Africa



The initiation of meaningful oil exploration in South Africa was spearheaded by the state-owned parastatal Soekor. Although the understanding of the potential existence of petroleum geological formations in the country at that time was limited, the apartheid government was compelled to consider the feasibility of oil and gas exploration in the country due to the international pressure being exerted upon the apartheid government and its ability to purchase oil from the global market place. As such, Soekor played a central role in creating an environment that would be conducive to oil exploration in South Africa with the inclusion of international oil companies (such as Total and Esso) into this supply structure. When the apartheid government committed to oil exploration in the country, it was necessary for them to raise the cash necessary for exploration efforts, and gain the expertise and technical experience which would affect the success of said operations. The initial exploration launched by Soekor focused largely on compiling a sound geological understanding of South Africa's offshore basins, primarily the Algoa, Bredasdorp, Gamtoos and Pletmos basins. Although these basins were subsequently determined to have petroleum systems in place, the full extent of those systems was not fully recognized at the time. Furthermore, portions of a handful of these offshore basins had onshore acreage which (due to the exploration of their

¹⁴⁶ Brink, G *et al.* 'New interpretation reveals potential in onshore Algoa basin, South Africa', *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 37

offshore acreage) seemed a logical extension of the exploration efforts. One such basin which fell into this category was the onshore portion of the Algoa basin. The geological justification for the potential for petroleum systems in the southern half of South Africa primarily comes from the breakup of East Gondwanaland from Africa. From the start of this breakup approximately 160 million years ago, a number of events took place which initiated the beginning of the creation of the potential petroleum systems which exist in the present day Eastern Cape.¹⁴⁷

It should also be noted that the geological views pertaining to the viability of oil exploration will be dealt with herein are contested. However, the importance of these geological views is not necessarily from the perspective of their accuracy, but rather from the perspective that they served as the basis from which oil exploration in the onshore Algoa basin began. As such, the value of expounding the geological significance of the onshore Algoa basin is only to illustrate why there was interest in exploring the Basin itself. The accuracy of the geology is not (for the purposes of this thesis) the key factor herein, but rather that it initiated the search for oil in the onshore Basin. Furthermore, the explanation of the possible geological makeup of the onshore Basin is not strictly confined to the knowledge thereof during the phase of exploration by Soekor: In order to construct an illustration of the potential for petroleum systems in the onshore Basin, it is necessary to draw on geological views that only became apparent after initial exploration efforts carried out by Soekor. The main intention herein is to provide a workable explanation of proposed petroleum systems in the Basin, not necessarily in chronological order.

The breakup of Gondwanaland that began about 167 million years ago illustrates the geological linkages between the Eastern Cape of South Africa and the Falkland Islands.¹⁴⁸ Although the actual breakup itself took approximately 47 million to fully materialize, the most crucial factor in the creation of a petroleum system pertaining to the coastal region of

¹⁴⁷ Aberdeen Offshore Engineering, 'Internal geology report extract: Links between South Africa & the Falklands'. *Extract 1*. Corporate interpretation of the synergies between South African and Falkland Islands' potential hydrocarbon profile, pg. 1.

¹⁴⁸ Aberdeen Offshore Engineering, 'Internal geology report extract: Links between South Africa & the Falklands'. *Extract 1*. Corporate interpretation of the synergies between South African and Falkland Islands' potential hydrocarbon profile, pg. 1.

South Africa was the resulting marine conditions that came about between Africa and the South Atlantic Ocean about 130 million years ago during the early Cretaceous period.¹⁴⁹ Due to the fact that oil and gas accumulations are developed from organic-rich source rock that is subjected to a specific set of thermodynamic conditions which allows for the creation of oil, gas and coal, it is essential that there is sufficient organic-rich source rock to allow for such a formation to happen.¹⁵⁰ Although this is not strictly the case, areas where there were shallow marine areas during the Mesozoic period (which contains within it the Triassic, Jurassic, and Cretaceous epochs) served as the primary biomass supply from which oil was formed: algae was the main form of biomass from which oil of this period was formed which makes it particularly significant that marine conditions existed on the coast of the Eastern Cape at this time.¹⁵¹

Due to the significantly fortuitous timing (from an oil formation perspective) of the breakaway of the present day Falklands from the Eastern Cape of South Africa during the Mesozoic period, it became necessary to establish what links (if any) there were geologically between the Falklands and the Eastern Cape coast. Although it was not immediately obvious to geologists of 60-or-more years ago because of the relatively limited understanding of potential petroleum system in southern Africa, the South African Algoa basin and the Falklands shared a number of geological qualities pertaining to the Cretaceous period. It seems possible that a particular geological formation on the African plate called the Malloy Trough has an important potential link between the Falklands and South Africa: Along a geological formation called the Diaz Ridge, the South African continental slope appears to contain a thick sedimentary stratum which would form the basis for a potential source rock for hydrocarbon formations.¹⁵² Due to the similarity of the oceanic crust shared by both the northern side of the fracture-zone in South Africa and the complementary northerly extension of the Jurassic Falkland Plateau Basin, certain geologists were of the view that the break between the Falklands and southern Africa was pre-Cretaceous which allowed for the marine

¹⁴⁹ *Ibid.*

¹⁵⁰ Raymond, M & Leffler, W. *Oil and Gas Production in Nontechnical Language* (Oklahoma, 2006), pg. 67.

¹⁵¹ Bartolini *et al.* *Mesozoic Sedimentary and Tectonic History of North-central Mexico* (Colorado, 1999), pg. 245.

¹⁵² Aberdeen Offshore Engineering, 'Internal geology report extract: Links between South Africa & the Falklands'. *Extract 1*. Corporate interpretation of the synergies between South African and Falkland Islands' potential hydrocarbon profile, pg. 1.

conditions during the Cretaceous period.¹⁵³ Hence, it is (according to this geological interpretation) entirely possible that the geological underpinnings that characterize the current potential for significant oil reserves in the Falklands may also be present on the coast of South Africa, particularly the Eastern Cape. This interpretation also takes the position that there are Cretaceous similarities between the South African Cape Supergroup and the Falkland Devonian-Carboniferous Group.¹⁵⁴

Indeed, there also seems to be a fair amount of similarity in the geology between the Falklands and South Africa after the Cretaceous sedimentary strata formed. The sedimentary composition of the Cretaceous sedimentary stratum that is in place on the South African coastline seems to have striking similarities to the same sedimentary deposits found in and around the Falklands.¹⁵⁵ This sedimentary layer is formed primarily by sandstone which is interlaminated by various shales and mudstones which would constitute the formation as being similar to the Lafonian system.¹⁵⁶ Furthermore, there is the view that these sedimentary strata are a remnant of the Gondwanaland breakup which would, effectively, define them as being Cretaceous.¹⁵⁷ The importance of this similarity is that it provides a basis of an argument that the organic source rock that portended the existence of oil in the Falklands may be the same source rock that lies under the Eastern Cape coast. Although the reservoir and cap rock structures in South Africa are more complex than those in the Falklands (particularly in the Sundays River Formation half-graben), there is a compelling argument to be made that the source rock that belies the Falklands is the same source rock that belies the Eastern Cape coast (this is assuming the rotation of the Falklands Microplate took place).¹⁵⁸ If this view of the geological evolution of the Falklands and South Africa is to be accepted, it would then be plausible to accept that a source rock conducive to oil formation would possibly be in place (assuming that the reservoir rocks would be porous enough to hold the hydrocarbons).

¹⁵³ *Ibid.*

¹⁵⁴ *Ibid.*, pg.2.

¹⁵⁵ Aberdeen Offshore Engineering, 'Internal geology report extract: Links between South Africa & the Falklands'. *Extract 1*. Corporate interpretation of the synergies between South African and Falkland Islands' potential hydrocarbon profile, pg. 3.

¹⁵⁶ *Ibid.*

¹⁵⁷ *Ibid.*

¹⁵⁸ *Ibid.*

The Falklands and South Africa also have a number of other geological synergies with regards to their hydrocarbon and minerals potential. Aside from the geological linkages that exist between the Falklands and South Africa (particularly the Malloy Trough and the Diaz Ridge), there are a few other similarities which seem to support the view of the relational geological nature of the Falklands and South Africa. One of the most robust similarities that exists is that between the two countries is the likenesses (in terms of sedimentary make up) of the Falkland Plateau basin (as well as the greater Falkland Platform and Maurice Ewing Bank) and the Cape Fold Belt and Karoo basin in South Africa.¹⁵⁹ Furthermore, the cross-bedding that features in the Cape Meredith complex formations have strong relational links to the palaeocurrent directions in the Falklands: The cross-bedding directions in the Falklands run northwards whereas very similar formations run southwards in South Africa, a linkage that seems apparent once the rotation of the Falklands Microplate is taken into account.¹⁶⁰

From the strict perspective of petroleum systems linkages between the Falklands and South Africa, the Eastern Cape coast and Falkland Islands seem to share further similarities. In a petroleum survey conducted over 400 000 square kilometres to the north of the Falklands in a number of sedimentary basins from the Mesozoic era (the same era as the Algoa basin in South Africa), a number of promising signs of potential hydrocarbon accumulation became apparent.¹⁶¹ After a thorough seismic study was done of the potential of the acreage (including a 3D seismic mapping of the area in question), a total of six test wells were drilled with five of those wells reporting yields of petroleum samples.¹⁶² Although these tests did (to a certain extent) prove that there was potentially productive source rock stemming from the Mesozoic period (most probably from the Cretaceous period), the Falklands geological systems pointed towards potential issues with not having high enough quality reservoir rock: These reservoir rocks are primarily volcanoclastic which, unfortunately, do not have high porosity which limits the ability for these rocks to store petroleum reserves in high quantities.¹⁶³ However, due to the relatively unknown nature of the reservoir rocks in the onshore portion of the Algoa basin, it may be the case that more porous reservoir rock

¹⁵⁹ *Ibid.*, pg. 4.

¹⁶⁰ Aberdeen Offshore Engineering, 'Internal geology report extract: Links between South Africa & the Falklands'. *Extract 1*. Corporate interpretation of the synergies between South African and Falkland Islands' potential hydrocarbon profile, pg. 5.

¹⁶¹ *Ibid.*

¹⁶² *Ibid.*

¹⁶³ *Ibid.*

structures exist in the Algoa basin which would allow for more meaningful petroleum reserves being stored in said basin.

Fortunately, a number of the theories pertaining to the Cretaceous makeup of the Algoa basin were confirmed by exploration drilling (mainly from core rock and sediment samples). It appears that a number of these exploration drills intersected lacustrine source rocks as well as marginal marine interbeds from the early Cretaceous period.¹⁶⁴ However, what was more important about the understanding of the stratigraphy of the Algoa basin in terms of its commercial value was the ability of the Basin to be considered a potential oil reserve. In order for a prospect area to be a viable oil reserve, it is necessary to determine whether a, “source quality and quantity expelling oil since the late Cretaceous Period [sic] and favourable migration pathways to proximal stratigraphically trapped sandstones” is in existence, which (by this definition and interpretation) the onshore portion of the Algoa seems to have.¹⁶⁵ Although the full extent of the geological significance of the Algoa basin was not fully understood and appreciated in the early 1960s, there was a significant enough body of knowledge to justify the view that oil exploration in the area at the time was worth attempting. In particular, the exploration for oil in the onshore portion of the Algoa basin was reliant on this interpretation of the subsurface geology. However, the understanding of this geology (despite its appeal) as it related to the existence of petroleum systems in the Algoa basin was most certainly not absolute.

Due to the presumed tectonostratigraphic evolution and plate setting of the handful of Mesozoic basins in South Africa, there is speculation that there are links between the onshore and offshore portions of the Algoa basin with regards to their prospective hydrocarbon status. Work done by Bate, Fouché and van der Merwe on Mesozoic basins in South Africa indicates that hydrocarbon prospectivity within said basins is largely dependent on the tectonic plate

¹⁶⁴ Aberdeen Offshore Engineering, ‘Internal geology report extract: Links between South Africa & the Falklands’. *Extract 2*. Corporate interpretation of the synergies between South African and Falkland Islands’ potential hydrocarbon profile, pg. 1.

¹⁶⁵ *Ibid.*

setting therein.¹⁶⁶ Interpretations by Soekor employees from the early 1980s onwards suggested (and continues to do so) that the Algoa and Gamtoos basins may contain older sediments from the Kimmeridgian age which has historically served as an oil source rock (particularly in the Kimmeridgian Oil Field in Dorset, England and the Kimmeridgian oil shales which serve as one of the source rocks in the North Sea petroleum systems).¹⁶⁷ However, despite this view of the geological makeup of the main Mesozoic basins in South Africa (i.e. the Bredasdorp, Pletmos, Gamtoos, southern Outeniqua and Algoa basins), the position generally held by Bate *et al.* is that the onshore portions of these basins (including the onshore Algoa basin) are largely regarded to be non-prospective hydrocarbon plays (a position that is refuted by Malan (1990) and Brink (2005)).¹⁶⁸ However, particular attention should be paid to the view put forward by Bate *et al.* of the tectonic plate setting of the onshore portion of the Algoa basin. Even though present day views of the potential for onshore hydrocarbon accumulations in South Africa have changed dramatically during the past decade (especially with regards to commercially exploitable shale gas reserves in the country), the onshore portion of the Algoa basin in question should be seen as more closely linked with the offshore portion of the Algoa basin than the onshore portion. The view held by those attempting to initiate commercial hydrocarbon production in the onshore Algoa basin takes the simplistic position that the onshore portion of the Basin has more in common with the offshore portion than geologists acknowledge: This view revolves around the extent to which the Sundays River and Uitenhage Troughs are believed to have developed onshore.¹⁶⁹ Although there is limited understanding of the geological potential of the onshore portion of the Algoa basin as being a promising hydrocarbon play (in spite of the fact that, by some calculations, the basin may actually have reserves that are ‘proven’ as mentioned previously), the reality is that many of the views of the hydrocarbon potential of the Basin are

¹⁶⁶ K. Bate, J. Fouche & R. van der Merwe. ‘Plate tectonic setting of the Mesozoic Basins, southern offshore, South Africa: A review’, *Soekor (Pty) Ltd*, pg. 33-45 in, M. De Wit & I. Ransome, Inversion Tectonics of the Cape Fold Belt, Karoo and Cretaceous Basins of Southern Africa (Rotterdam, 1992), pg. 33.

¹⁶⁷ Bate, K, Fouche, J & van der Merwe, R. ‘Plate tectonic setting of the Mesozoic Basins, southern offshore, South Africa: A review’, *Soekor (Pty) Ltd*, pg. 33-45 in, De Wit, M & Ransome, I. Inversion Tectonics of the Cape Fold Belt, Karoo and Cretaceous Basins of Southern Africa (Rotterdam, 1992), pg. 33 & Gautier, D. ‘Kimmeridgian Shales Total Petroleum System of the North Sea Graben Province’, *USGS Bulletin 2204-C*, pg.9.

¹⁶⁸ Bate, K, Fouche, J & van der Merwe, R. ‘Plate tectonic setting of the Mesozoic Basins, southern offshore, South Africa: A review’, *Soekor (Pty) Ltd*, pg. 33-45 in, De Wit, M & Ransome, I. Inversion Tectonics of the Cape Fold Belt, Karoo and Cretaceous Basins of Southern Africa (Rotterdam, 1992), pg. 33.

¹⁶⁹ Malan, J. ‘Geology, Potential of Algoa, Gamtoos Basins of South Africa’, *Oil & Gas Journal*, 91, 46, 15 November (1993), pg. 2.

just views, as the absence of drill stream and core data to support the conjecture of the oil wildcatters in the area.¹⁷⁰

The geological point that needs to be addressed relates to the specific evolution of the tectonostratigraphy in the Algoa basin. The breakup of Gondwanaland seems to have created a negative inversion of the Cape Fold Belt thrust fault which appears to have consequently created a number of localised depressions (some of which seem to be present in the Algoa basin) forming Mesozoic depocentres (an area of the highest density of the sedimentary sequence and the site of maximum sedimentary deposition).¹⁷¹ Furthermore, assuming that the hydrocarbon source rock is of sufficient organically rich sediment and that the reservoir rocks are sufficiently permeable and porous (which is by no means a certainty), there remains the question of whether there are suitable oil and gas traps present in the onshore Algoa basin. Probably the most significant geological formations with relevance to the potential petroleum systems in the onshore Basin are the ones that have the potential to serve as hydrocarbon traps in the Basin: the St. Croix and Port Elizabeth fault planes could provide the clue as to where these potential traps lie and their general positioning.¹⁷² In order for a suitable trap to exist (namely a fault, an anticline, a salt dome, or a stratigraphic trap), it would also be essential that that trap is formed with the reservoir rock underneath it. If this is not the case, the potential reserve may indeed have the three main rock structure that are necessary (a source rock, a suitably permeable and porous reservoir rock, and a suitable trap and cap rock), but the actual formation of that structure may not be conducive to the hydrocarbons actually migrating to said trap. This, coupled with the structural complexity of the onshore Algoa basin, indicates that although there is most certainly the possibility that a potential petroleum system exists in the onshore Basin, it is also clear that the understanding of the Basin itself is insufficient to guarantee the accuracy which is required for a drilling operation. This is not to say that the onshore Algoa basin should have been overlooked, but rather that the comprehension of the subsurface geology is limited at best. However, the

¹⁷⁰ It should be noted that this is not necessarily a bad thing, considering that before new oil finds are made, they are by definition unproven and unsubstantiated. However, the lack of a detailed geological understanding of the area would indicate caution should be exercised in interpreting the onshore Algoa basins potential as a hydrocarbon play.

¹⁷¹ Bate, K & Malan, J. 'Tectonostratigraphic evolution of the Algoa, Gamtoos and Pletmos Basins, offshore South Africa', *Soeker (Pty) Ltd*, pg. 61-73 in, M. De Wit & I. Ransome, Inversion Tectonics of the Cape Fold Belt, Karoo and Cretaceous Basins of Southern Africa (Rotterdam, 1992), pg. 71.

¹⁷² *Ibid.*

geological knowledge that was (and is) available about the geological composition of the onshore Basin most certainly warranted interest in the onshore Basin as a potential petroleum play.

The interest by Soekor and the apartheid government in the Mesozoic basins in South Africa as a potential source of local oil is understandable from a geological perspective. This is because from a strictly geological perspective, sediments deposited during the Mesozoic period (particularly in shallow marine conditions) was a particularly strong indication that suitably organic-rich source rock may have formed, hence constituting one of the three key pillars in a potential petroleum system. Furthermore, there are good grounds for believing that the South African Mesozoic basins may contain sufficiently permeable and porous reservoir rock to store any hydrocarbons that would have been expelled from the Mesozoic source rock. Finally, despite the highly complex nature of the subsurface stratigraphy in some of these basins, there also seemed to be trapping mechanisms within the subsurface structures comprising of suitable cap rocks. All three of these geological phenomena are essential in the creation of conventional oil reserves. Hence, if these conditions are found to exist in any potential or prospecting area, it would persuade geologists of the potential for prospecting for oil. This would usually involve seismic mapping, drilling for core samples, 3D seismic mapping etc. Indeed, this is what Soekor subsequently carried out.

The geological findings in the Algoa basin (both onshore and offshore) reinforced the position that Soekor should explore the basin along with their efforts in the Bredasdorp, Pletmos and Outeniqua basins. From the perspective of the geological composition of the onshore Algoa basin, the necessary geological conditions for the creation of petroleum systems seemed to be in place as well. There appears to be the presence of organic-rich source rock comprised mainly of dark organic-rich shales.¹⁷³ There is also the view (subsequent to the exploration carried out by Soekor, but relevant nonetheless) that these shales are kerogen-rich furthering the position that the source rock would be of a sufficiently organic-rich makeup to underpin a petroleum system.¹⁷⁴ There is also the existence of

¹⁷³ Brink, G *et al.* 'New interpretation reveals potential in onshore Algoa basin, South Africa', *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 37.

¹⁷⁴ *Ibid.*

sandstone reservoir rock that, despite relatively low permeability, has the potential to sufficiently house hydrocarbon accumulations.¹⁷⁵ Lastly, there is the (according to sequence stratigraphic modelling done in recent decades) the apparent existence of suitable cap (or seal) rocks and trapping mechanisms therein.¹⁷⁶ All of the above (even though various pieces of this geological puzzle were not sufficiently understood when Soekor initially began exploration in the area) indicates that the onshore Algoa basin was one of the reasonable prospect areas in which Soekor and the apartheid government could have initiated hydrocarbon exploration in the country.

¹⁷⁵ *Ibid.*

¹⁷⁶ Brink, G *et al.* 'New interpretation reveals potential in onshore Algoa basin, South Africa', *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 37.

Chapter 2

*Exploration Drilling: It's Findings, Its Failings, and
It's Potential*

Soekor Exploration Efforts in the Onshore Algoa Basin and Subsequent Data Findings

Although the geological information that was available in the mid-1960s was relatively thin, there was enough generalized information to begin research into the possibility that petroleum systems may exist in the Mesozoic basins of South Africa. Indeed, it needs to be emphasized that the apartheid government were becoming increasingly aware that oil would have growing significance as a strategic fuel in the country. Soekor, owing to its status as a parastatal, needed to keep the national interest (i.e. the interest of the apartheid government) at the forefront of its proposed projects. This view led to Soekor carrying out exploration in a manner which prioritized potentially high value exploration acreage. As a result, initial exploration for petroleum systems began in the Bredasdorp and Pletmos basins and migrated to the Gamtoos and Algoa basins later on. Fortunately for Soekor, their efforts in the Bredasdorp and Pletmos basins proved to be successful with several small oil and gas fields being discovered (these fields collectively served as the primary supply base for the Moss gas processing and production facility). The exploration for petroleum systems in the Algoa basin was not initially as fruitful as efforts in the Bredasdorp and Pletmos basins. However, there was crucial data that came from the exploration of the onshore Algoa basin which (despite not being completely acknowledged for its value at the time) did give initial indications as to the potential for petroleum systems therein. The first part of this chapter will look specifically at what the exploration efforts by Soekor in the onshore Algoa basin yielded, and what those outcomes meant for future interpretations of the onshore Basin from a petroleum geology perspective.

Once again, it should be noted that the assertions made about the onshore Algoa basin and its geology are strictly limited to the findings by Soekor and its exploratory drilling therein. The intention herein is not to provide an accurate account of the geological makeup of the Basin (indeed, the views put forward herein would likely be challenged in terms of their accuracy), but rather to provide the basis on which exploration in the area was continued or discontinued due to the outcomes expanded upon below. Hence, the findings presented below are not

assumed to be accurate, but rather serve the purpose of providing a view of the geological interpretation of the onshore Basin at that time. The nature of the sources may also lead to technical misstatements as a result of record keeping errors.

From 1967 until 1971, Soekor carried out 12 drilling programmes in the onshore Algoa basin with varying degrees of success. Although the drilling itself was mostly exploratory in nature, the principle outcome (aside from actually finding oil reserves) was to determine what the nature of the subsurface geology was; and what, if any, stratigraphic anomalies may exist which would limit the existence of petroleum systems. Essentially, Soekor was looking for reasons why a petroleum system could *not* exist in the Algoa basin: It seemed clear enough to the Soekor drillers and geologists that there was potential for productive source rock, the possible existence of suitably porous and permeable reservoir rock, and rock systems which could serve as sufficient traps for expelled hydrocarbons. However, this understanding of the geology was too simplistic and required further examination. In particular, it needed to be determined if the various formations which were believed to be in place were intact, or had any damage which could have affected the coherence of the petroleum system.

In order to determine if any such anomalies existed, the examination of core and drill stem samples was necessary. Hence, in order to suitably and summarily synthesize the data that was collected during the onshore Basin exploration, it is necessary to focus on the wells which provided the most interesting results. Of the 12 wells that were drilled, three in particular had outcomes significant to the hydrocarbon potential of the onshore Basin. These wells were CK 1/68, NA 1/69 and AL 1/69.¹⁷⁷ Although all 12 of the wells drilled provided interesting information pertaining to the geological makeup of the onshore Algoa basin, the three wells mentioned above proved to be the most useful and informative from a data perspective. In particular, these three wells were important in determining the two important points about the subsurface stratigraphy and petroleum potential of the Basin. Firstly, it was necessary to determine the reasons that certain well tests which did not have sufficient fluid flow from the wells, despite indications from geophysical logs and/or core samples that there

¹⁷⁷ Leith, M. 'A Summary of Drill Stem Test Data of the Algoa Basin Rotary Boreholes with Special Reference to Formation Damage', *Soekor (Pty) Ltd*, November 1971, pg. 4.

should have been at least some amount of flow coming from the formation.¹⁷⁸ Secondly, it was important to determine which of the well tests indicated permeability damage to the reservoir rocks which was sufficient enough to lead to a highly diminished (or complete lack of) production ability.¹⁷⁹ Indeed, the information and data provided on the results from drill tests will not be strictly limited to the two intended outcomes described above. The data obtained from these wells will be expounded upon at length to indicate precisely what was found during testing. Although the explanation of each well test may seem overly detailed (especially pertaining to the formation damage in the Basin and issues around permeability), the expansionary data is nevertheless important. With regards to the petroleum prospectivity, it is absolutely necessary to examine all data which would effect and affect the existence of said petroleum systems. Hence, the detailed data will serve the dual purpose of a thorough summary of the well tests as well as providing an indication of the basin formations and their structural soundness as potential petroleum systems.¹⁸⁰ Furthermore, the data that will be presented herein comes from numerous sources that need to be recognized. These sources include the logs completed by the drill engineers and geologists on a weekly and monthly basis for each of the wells in question, as well as geophysical logging surveys and drill stem tests in reference to the formation evaluation of the samples collected.¹⁸¹ Finally, the well completion and standardized test engineers reports will be taken into account where available and necessary.¹⁸² What follows is a summarized, but detailed, account of the initial drill tests.

Of the three wells that provided positive signs of possible petroleum systems in the onshore Algoa basin, CK 1/68 was the first to be drilled. This test well which was sunk during 1968 in Commandokraal was the first of the exploration wells to yield hydrocarbon shows.¹⁸³ The initial impetus which led to the interest in the site came from the geophysical logs which indicated the presence of highly porous sandstone, serving as the basis of a potential hydrocarbon reservoir.¹⁸⁴ However, despite the potential that the geophysical logs showed with regards to a potential hydrocarbon reservoir at the site, it was still necessary to

¹⁷⁸ *Ibid.*

¹⁷⁹ *Ibid.*

¹⁸⁰ Leith, M. 'A Summary of Drill Stem Test Data of the Algoa Basin Rotary Boreholes with Special Reference to Formation Damage', *Soekor (Pty) Ltd*, November 1971, pg. 4.

¹⁸¹ *Ibid.*

¹⁸² *Ibid.*

¹⁸³ *Ibid.*, pg. 5.

¹⁸⁴ *Ibid.*

determine whether “[f]ormation fluids were required for evaluation and correlation purposes”.¹⁸⁵ With regards to the geophysical logging of reservoir rock, it is also necessary to determine the gas/oil contact points as well as the oil/water contact points in order to determine how the well should be developed and provide a reasonable estimate of the recoverable hydrocarbons from that site.¹⁸⁶ The tests that took place at the Commandokraal well CK 1/68 consisted of testing the samples collected from the Drill Stem Test (DST) intervals 2 and 5.¹⁸⁷ The DST interval 2 pertained to the formations between 6363 ft. and 6421 ft. and was tested using an uphole straddle packer.¹⁸⁸ This testing method involves the use of two packers (one which sits atop the formation in question and the other at the bottom of the formation) in order to gauge structure of the interval in question (amongst other things).¹⁸⁹ The results of the test had some positive, albeit limited, results: There was good flow from the formation which indicated that there was meaningful porosity (and most probably permeability as well) within the reservoir rock in question.¹⁹⁰ The test recovered 1200 ft. of very salty water (with a NaCl content of approximately 90 000 parts per million) which also contained 24 units of methane gas.¹⁹¹ The conclusion by the test drillers was that the tests were mechanically successful. Furthermore, the tests managed to prove the existence of a reservoir rock which could contain salt water. This indicated that although there was little in the way of hydrocarbons in that particular formation (the 24 units of methane gas would not have warranted much interest), the proof that suitable reservoir rock formations existed meant that a similar formation may be present with hydrocarbons captured therein. Hence, despite the fact that hydrocarbons were not found at the DST interval 2, the formation findings did provide an incentive to continue drilling with the intention of finding similar reservoir rock formations housing hydrocarbons. It was DST interval 5 which produced the most promising find in this regard. Testing the formation between 8536 ft. and 8573 ft., the outcome was that porous sandstone did exist with methane shows of 10 units.¹⁹² Although there were no meaningful deposits of hydrocarbons found at this level and the well was considered to be dry, the conclusions reached by the report compilers was that the poor flow

¹⁸⁵ *Ibid.*

¹⁸⁶ Evernick, J. *Introduction to Well Logs and Subsurface Maps* (Oklahoma, 2008), pg. 149.

¹⁸⁷ Leith, M. ‘A Summary of Drill Stem Test Data of the Algoa Basin Rotary Boreholes with Special Reference to Formation Damage’, *Soekor (Pty) Ltd*, November 1971, pg. 4.

¹⁸⁸ *Ibid.*

¹⁸⁹ Sahay, B. *Petroleum Exploration and Exploitation Practises* (New Delhi, 2001), pg. 420.

¹⁹⁰ Leith, M. ‘A Summary of Drill Stem Test Data of the Algoa Basin Rotary Boreholes with Special Reference to Formation Damage’, *Soekor (Pty) Ltd*, November 1971, pg. 5.

¹⁹¹ *Ibid.*

¹⁹² *Ibid.*, pg. 6.

from the well (despite the recovery of a substantial amount of rathole mud) was due to low permeability, or a faulty packer.¹⁹³ A further 8 attempts were made to recover the data pertaining to the DST interval in question but all failed due to the fact that no packer seats could be obtained therefrom.¹⁹⁴ Thereafter, the well was abandoned.

Exploration well NA 1/69 was drilled in Nanaga in 1969.¹⁹⁵ In contrast to the test work carried out on well CK 1/68, the testing of NA 1/69 comprised of 15 DST tests at 6 different interval levels. The test range of these intervals comprised the various sedimentary regions between 3231 ft. and 6339 ft.¹⁹⁶ From a range and DST perspective, well NA 1/69 was tested far more thoroughly than CK 1/68 was. Indeed, the initial findings of the well indicated that it deserved a more thorough testing than CK 1/68. The first DST interval was tested in order to obtain samples of the fluid from the formation which would be compared to the results of the Sundays River sands.¹⁹⁷ The subsequent attempts to retrieve uncontaminated water samples from DST interval 2 also provided additional information that the formations at the depths of between 4170 ft. and 4232ft. had very little permeability and, hence, would be unsuitable as a reservoir rock.¹⁹⁸ However, at the DST interval 3, a number of tests were conducted with regards to the nature of the rock within the upper sand of this zone. The outcome was that porosities averaged approximately 15% for the upper sand as well as exhibiting that permeability was present, which allowed for the interpretation that reservoir potential may exist at this level despite the lack of hydrocarbon shows within said tests (as potentially indicated by the Jay Field).¹⁹⁹ The DST interval 4 also encountered a formation layer with zero effective permeability which covered approximately 58 ft. from 6765 ft. downwards.²⁰⁰ However, the DST interval 5 seemed to indicate a more promising formation: the geophysical log of the interval was interpreted as having hydrocarbon shows within the porous Wood Beds (now called the Kirkwood formation) sandstone just above the Enon strata.²⁰¹ As a

¹⁹³ *Ibid.*

¹⁹⁴ Leith, M. 'A Summary of Drill Stem Test Data of the Algoa Basin Rotary Boreholes with Special Reference to Formation Damage', *Soekor (Pty) Ltd*, November 1971, pg. 6.

¹⁹⁵ *Ibid.*

¹⁹⁶ *Ibid.*

¹⁹⁷ *Ibid.*

¹⁹⁸ *Ibid.*

¹⁹⁹ Warren, J. *Evaporites: Sediments, Resources and Hydrocarbons* (Berlin, 2006), pg. 739.

²⁰⁰ Leith, M. 'A Summary of Drill Stem Test Data of the Algoa Basin Rotary Boreholes with Special Reference to Formation Damage', *Soekor (Pty) Ltd*, November 1971, pg. 7.

²⁰¹ *Ibid.*

result of this potential, a core analysis was done of the sandstone; although the intended uphole straddle test yielded no result due to a faulty packer.²⁰² However, due to the promising signs given by the geophysical logs, five further DST subtests were done on interval 5, each denoted by a number and letter combination: this meant that the five subtests were labelled 5A, 5B, 5C, 5D, and 5E.²⁰³ The first two subtest intervals (these being 5A and 5B) indicated that the reservoir layer in which they lay were both in zones with low to zero permeability and were largely neglected from further analysis as a result.²⁰⁴ With the failure to find any hydrocarbon potential in the 5A and 5B intervals (and no formation fluid flow at all from interval 5B), three more attempts were made at concluding whether hydrocarbons did indeed exist in well NA 1/69. However two of these attempts failed once again owing to failed packer placements which meant that the intervals were not adequately sealed and led to incomplete samples being taken therefrom.²⁰⁵ The third attempt was even more problematic when the drill string became stuck in the test hole and was recovered by a fishing job, ultimately leaving the test samples unusable.²⁰⁶ Due to the expense of the accidents that occurred in the well, no further DST testing took place. However, a subsequent coring programme which covered this zone of interest in a new deflected hole proved “without a doubt” that no hydrocarbons existed in the sands of interest, hence the well was abandoned.²⁰⁷ A number of tests were also carried out at the DST interval 6, and although formation fluid (primarily mud and salt water) did flow at an average of 20 barrels per day, there were no hydrocarbon shows to justify further testing.²⁰⁸

Of all the exploration wells drilled in the onshore Algoa basin, well AL 1/69 was the well site of most interest. Drilled in the Alexandria area in 1969, the well was closer to the coastline than NA 1/69 and CK 1/68 had been.²⁰⁹ The initial impetus for deep exploration drilling in this particular area was due to hydrocarbon shows (10-20 units of methane gas were

²⁰² *Ibid.*

²⁰³ *Ibid.*

²⁰⁴ *Ibid.*

²⁰⁵ Gow, S & Gow B. *Roughnecks, Rock Bits and Rigs: The Evolution of Oil Well Drilling Technology in Alberta 1883-1970* (Calgary, 2005), pg. 264.

²⁰⁶ Leith, M. 'A Summary of Drill Stem Test Data of the Algoa Basin Rotary Boreholes with Special Reference to Formation Damage', *Soekor (Pty) Ltd*, November 1971, pg. 9.

²⁰⁷ Leith, M. 'A Summary of Drill Stem Test Data of the Algoa Basin Rotary Boreholes with Special Reference to Formation Damage', *Soekor (Pty) Ltd*, November 1971, pg. 9.

²⁰⁸ *Ibid.*, pg. 10.

²⁰⁹ *Ibid.*, pg. 12.

recovered) at shallow drilling depths between 1380 ft. and 1420 ft.²¹⁰ This find prompted further drilling due to the fact that this was not the target zone, indicating that larger stores of hydrocarbons may exist at deeper levels. The DST interval 1 tests indicated that the zone between 1355 ft. and 1463 ft. consisted of low permeability rock, and due to apparent tool malfunctions no further conclusions could be drawn.²¹¹ The DST interval 2 was also examined due to the appearance on the geophysical logs that porous and slightly permeable Sundays River sands were present within the formation.²¹² Furthermore, a straddle test was performed on the sidewall anchor of the well; although a sidewall core could not be obtained therefrom.²¹³ Although minor packer issues did arise in the testing process, a certain amount of water flow did occur. The DST interval 3 testing was carried out on the basis that background methane gas content increased to approximately 4 units, and further formation fluids were required from the porous Sundays River formation.²¹⁴ Due to incorrect record keeping on the depth of the zone tested, no real conclusions could be drawn on hydrocarbon prospectivity of the zone. The DST interval 4 zone tested between 6085 ft. and 6110 ft. was done with tandem packers.²¹⁵ The justification for this zone testing was to obtain fluids from porous sandstone in the upper section of the Wood Beds formation, as well as a core analysis being needed from said zone.²¹⁶ This test was the first to yield good reservoir sandstone which produced salt water at the expected flow rates. The DST interval 5 testing was carried out due to an incident at 9475 ft. where an unexpected and sudden mud loss of 80 barrels occurred while drilling through porous sandstone.²¹⁷ Furthermore, at 9497 ft. (22 ft. below the mud loss zone), a small methane gas release of approximately 17 units was recorded, prompting a further investigation into formation of interval 5.²¹⁸ As a result, interval 5 was tested using a bottom hole test with only one packer being used between 9475 ft. and 9524 ft.²¹⁹ The results of the test produced good flow from the formation, with the recovered fluids containing normal quantities of dissolved methane. However, the general lithology of the zone in question indicated that there was significant potential for the rock in question to act as

²¹⁰ *Ibid.*

²¹¹ *Ibid.*

²¹² *Ibid.*

²¹³ Bahadori, A *et al.* *Dictionary of Oil, Gas and Petrochemical Processing* (Florida, 2013), pg. 390.

²¹⁴ Leith, M. 'A Summary of Drill Stem Test Data of the Algoa Basin Rotary Boreholes with Special Reference to Formation Damage', *Soekor (Pty) Ltd*, November 1971, pg. 13.

²¹⁵ Leith, M. 'A Summary of Drill Stem Test Data of the Algoa Basin Rotary Boreholes with Special Reference to Formation Damage', *Soekor (Pty) Ltd*, November 1971, pg. 13.

²¹⁶ *Ibid.*

²¹⁷ *Ibid.*, pg. 16.

²¹⁸ *Ibid.*

²¹⁹ *Ibid.*

a cap rock top to a potential reservoir (the effective permeability being low enough).²²⁰ Hence, continued testing took place. The most notable hydrocarbon potential came from the tests from DST intervals 6 and 7: At both levels, live oil shows were encountered at 11 885 ft. and in core samples of sandstone between 12090 ft. and 12107 ft. along with methane shows, indicating that hydrocarbons were at least present in that particular zone.²²¹ However, despite the methane gas and oil shows, there remained serious concerns around the lack of permeability of the reservoir rock (the porosity, more generally, was more conducive to hydrocarbon producing reservoir rock).²²² However, due to the hydrocarbon shows, well AL 1/69 was the best indication that suitable source rock existed with oil and gas expulsion coming therefrom; and that, despite disappointing permeability's of potential reservoir rock, there did appear to be the chance that reservoir systems could be in place elsewhere.

The findings of various drill stem testing of well AL 1/69 provided a strong indication that, despite the fact that a suitably structured petroleum system had yet to be found, hydrocarbons had been expelled from source rock and potential reservoir rock were in place, although they had yet to be found.

Due to the relative significance of the finds made within the formations examined by well AL 1/69, it would seem that further exploration pertaining to the findings made therein would be necessary. As such, this subsection will provide an appraisal of the specific details of well AL 1/69 with regards to both general information pertaining thereto and more specific details relating to this sites' petroleum system potential as well as the geology thereof.

Exploration well AL 1/69 was sunk in 1969 in the wider Alexandria area, in what was then the Cape Province. The prospect lease area was owned at the time by H.M Mining, who would have necessarily had a commercial relationship with Soekor.²²³ The well was also considered particularly deep measuring 14950 ft. from the Kelly bushing (the separation

²²⁰ Buryakovsky, L, *et al. Geology and Geochemistry of Oil and Gas* (Amsterdam, 2005), pg. 289.

²²¹ Leith, M. 'A Summary of Drill Stem Test Data of the Algoa Basin Rotary Boreholes with Special Reference to Formation Damage', *Soekor (Pty) Ltd*, November 1971, pg. 17-19.

²²² *Ibid.*

²²³ Van Wyk, S.J. 'Geological Well Completion Report of Borehole AL 1/69', *Soekor (Pty) Ltd*, August 1971, pg. 4.

point of the Kelly from the rotor).²²⁴ The drilling of the well began in on the 8th of May, 1969 and was completed by the 2nd of November of the same year during which 21 conventional core samples were collected along with a further 6 oriented cores which were all subsequently tested.²²⁵ Furthermore, 7 of these intervals were Drill Stem Tested with final well plugging at the Enon/Bokkeveld contact, the Wood Beds/Enon contact, and the Sundays River/Wood Beds contact.²²⁶ After AL 1/69 was formally abandoned on the 8th of November 1969, the final status of the well was, “[dry] with oil shows. Well abandoned”.²²⁷ Essentially, for the intents and purposes of Soekor’s exploration activities in the onshore Algoa basin, the well was considered to have no commercial value to them or their partners (these being H.M Mining, K.C.A Drilling and Schlumberger).²²⁸ From a data perspective, the drilling operation did provide samples for testing beyond the scope of the Soekor testing. The Geological Survey received cores which it showed a particular interest in as well as unwashed core samples taken from every 10 ft. segment of the well which were distributed to H.M Mining, Rhodes University and the compiler of the AL 1/69 report, S.J van Wyk.²²⁹ There were also samples taken every 100 ft. from shale formations with the intent of finding the most promising source rock, clay, and carbon isotope.²³⁰ Although many of these findings were not considered of great significance to Soekor’s goal of finding commercial quantities of oil and gas in the onshore Algoa basin, the cuttings would prove to be invaluable to future revisions of the potential for petroleum systems in the Mesozoic basin. It should also be noted that a number of geologists who were privy to the information compiled pertaining to the drilling operation at well AL 1/69 used much of the information obtained through these various core samples to revise the orthodox view of the geological makeup of the onshore Basin. This would be crucial in the period of re-examination of the Basin post-1991.

The geology of well AL 1/69 was primarily defined using four primary structural concepts: these were the wells’ stratigraphy, lithology, structure, and contributions to geological concepts. The stratigraphy that was illustrated through the examination of core samples from

²²⁴ Lyons, W, *et al. Standard Handbook of Petroleum and Natural Gas Engineering* (Houston, 2011), pg. 4-84.

²²⁵ Van Wyk, S.J. ‘Geological Well Completion Report of Borehole AL 1/69’, *Soekor (Pty) Ltd*, August 1971, pg. 4.

²²⁶ *Ibid.*

²²⁷ *Ibid.*

²²⁸ Van Wyk, S.J. ‘Geological Well Completion Report of Borehole AL 1/69’, *Soekor (Pty) Ltd*, August 1971, pg. 4 & 5.

²²⁹ *Ibid.*, pg. 5.

²³⁰ *Ibid.*

well AL 1/69 indicated that there were five formations that comprised the 14950 ft. that was drilled. These formations were the Alexandria (the surface formation), Sundays River (250 ft. from the surface), Wood Beds (5985 ft. from the surface), Enon (13273 ft. from the surface), and Bokkeveld group (13920 ft. from the surface).²³¹ The chrono-stratigraphic periods for these various formations mainly cluster within the Mesozoic era (the Sundays River, Wood Beds and Enon formations all seem to come from the late-Jurassic and early Cretaceous periods), with only the Bokkeveld group being from the older Devonian period of the Palaeozoic era (the Alexandria formation is simply considered tertiary).²³² The thickest of these formations was the Wood Beds which measured 7288 ft. in depth, followed by the Sundays River formation at 5735 ft. (the full extent of the Bokkeveld group is not known due to the cessation of drilling at 14950 ft.).²³³ The lithology (referring to the physical characteristics) of the various stratigraphic layers provided a more detailed indication of the geological makeup thereof. The Alexandria formation largely consisted of unconsolidated brownish yellow sand with numerous shell fragments therein, and quartzite pebbles at the base of the formation (approximately 240 ft.).²³⁴ The Sundays River formation, owing largely to its depth, consisted of alternating shale, siltstone and sandstone layers. The shale layers are described as being soft/moderately hard in their consistency as well as being very silty, containing numerous coal seams and shell and plant fossil formations.²³⁵ The siltstone has a similar lithological makeup to the shale, but comprises slightly coarser rock material and seems to grade similarly to very fine sandstone.²³⁶ The sandstone itself ranges from being tight to very porous, and is usually fine to medium grained which is generally poorly sorted and is collectively cemented primarily with argillaceous calcite.²³⁷ Most importantly, the numerous sedimentary layers within the Sundays River formation comprise sediments which are typical of shallow water marine environments, a promising sign from a petroleum system standpoint due to the links between Mesozoic marine environments and present day petroleum systems.²³⁸

²³¹ *Ibid.*, pg. 19.

²³² Jones, C. *Geology* (Michigan, 2005), pg. 122.

²³³ Van Wyk, S.J. 'Geological Well Completion Report of Borehole AL 1/69', *Soekor (Pty) Ltd*, August 1971, pg. 19.

²³⁴ *Ibid.*

²³⁵ *Ibid.*

²³⁶ *Ibid.*

²³⁷ *Ibid.*

²³⁸ Jia, C. *Characteristics of Chinese Petroleum Geology: Geological Features and Exploration Cases of Stratigraphic, Foreland and Deep Formation Traps* (Berlin, 2013), pg. 43.

The Wood Beds, Enon and Bokkeveld formations comprised of different sedimentary material. The Wood Beds formation had a lithological makeup consisting of sandstones and shale. The sandstones also ranged from being tight to porous (similar to the Sundays River formation) with graining too ranging from fine to coarse, with the only notable difference from the Sundays River formation sandstone being the “pebbly” nature of the sandstone itself as well as the colouring which was brownish as opposed to the greyish yellow of the Sundays River sandstone.²³⁹ (It should be noted that this pebbly description of the sandstone would be attractive from a geological standpoint: The rounder the grains of sand that collectively form the sandstone are, the larger the gaps between the sand is for tiny drops of oil to be caught in). The shale in the Wood Beds formations was also deemed to be different in composition to the Sundays River formation in that the colouring was reddish brown; as well as having a consistency of moderately hard to blocky, differing with the soft to moderately hard consistency of the Sundays River shale.²⁴⁰ However, the most notable part of the Wood Beds formation was the acknowledgement of a layer of dark grey shale that has come to be known as the Colchester member.²⁴¹ It is asserted that the Colchester member was, “laid down during a major marine invasion over the continent”, indicating further potential for petroleum source rock within the Wood Beds formation.²⁴² The Enon formation is the name given to a stratigraphic layer of a brown argillaceous conglomerate between 13273 ft. and 13920 ft. in depth.²⁴³ The formation consists primarily of, “well rounded quartzite pebbles, up to at least 5 cm diameter [*sic*]”.²⁴⁴ These pebbles also consisted (at times) of grey to white quartzite and black shale. The Bokkeveld group was the last stratigraphic unit to be intersected (the group is composed of two or more formations which a number of lithological similarities), between the depths of 13920 ft. and 14950 ft. and shares numerous correlations with the Cape supergroup.²⁴⁵ This unit comprised of a lithological profile consisting firstly of a very hard quartzitic sandstone which was followed by a primarily black shale up to the depth at which

²³⁹ Van Wyk, S.J. ‘Geological Well Completion Report of Borehole AL 1/69’, *Soekor (Pty) Ltd*, August 1971, pg. 20.

²⁴⁰ Van Wyk, S.J. ‘Geological Well Completion Report of Borehole AL 1/69’, *Soekor (Pty) Ltd*, August 1971, pg. 20.

²⁴¹ In the revision of the potential for petroleum systems in the onshore Algoa basin, Brink (2005) asserted that the Colchester Member would likely be the main source rock for oil expulsion. It seems for the early well reports that the significance of this lithological Member was not fully recognized at the time.

²⁴² Van Wyk, S.J. ‘Geological Well Completion Report of Borehole AL 1/69’, *Soekor (Pty) Ltd*, August 1971, pg. 20.

²⁴³ *Ibid.*, pg. 21.

²⁴⁴ *Ibid.*

²⁴⁵ *Ibid.*

the well was abandoned.²⁴⁶ The various stratigraphic units within the total drill depth did provide positive indications of petroleum potential within the area drilled despite the fact that no oil was found. It is also the case that the Colchester member may have provided a potential source rock for petroleum systems within the Wood Beds formation.²⁴⁷

From a structural point of view, well AL 1/69 did provide some useful contributions to geological concepts, particularly with regards to the existence of hydrocarbon systems within the onshore Algoa basin. The well itself was sunk approximately 3 kilometres from the sea in the sand dunes of the Alexandria Forest Reserve.²⁴⁸ The initial reason for the well being drilled in this location was due to appearance of a gravity anomaly which was believed to be an extension of the 'Addo nose'.²⁴⁹ However, subsequent seismic mapping (which was highly detailed) indicated that the well itself was drilled roughly north-west of a seismic low, approximately 2 kilometres south of the Colchester fault: This is significant because of the fact that the fault itself may serve as a potential trapping mechanism for the oil and gas expelled from the Wood Beds formation and Colchester member.²⁵⁰ This may explain the reasons why no significant oil accumulations were found in the drilling of AL 1/69 due to the lack of a suitable trapping mechanism. Although the drilling of well AL 1/69 did not yield an oil reserve that could be exploited, it did provide a number of geological firsts regarding petroleum geology in South Africa. Firstly, it was the first time that oil shows had been discovered onshore in a Cretaceous rock formation in South Africa.²⁵¹ Secondly, the discovery and confirmation of the existence of the Colchester member within the Wood Beds formation was vitally important in locating a potential source rock for a petroleum system to be in place within the Wood Beds formation.²⁵² Finally, the oil shows which occurred on "top of and immediately above" the Colchester member made the member in particular the prime area of interest with regards to further oil exploration in the onshore Algoa basin. These three

²⁴⁶ *Ibid.*

²⁴⁷ Brink, G *et al.* 'New interpretation reveals potential in onshore Algoa basin, South Africa', *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 38.

²⁴⁸ It is noteworthy that drilling was even allowed to take place at this location due to its 'reserve' status. A waiver was probably given to Soekor in this case due to the national significance of oil exploration, an act that will unlikely be repeated in the future.

²⁴⁹ Van Wyk, S.J. 'Geological Well Completion Report of Borehole AL 1/69', *Soekor (Pty) Ltd*, August 1971, pg. 22.

²⁵⁰ Pipkin, B *et al.* *Geology and the Environment* (Massachusetts, 2010), pg. 474.

²⁵¹ Van Wyk, S.J. 'Geological Well Completion Report of Borehole AL 1/69', *Soekor (Pty) Ltd*, August 1971, pg. 22.

²⁵² *Ibid.*

contributions to the geological knowledge of the onshore Algoa basin provided the basis for future exploration for petroleum systems within the Basin and further indicated that said systems may exist therein.

Well AL 1/69 also illuminated a meaningful amount of information with regards to the petroleum aspects of the onshore portion of the Basin. The first areas of interest which yielded some interesting results revolved around the porosity and permeability of the various sedimentary levels and geological formations. One of the methods used by the drilling crew of well AL 1/69 to determine the porosity and permeability of the various layers of sediment was the Rate of Penetration, or ROP.²⁵³ The ROP obtained from the drilling indicated (with great success) the fair to good porosity layers within the Wood Beds formation.²⁵⁴ This was done through the measurement of the drill speed through the different formation layers in order to determine the density of the rock layers that were encountered. However, pertaining particularly to the Sundays River formation, the sediment layers were often too thin to determine the actual ROP and, hence, the porosities thereof.²⁵⁵ In terms of the information gained from the core samples obtained, much meaningful data was recovered with regards to porosity and permeability (amongst other parameters as well). The general outcomes of the data relating to porosity indicated that, again, fair to good porosity was found within the sandstones relating to the Cretaceous period; a positive sign for potential petroleum systems.²⁵⁶ However, despite good porosity, the permeability was not so encouraging. The relatively good permeability (considered more than 10 millidarcys) indicates that if a reservoir was found to contain oil and gas, it would need to be significantly acidized or fractured in order for it to be permeable enough for oil and gas to be extracted therefrom (this is now possible due to technological advancements, a situation which did not exist during the 1960s). From the perspective of actual hydrocarbons retrieved from the drill stem and core samples, there were a number of oil and gas shows therein. With regards to gas finds, there were a number of small methane gas amounts present during the drilling process, but none of them were considered 'gas shows'.²⁵⁷ However, there were a number of oil indications. Three

²⁵³ Sahay, B. *Pressure Regimes in Oil and Gas Exploration* (New Delhi, 1999), pg. 53.

²⁵⁴ Van Wyk, S.J. 'Geological Well Completion Report of Borehole AL 1/69', *Soekor (Pty) Ltd*, August 1971, pg. 22.

²⁵⁵ *Ibid.*

²⁵⁶ *Ibid.*

²⁵⁷ *Ibid.*

sandstone intervals contained oil: The first of these intervals was between 11885 ft. and 11903 ft. where oil was found to be coating quartzite grains which was detected under a microscope and confirmed by fluorescence.²⁵⁸ The second interval to produce an oil show was in the interval between 12079 ft. and 12106 ft. which comprised of two layers of sandstone, the top layer being the most prospective from a petroleum perspective.²⁵⁹ Finally, there was a small oil show at the top of the Colchester member.²⁶⁰

The AL 1/69 exploration well did provide some interesting petroleum geological results. Firstly, the discovery of oil within the Wood Beds formation within the Basin indicated that oil expulsion had taken place therein. Secondly, the oil shows that did occur were all generally believed to have been associated with the Colchester member which (as the report indicated) should be the prime point of interest for further drilling within the Basin.²⁶¹ However, despite these oil shows and the potential found in the Colchester member, AL 1/69 was declared dry and abandoned. This exploration well served as the basis from which most of the body of knowledge of the petroleum geology potential of the onshore Algoa basin was subsequently built.

²⁵⁸ *Ibid.*, pg. 23.

²⁵⁹ *Ibid.*

²⁶⁰ *Ibid.*

²⁶¹ Van Wyk, S.J. 'Geological Well Completion Report of Borehole AL 1/69', *Soekor (Pty) Ltd*, August 1971, pg. 23.

The AL 1/69 Data: Interpreting the Findings

The data findings from well AL 1/69 provided a number of valuable clues as to the geological makeup of the onshore Algoa basin, particularly with regards to potential petroleum systems existing therein. The data obtained pertaining to the porosity of the potential sandstone reservoirs, as well as the oil expelling source rock in question (the Colchester member), indicated that further research into the Basin as a potential source of oil could be justified. However, the data collected from core samples was presented as a basic indicator as to the petroleum potential therein. Hence, it was necessary to initiate further analysis of the data in order to determine the makeup of the various sediment layers beyond the most basic petroleum geological interpretation (i.e. source rock, porosity, permeability etc.). One tool of analysis which shed light on the findings from well AL 1/69 was a palynological report compiled by McLachlan and Scott (1973).²⁶² As is the intention of a palynological study, the report focuses on examining the fossilized plant pollen and spores (including plankton organisms in this case, due to the fluviolacustrine environment which the onshore Basin existed in after the Gondwanaland breakup) which are found in the various sedimentary layers in order to correctly date them, and determine their organic makeup.²⁶³ This, ultimately, added more value to the samples taken from the well and provided a more inclusive understanding of the geological makeup of the onshore Basin sedimentary layering. Once again, it is necessary to note that the observations made herein pertaining to the palynological findings are not necessarily universally accepted, but are rather used to indicate the petroleum potential of the onshore Algoa basin.

In order for a comprehensive palynological study of the well AL 1/69 sediments to be done, it was necessary to inspect as many samples from the drilling operation as possible. The study carried out by McLachlan and Scott examined 60 samples taken from 21 cores, and used 43 cutting samples for processing and analysis.²⁶⁴ From these various samples, the testers

²⁶² McLachlan, I & Scott, L. 'Algoa Basin Palynology: AL 1/69 and CK 1/68 Wells', *Soekor (Pty) Ltd*, 15 January 1973.

²⁶³ Hesse, M *et al.* *Pollen Terminology: An Illustrated Handbook* (New York, 2009), pg. 11.

²⁶⁴ I. McLachlan & L. Scott. 'Algoa Basin Palynology: AL 1/69 and CK 1/68 Wells', *Soekor (Pty) Ltd*, 15 January 1973, pg. 2.

managed to identify 134 miospores. The most notable fact about these spore findings is where they were found: The Kirkwood formation (previously referred to as the Wood Beds foundation) yielded the highest number of spores relative to cuttings and cores obtained from other wells (these wells included well CK 1/68).²⁶⁵ However, most of the spores collected from other formations (including formations where no spores were found) have been assumed to be the result of down-hole contamination.²⁶⁶ It seems that although there was significant spore contamination within the various wells, the spores found within the Kirkwood formation of AL 1/69 were actually derived therefrom, not via contamination.²⁶⁷ Other formations (in particular the Enon) seemed to indicate a certain amount of spore contamination which limited the interpretation of the core samples. In general, this contamination did provide obstacles with regards to the interpretation of the carbon content of each formation. This was particularly true of the Colchester member which, as the most promising source rock within the Kirkwood formation, required further study to determine its prospects in this regard. Nevertheless, the palynological studies of the core samples from well AL 1/69 did provide other data which led to a more holistic geological understanding of the well site.

One of the more important data sets compiled from the core and cutting samples related to the significant species diversity of the spores collected, as well as the phytoplankton occurrences therein. Although the down-hole contamination created a number of anomalies with regards to the species diversity within the Kirkwood formation (the cuttings indicated high diversity in the cuttings and low diversity in the cores, a highly unusual result), it does seem reasonably clear that the high diversity samples would have likely come from the high yielding shales within the Kirkwood formation.²⁶⁸ Furthermore, core samples obtained from the Colchester member contained, “a reasonable number of species”.²⁶⁹ Probably one of the most important findings from a palynological perspective was the relative richness of phytoplankton within the samples collected from AL 1/69 as compared to the other onshore wells that were drilled. This is significant due to the fact that the organic formation which led

²⁶⁵ McLachlan, I & Scott, L. ‘Algoa Basin Palynology: AL 1/69 and CK 1/68 Wells’, *Soekor (Pty) Ltd*, 15 January 1973, pg. 2.

²⁶⁶ *Ibid.*

²⁶⁷ *Ibid.*

²⁶⁸ *Ibid.*, pg. 3.

²⁶⁹ *Ibid.*

to the creation of numerous oil fields from both the Palaeozoic and Mesozoic periods was plankton (phytoplankton in particular).²⁷⁰ Although McLachlan and Scott indicated that the phytoplankton findings from AL 1/69 were encouraging, they also noted that this factor was probably not significant enough to put into doubt that well AL 1/69 was found in a “more marine environment” than other wells such as CO 1/67 and CK 1/68.²⁷¹ However, outside of the samples mentioned herein, there seemed to be little other evidence of phytoplankton spores, particularly within the Kirkwood formation.²⁷²

The zonation of the spores that were recovered from well AL 1/69 also provided new data from which geological interpretation of the site in question could be provided. From a general perspective, the distribution of microflora from a zonation standpoint within well AL 1/69 was largely similar to the distribution found in well CO 1/67.²⁷³ One of the issues that did arise in the zonation of AL 1/69 was the major floral break at the beginning of the Kirkwood formation which took place over an interval of between 250 and 400 ft. and was thus difficult to define.²⁷⁴ The 1st zone that was tested, between the depths of 450 ft. to 5710 ft., indicated the presence of 11 species of spores.²⁷⁵ The upper part of this 1st zone was largely similar in composition to the subzones of well CO 1/67 (these subzones were labelled 1A, 1B, 1C, and 1D), signifying that the organisms between these two zones were fairly similar in composition; meaning the surface conditions during the geological era in question were largely the same between the two wells (a useful piece of information in terms of the potential location of source rocks in the area).²⁷⁶ The 2nd zone, between the depths of 5710 ft. and 11924 ft., further found numerous species within the Amsterdamhoek member at the top of the Kirkwood formation. The 2nd zone had indicated the relatively common presence of a spore type labelled ‘AL 17’ which was remarkable due to the fact that this spore type was not found in the other wells tested (namely wells CO 1/67 and CK 1/68).²⁷⁷ However, the down-hole well contamination further complicated these results: The presence of spore type AL 17

²⁷⁰ McLaren, P & Duff, D. *Holmes’ Principles of Physical Geology* (Oxford, 1993), pg. 129.

²⁷¹ McLachlan, I & Scott, L. ‘Algoa Basin Palynology: AL 1/69 and CK 1/68 Wells’, *Soekor (Pty) Ltd*, 15 January 1973, pg. 3.

²⁷² *Ibid.*

²⁷³ *Ibid.*

²⁷⁴ *Ibid.*

²⁷⁵ *Ibid.*

²⁷⁶ *Ibid.*

²⁷⁷ *Ibid.*

was only present in the cutting samples from AL 1/69 and not the core samples therefrom.²⁷⁸ Hence, the relative significance of this anomaly can unfortunately only be viewed as an anecdotal commentary on the palynology of the well. However, this finding (amongst many other intriguing, but ultimately inconclusive, findings) did add further impetus to the notion that the well (and the geological zones which it intersected) should be further explored in order to determine the petroleum potential thereof.

Ultimately, what the palynological results demonstrated more clearly than anything else was that there were unknowns with regards to a thorough understanding of the geological makeup of the onshore Algoa basin. Most of the information contained in the reports produced by Soekor employees and contracted drilling companies were in many cases not comprehensive enough and lacked the attention to detail which can detract from their ultimate value (even the most basic errors, including the lack of proof reading of reports, were apparent in almost all the documents referenced herein). However, despite this criticism of the reports, the authors thereof did make some important observations in their various findings from cutting and core samples. Hence, these reports (despite the occasional lack of detail which could sometimes obscure the valuable information contained therein) did provide an important foundation on which a geological understanding of the onshore Basin could be built. Unfortunately, Soekor's discontinued exploration in the area meant that these reports were largely underutilized.

²⁷⁸ *ibid.*

The State of the Global Oil Market

The initiation of oil exploration by Soekor in South Africa came at a time of global volatility in the oil market. In the late 1960s up until the early 1970s the global oil market had been dominated not by countries, but by a handful of oil companies which dictated the production levels of various countries as well as exploration efforts therein. In the half decade building up to the 1973 Arab Oil Embargo and resulting oil shock, a number of key changes took place in the global oil industry which impacted all spheres thereof; including the oil and gas supply position in South Africa. However, by 1973, most of the predominant oil companies in the world (mainly the Seven Sisters) had lost the sole ability to price their oil as they saw fit and began to capitulate to the governmental demands by OPEC territories in which they operated; which included massive operational tax hikes.²⁷⁹ Any company or country which refused to accept these new conditions fell under the ‘total embargo’ instituted by OPEC. Aside from the embargo imposed on various countries by OPEC, the price of oil also skyrocketed: By the middle of 1974 oil prices had globally risen approximately four-fold and there did not seem to be a decrease thereof on the horizon.²⁸⁰ To complicate matters for the apartheid regime, the OPEC members specifically pinpointed South Africa as a country to whom they were no longer willing to supply oil. Coupled with the repercussions of the 1962 United Nations Resolution 1761, the immediate result of the embargo was that South Africa could essentially no longer buy oil on the open market at global market prices.²⁸¹ Hence, the attempts by the apartheid government in the field of traditional oil exploration, and the progress made by them regarding synthetic oil production, must be understood within the global context of the oil industry. The changes in global oil pricing, the newly politicized nature of oil production and supply dealing by the majority of OPEC members meant that the oil supply model on which the apartheid government had depended was no longer viable. Thus, although the internal oil supply decisions by the apartheid government seemed to be sovereign decisions, the global oil market played a substantial role in the determination of this national policy. Therefore, it is necessary to provide an outline of the global oil industry and how it impacted South Africa.

²⁷⁹ Falola, T & Genova, A. *The Politics of the Global Oil Industry: An Introduction* (California, 2005), pg. 74.

²⁸⁰ *Ibid.*, pg. 74-76.

²⁸¹ *Ibid.*, pg. 100.

Oil supply to apartheid South Africa was, for the most part, not a transparent process. In the years leading up to 1973, apartheid South Africa (despite being politically condemned in many parts of the world) still had favourable trade relations with many countries which included OPEC members and other oil-exporting countries. However, from 1973 onwards, the South Africa' oil supply position was squeezed: due to the Arab embargo on oil imports from OPEC members into South Africa, as well as the growing political pressure regarding sanctions against apartheid, buying oil on the open market became very difficult for the apartheid government. Hence, the South African government needed to find new supply points in order to meet the country's demand which led to them turning to the quasi-black market trade in the global oil industry. Although there were many players in this global 'black market' for oil (both at an institutional and individual level), one person in particular played a central role in supplying the apartheid government with oil: Marc Rich.

Marc Rich came from humble beginnings. Born in 1934 to Jewish parents in the Belgian city of Antwerp, Rich and his parents were forced to flee continental Europe in 1941 due to the Nazi invasion of their home country.²⁸² The family fled to the US and settled in Kansas City, Missouri. After completing his schooling and dropping out of the New York University after one semester, Rich went to work for a commodities trading firm called Philipp Brothers (which later came to be known as Phibro) beginning his lifelong professional occupation as a commodities trader.²⁸³ Although Rich had been operating as a global commodities trader prior to 1973 and had even visited South Africa for the first time in his professional capacity as an employee of Phibro in 1958, it was after the fall of the Shah of Iran that Marc Rich's business relationship with South Africa truly began.²⁸⁴ After Ayatollah Khomeini took power in Iran, he instated a clause in all of Iran's oil contracts that no oil was to be sold to either Israel or South Africa; a significant blow for the supply positions of both countries (especially Israel which relied on Iran for as much as 90% of its oil supply).²⁸⁵ The supply gap left by this contractual clause allowed for daring independent oil traders to attempt to close said gap. However, the oil trade with Israel and South Africa came with substantial risks: Firstly, the US had formally sanctioned trade with Iran, a condition which should have

²⁸² Hayward, S. *The Politically Incorrect Guide to the Presidents: From Wilson to Obama* (Washington, 2012), pg. 252.

²⁸³ Ammann, D. *The King of Oil: The Secret Lives of Marc Rich* (London, 2009), pg. 44.

²⁸⁴ Ammann, D. *The King of Oil: The Secret Lives of Marc Rich* (London, 2009), pg. 44.

²⁸⁵ *Ibid.*, pg. 102.

theoretically ended Rich's relationship with Iran (though this relationship continued nonetheless).²⁸⁶ Secondly, trading Iranian oil with South Africa by the 1970s was considered to be bordering on illegality even for an American citizen; aside from the fact that it was considered unethical at the very least.²⁸⁷ Nevertheless, Rich proceeded to construct the infrastructure which would allow for him to trade oil between these three countries (amongst others) which would come to include a fleet of oil tankers, large financing deals, and the entrenching of his connection to the murky world of commodities traders.²⁸⁸

Getting business done between countries who refused to have diplomatic relations with each other was a trying task; one which Rich believed to be worth the risk. One example of this was a particular shipment of oil from the Soviet Union to South Africa in 1988, a politically strange deal due to the fact that the Soviet Union had formally severed diplomatic relations with apartheid South Africa in 1956 (it should be noted that oil trades, like the one about to be described, had been happening through Rich's myriad of companies for at least 15 years prior).²⁸⁹ A Liberian oil tanker named the *Dagli* (which was, at the time, flying a Norwegian flag) set sail from the port of Odessa in the Black Sea in the September of 1988 laden with Soviet crude oil bought by a Greek conduit company and was theoretically destined for Italy.²⁹⁰ The shipping itinerary as well as the various companies involved in the transaction were very complicated, and deliberately so: In order to sneak oil into South Africa, Marc Rich had to provide a shipping sequence and ownership structure that was simply too complicated to follow, which he did very well. After passing Genoa (the theoretical destination for the ship) and not offloading the cargo, the *Dagli* proceeded through the Straits of Gibraltar and down the West African coast towards South Africa.²⁹¹ Although much of the deception by Rich and his various companies and business partners were at times highly sophisticated, it could also be extremely crude at others. For example, while moving down the African coast, the *Dagli* crew members covered the ship's name so it could not be identified; and the crew could not refer to the ship as the *Dagli* over radio, but were to use the

²⁸⁶ The use of chronology here is not the primary concern. Making mention of the key events within the industry during this 25-odd year period is the primary concern.

²⁸⁷ *Ibid.*, pg. 3-20.

²⁸⁸ Copetas, C. *Metal Men: Marc Rich and the \$10 Billion Scam* (New York, 2001), pg. 56.

²⁸⁹ Ammann, D. *The King of Oil: The Secret Lives of Marc Rich* (London, 2009), pg. 189.

²⁹⁰ *Ibid.*, pg. 189-190.

²⁹¹ Ammann, D. *The King of Oil: The Secret Lives of Marc Rich* (London, 2009), pg. 189.

term “MFI” instead.²⁹² Three weeks after the Dagli left the Black Sea, it arrived in Cape Town harbour on 15 October 1988.²⁹³ Despite the fact that the ship was an oil tanker with a covered name and its Norwegian flag removed, the ship managed to offload its cargo and leave the Cape Town harbour uninhibited; disappearing as indistinctly as it arrived. This type of oil deal epitomized the way in which Marc Rich did business. He would approach countries which needed to either buy or sell crude oil; but could not be seen to be dealing with each other and, in the words of Daniel Ammann, “served as a sort of “crude middleman” who bought sensitive commodities from sensitive sellers and sold them to sensitive buyers. He was able to bring together countries that no longer maintained an official relationship with one another”.²⁹⁴ Rich’s skill in this regard was particularly true for apartheid South Africa. Due to the fact that the country had been shunned by the imposition of international sanctions, the apartheid government needed to find creative ways of securing a supply of crucial commodities including oil.

After the overthrowing of the Shah of Iran in 1979, the oil trading relationship between South Africa and Iran (which had once been very strong) turned sour overnight. Up until 1979, South Africa had been supplied crude by the Shah who had consistently refused to kowtow to the OPEC embargo on oil exports to the apartheid government.²⁹⁵ However, post-1979, the South African government could not transparently import oil from Iran. At this point, Marc Rich becomes a notable player in the oil trade between Iran and South Africa who, despite the fact that Ayatollah Khomeini had contractually banned all oil buyers from selling oil to South Africa, managed to initiate a series of deals which seemed to involve the supply of small arms consignments in exchange for Iranian oil which would be signed over to his Swiss trading company called Marc Rich & Co. AG.²⁹⁶ From there, Rich would sell the oil to South Africa in exchange for yet another commodity (e.g. Uranium from Namibia) which would then be sold to yet another country (e.g. the Soviet Union) in exchange for cash.²⁹⁷ The transactions were rarely as simple as buying a consignment of oil from one country and then exchanging it for cash with another country. The deals often involved three or more

²⁹² *Ibid.*, pg. 190.

²⁹³ *Ibid.*

²⁹⁴ *Ibid.*

²⁹⁵ *Ibid.*

²⁹⁶ Committee on Government Reform. ‘Justice Undone: Clemency Decisions in the Clinton White House’, *House Report 107-454*, Union Calendar No. 269 (U.S. Government Printing Office, 2002), pg. 11.

²⁹⁷ *Ibid.*, pg. 11-12.

transactions all with the explicit intention of avoiding detection and implied illegality. In fact, Rich and his partners (the most notable partner in this regard was Pincus Green who was also indicted on the same charges as Rich in the US) in some cases went to extreme lengths to hide their trading operations. For example, it is believed that Rich would scuttle an oil tanker after it had offloaded its oil consignment and fly the crew of the ship home thereafter.²⁹⁸ Rich also went to great lengths to keep his partnerships with other companies (who aided this trade) discreet. For example, regarding his oil trade with South Africa, a man named Alan Fenton was Rich's primary business controller of his commodities trading in South Africa, including their role in chrome and manganese trades therein.²⁹⁹

All of Rich's primary oil trading operations with South Africa came from a long-term contract which he signed with the apartheid government on 12 April 1979; which is believed to have made him personally more than \$1 billion and, by his own admission, had been his, "most important and most profitable" business.³⁰⁰ Moreover, Rich portrayed a strongly pragmatic justification for his dealings with South Africa. When being accused of supporting the apartheid regime and reinforcing the racist system which governed South Africa, Rich simply stated that, "I'm not a political person. We were not a political company. We just wanted to be an excellent trading company for our customers. The South Africans needed oil, and people were reluctant to sell it to them because of the embargo. We agreed to do it because we felt it was nothing illegal."³⁰¹ Although parts of this statement can be seen as disingenuous and self-serving, Rich clearly did not justify his business on moral grounds, but rather on the fact that he was making money from it. To Rich, the law was the only objective standard against which he was prepared to measure himself, despite the fact that it appeared he overstepped legal barriers too.³⁰²

Another player who helped South Africa defy the international oil sanctions against the apartheid government was a Dutchman by the name of John Deuss. In stark contrast to Marc Rich, Deuss was (and remains) an extremely private person who shunned the limelight and

²⁹⁸ *Ibid.*, pg. 12.

²⁹⁹ *Ibid.*

³⁰⁰ Ammann, D. *The King of Oil: The Secret Lives of Marc Rich* (London, 2009), pg. 194.

³⁰¹ *Ibid.*, pg. 195.

³⁰² *Ibid.*, pg. 196.

largely kept himself out of the public eye. From the scant information that is publicly available regarding Deuss, it appears that he was born in 1942 in the Dutch town of Nijmegen where his father was a manager of an Amsterdam-based automobile plant.³⁰³ Deuss dropped out of school at the age of 17 and managed to build a small empire comprising of a taxi service, fuel filling stations, and a Citroën car dealership.³⁰⁴ However, due to what seemed to be excessively leveraged business expansion plans, Deuss lost everything when he could no longer meet the necessary loan obligations.³⁰⁵ Following this collapse, Deuss (initiated through a friend) moved into the oil trading business in 1973 with \$300 000 and established a Bermuda-based company called JOC (apparently an acronym for ‘John’s Own Company’).³⁰⁶ In very little time and with even less experience, Deuss and his companies seemed to go from being virtually unknown entities in the global oil trade to being one of the world’s premier oil traders.³⁰⁷ Although Deuss started his oil trading business at a time when a barrel only cost \$2.50, he still managed to build a substantial business and amass a notable fortune in a very short period of time: by the mid-1970s, Deuss was moving more than 1 million barrels of oil per day in his own tanker fleet.³⁰⁸ In so doing he managed to become, along with Rich, one of South Africa’s largest independent oil suppliers from 1979 until the late 1980s.³⁰⁹ Using his connections with the royal family of Oman and ruling elite (his main connection being Qais Abdulmonim al-Zawawi, the powerful deputy prime minister of finance), he earned the Omanis and himself substantial profits by selling Omani oil to South Africa at a substantial premium.³¹⁰ Furthermore, due to a deal involving the sale of a big US refinery and gas station chain which earned him a profit of \$300 million and illustrated Deuss’ business acumen, the Omanis and Deuss came together to create the Oman Oil Company to which Deuss was appointed chairman and partial owner along with the Omani government.³¹¹ Although Deuss’ business was not solely reliant on its trade with apartheid South Africa, it did form a substantial part thereof after the 1979 Iranian revolution which left South Africa starved of

³⁰³ LeVine, S. *The Oil and the Glory: The Pursuit of Empire and Fortune on the Caspian Sea* (New York, 2007), pg. 132.

³⁰⁴ *Ibid.*

³⁰⁵ *Ibid.*

³⁰⁶ Gibbons, C. ‘Deuss: From a Second-Hand Car Dealer to Controversial World Figure’, *The Bermuda Sun* (October, 2006) at <http://bermudasun.bm/Content/NEWS/News/Article/Deuss--From-second-hand-car-dealer-to-controversial-world-figure/24/270/31102>.

³⁰⁷ LeVine, S. *The Oil and the Glory: The Pursuit of Empire and Fortune on the Caspian Sea* (New York, 2007), pg. 128.

³⁰⁸ *Ibid.*

³⁰⁹ *Ibid.*

³¹⁰ LeVine, S. *The Oil and the Glory: The Pursuit of Empire and Fortune on the Caspian Sea* (New York, 2007), pg. 129.

³¹¹ *Ibid.*, pg. 128-129.

oil. Although players such as Marc Rich were already supplying South Africa, the country needed yet more oil which Deuss was (amongst others) was willing and able to supply.³¹²

Keeping in the spirit of the oil trade with South Africa at the time, Deuss' dealings with the apartheid government were clandestine and subversive. Despite the fact that Deuss managed to ship over 115 million barrels of oil from the Gulf (primarily Oman) to South Africa between 1979 and 1983, very little was known about Deuss and his operations; a state of affairs which Deuss would no doubt would have approved of.³¹³ In order to keep his oil trading with South Africa as secretive as possible in order to avoid detection, Deuss' crude oil shipments to South Africa would be as incomprehensible and deliberately difficult to follow as those carried out by Marc Rich. One 1980s oil transaction in particular illustrated the extent to which Deuss would go in order to evade being tracked and held to account by the various shipping authorities. A Deuss led oil shipment began on a Norwegian tanker called the Havdrott which collected its oil consignment from the Gulf and was theoretically destined to offload the cargo in Bahrain: this was nothing out of the ordinary considering Bahrain was (and remains) a major refining centre within the Gulf region.³¹⁴ However, once in international waters, the Havdrott tanker met a partially loaded Danish oil tanker called the Karoline Maersk which was also under the indirect employ of John Deuss. At the point where the two ships crossed paths, they came together and (under Deuss' instruction) proceeded to carry out a breathtakingly audacious move which involved pumping the oil cargo from the Havdrott into the Karoline Maersk in the middle of the sea through a number of large hoses.³¹⁵ From there, the Karoline Maersk scrapped its original destination of Singapore and, instead, went to South Africa to deliver the cargo.³¹⁶ The risks involved in a cargo offload like this were large: Not only could this be interpreted as defying the various international sanctions against South Africa and possibly in contravention of various laws; the transferring of oil from one tanker to another in the middle of the sea with no contingency plans in place is a staggeringly bold decision to take. A loss of cargo from even the smallest tanker would

³¹² Unfortunately, scant information is freely available as to how Deuss and Rich actually ran their trading operations. This is not particularly surprising considering the potential for legal repercussions should such information become available.

³¹³ *Ibid.*, pg. 133.

³¹⁴ *Ibid.*, pg. 134.

³¹⁵ *Ibid.*

³¹⁶ LeVine, S. *The Oil and the Glory: The Pursuit of Empire and Fortune on the Caspian Sea* (New York, 2007), pg. 134.

amount to many millions of dollars. As a result of the daring oil deals that Deuss brought to fruition, he managed to amass a notable fortune in a very short period of time. Due to the fact that the South African government was prepared to pay a premium of anywhere between \$2.50 and \$4.50 per barrel over and above the original price per barrel with the shipping costs factored therein, Deuss is believed to have earned between \$280 million and \$500 million from these transactions with the apartheid state.³¹⁷

Although Deuss had achieved monetary success as an oil trader, his outright defiance of the apartheid oil blockade was often met with anger and resentment. One incident in particular was a stark reminder that choosing to deal with apartheid South Africa was not a decision that many approved of. In 1985, during Deuss' most prolific period of oil trade with South Africa, his home in Berg en Dal in Holland was set ablaze by an anti-apartheid group who called themselves Pyromaniacs Against Apartheid.³¹⁸ Deuss, who was not hurt in the incident, had the same pragmatic (and arguably disingenuous) response to his critics that Marc Rich had; stating that he believed that the oil embargo on South Africa was, "counterproductive to correcting the socio-political problems in that country".³¹⁹ However, despite Deuss' public position defending his trade with apartheid South Africa, privately he would have been revising his view due to the fact that two years later, Deuss renounced trading with the South African market stating that, "the change we had hoped for has not come about. We don't believe in sanctions. They will not work. But that does not mean we have to continue trading with South Africa".³²⁰ While Deuss chose to end his oil trading relationship (a politically expedient decision rather than a principled one) with South Africa, many other players were eager to take his place.

Players such as Deuss and Rich were essential in the stable supply of crude oil to South Africa. Furthermore, without independent oil traders such as Deus and Rich, the apartheid government would have found it difficult to meet South Africa's oil demand. From a price stand point, the premiums paid for oil by the South African government during this period created an environment where internal oil exploration within South Africa was an

³¹⁷ *Ibid.*

³¹⁸ *Ibid.*

³¹⁹ *Ibid.*

³²⁰ *Ibid.*

economically attractive option due to the relative value of oil on the South African market. Hence, although the oil trade by people like Deuss and Rich may have seemed unrelated to exploration efforts within South Africa, the artificially high prices of oil within South Africa encouraged South African individuals and companies to scour the country for even the most marginal resources such as those in the onshore Algoa basin.

The single largest influence on apartheid South Africa's oil supply position was the new control structure of the global industry. Prior to 1973, the control of the global oil industry lay predominantly in the hands of seven oil companies who were collectively referred to as the Seven Sisters. These seven companies (Esso, Chevron, Mobil, Gulf Oil, Texaco, Shell and BP) were responsible for the majority of the global exploration, production, refining and pricing of oil from a global perspective.³²¹ In other words, these companies would do a deal to supply oil to a particular entity (ranging from companies to countries) and decide on what the price per barrel would be for the life of the contract, or in predefined increments. Furthermore, these companies carried out their business in a ruthless fashion which characterised the companies and individuals that had spawned them. Although the four of the Seven Sisters companies emerged as independent entities due to the antitrust breakup of John D. Rockefellers Standard Oil behemoth (Esso, Chevron and Mobil were all part of the Standard Oil empire, whereas Texaco was merged with Chevron in 2001), the other three companies had similarly storied backgrounds.³²² Gulf Oil was founded and funded primarily by the wealthy Mellon family, BP (in its current form) was founded by William Knox D'Arcy in Persia, and Shell was built off a large Sumatran oil find in the late 19th century and early 20th century.³²³ Up to 1973 these companies were the controllers of the world's oil supply and had done so for about the fifty years prior to that, and it was they who were accused of behaving like a cartel; not the oil-producing countries.³²⁴ Due to the sheer scale of their operations, the vast distances between their various work sites, and their monetary might, they appeared to be part of world governments and the decision making thereof.³²⁵ However, by 1973, the tide had unquestionably started to turn against the Seven Sisters. After

³²¹ Sampson, A. *The Seven Sisters: The Great Oil Companies and the World They Made* (London, 1988), pg. 5.

³²² *Ibid.*

³²³ Ferrier, R & Bamberg, J. *The History of the British Petroleum Company: Volume 1, The Developing Years, 1901-1932* (Cambridge, 1982), pg. 31.

³²⁴ Sampson, A. *The Seven Sisters: The Great Oil Companies and the World They Made* (London, 1988), pg. 5.

³²⁵ *Ibid.*

the oil embargo had been enforced with success in 1973, the OPEC cartel members became more powerful with each passing year. At the first summit meeting of OPEC at the Palace of Nations outside Algiers in March 1975, it became immediately clear that the world's most powerful oil companies were no longer the key decision makers in the global oil industry. Not only were the companies not invited, they were hardly even mentioned.³²⁶ The leaders of the OPEC member countries were also using a language that was also very different to the commerce-speak that had previously dominated the oil industry. The Shah of Iran referred to oil as a, "noble fluid which must be properly conserved".³²⁷ The President of Venezuela said he was concerned with, "another kind of energy which is rarer; a *moral* energy".³²⁸ The tone that seemed to dominate the numerous speeches that took place pointed more towards social justice than it did to commercial sensibility. The event even saw some deep personal rifts being closed: in a moving show of Middle Eastern solidarity, Saddam Hussein walked across the Palace hall to the Shah of Iran, and both leaders proceeded to embrace in front of the whole delegation.³²⁹ All of the political pageantry that was displayed at that first summit happened for one reason: OPEC wanted a high price for oil, and in order to achieve this all the member states had to agree on production quotas. Needless to say, this was not always in the best interests of the oil companies who wanted to control their own production outputs. For the most part, these companies had been completely in control of their own futures. Not only did they control their own supply and demand paradigms, they operated their own infrastructure and the mini-cities which serviced them. For the most part, they were invulnerable to the governments of the countries in which they operated.³³⁰ However, this all changed after the 1973 Oil Shock and the power that Middle Eastern governments received as a result.

In order to understand the repercussions of the Arab oil embargo, it is necessary to understand how the embargo came to be. Although there were many important players in the consolidation of Arab power with regards to their oil wealth, one person in particular led this this fervent power charge from the front: Colonel Muammar Qaddafi. From the perspective of taking decisive action on securing oil reserves in the name of national interest, Qaddafi can

³²⁶ *Ibid.*

³²⁷ *Ibid.*, pg. 6.

³²⁸ *Ibid.*

³²⁹ *Ibid.*

³³⁰ *Ibid.*

be considered a pioneer. Largely in response to US military and diplomatic support for Israel, Qaddafi (during celebrations of the fourth anniversary of the Libyan revolution), declared that he would nationalize 51% of all the oil companies which operated in Libya.³³¹ Furthermore, Qaddafi announced two days later that the Libya would raise the price of its oil to \$6 per barrel (nearly double the Persian Gulf price, the benchmark for the region); and that he would cut off all supplies to the US if they continued to support Israel diplomatically and militarily.³³² This move by Qaddafi seemed to have an empowering effect on other Middle Eastern leaders. Two weeks after Qaddafi's announcement, Sheik Ahmed Zaki Yamani (the then Saudi Oil Minister) formally warned the US of the possibility of a cutback in Saudi Arabian oil.³³³ Needless to say, this newly assertive stance by Libya and Saudi Arabia did not sit well with the US. On hearing the news, President Nixon made a televised public address to warn Libya (and, by implication, Saudi Arabia too) that oil boycotts may not be as attractive to these countries in reality as they might seem in theory.³³⁴ However, it seemed reasonably clear to most experts that Nixon's threats were without substance; due to the newly peaked US domestic oil production and the Arab nations' obstinate new supply position, it appeared that the US was now more reliant on the Arab nations and their oil than the Arab nations were on the US for their consumer market.³³⁵

In the same way that the Seven Sisters had become subservient to their host governments from where they produced oil, they had also become more subservient to host governments to which they sold oil. Even in South Africa, the Seven Sisters seemed to be under the thumb of the apartheid government. Much of the dealings between oil companies and apartheid South Africa were shrouded in mystery simply because of the embargo and other sanctions placed on the country.³³⁶ The control that the oil producing countries had over the international oil companies was strong enough that they could dictate how those companies sold the oil they got therefrom.³³⁷ As a result of this, companies such as Caltex (a joint venture between the then separate Chevron and Texaco) were in a situation where their operations in the Middle

³³¹ Sampson, A. *The Seven Sisters: The Great Oil Companies and the World They Made* (London, 1988), pg. 248.

³³² *Ibid.*

³³³ *Ibid.*

³³⁴ *Ibid.*

³³⁵ *Ibid.*

³³⁶ Palmer Smith, R. *Darkest Truths of Black Gold: An Oil Industry Executive Breaks the Industry's Code of Silence* (Indiana, 2007), pg. 395.

³³⁷ *Ibid.*

East (primarily Saudi Arabia) could give them oil to sell, but they were blocked by that same country from selling oil to South Africa under the Arab oil embargo.³³⁸ This is an illustration of the significance of changes in the global oil affecting South African internal oil operations. Although changes in the relationship between Chevron and Saudi Arabia may not have immediately seemed significant to the South African oil supply position, it did create significant problems. As such, South Africa's oil supply situation cannot be seen as being isolated from these seemingly separate geopolitical events.

Arguably the biggest issue to affect oil exploration efforts in South Africa was the dramatic change in oil price post-1973. Due to the significant upsurge of oil prices stemming from a shortfall in OPEC supplies, the price of oil increased fourfold between the end of 1973 and mid-1974: from \$3 per barrel to \$12 per barrel.³³⁹ Coupled with the premiums that the apartheid government needed to pay for oil to be brought into South Africa by traders such as Deuss and Rich, the global increase in the price per barrel imposed a significantly inflated cost of fuel on the South African economy. Indeed, this cost could have been offset if oil was found and produced domestically in South Africa hence prompting a local search for the commodity. Although Soekor's expenditure on local oil exploration may have been high, if the search proved successful the costs would have been low over the long term. As can be seen from this explanation, the rationale for oil exploration in South Africa made sense from an economic perspective. However, significant oil finds were not made during this period which scuppered any hope of this economic boost coming to fruition. This left South Africa completely open to the swings of the global oil market, a problematic position to be in considering that by the late-1970s the global political tide had begun to turn sharply against apartheid South Africa.

³³⁸ *Ibid.*

³³⁹ Tanous, P & Cox, J. *Debt, Deficits, and the Demise of the American Economy* (New Jersey, 2011), pg. 139.

Oil Trade & Market Liberalization

Beginning in the early- to mid-1970s, western economies began to move towards economic neoliberalism. From an academic perspective, the Chicago School of Economics, typified by economists such as Eugene Fama and Milton Friedman, had made significant progress in convincing nation states to adopt laissez-faire economic systems with leaders such as Margret Thatcher and Ronald Reagan adopting said approach to economic governance. One of the outcomes of this economic liberalization was a rapid increase in financialization.³⁴⁰ Although there are various definitions of financialization, the definition that will be used here is, “the growing dominance of capital market financial systems over bank-based financial systems”.³⁴¹ The reason for this particular definition being used is that when applied to the oil trade during the 1970s and 1980s, a market shift took place where the trading of oil moved away from the direct trade between oil producers and clients towards the use of exchanges (such as the New York Mercantile Exchange (NYMEX) and Chicago Board of Trade (CBOT)) as an intermediary. Put another way, oil companies turned to exchanges and market-makers (commonly referred to as speculators) to sell their product for them, instead of directly selling their product to clients (usually at a fixed price over a fixed period). As a result of this move, the oil trade came to be dominated by oil contracts which were traded on exchanges by traders; either with their own money, or on behalf of clients. Hence, the trade in oil moved away from closed trades between producers and clients towards a more transparent exchange format where efficient pricing was the priority. Ultimately, the changing paradigm for the global oil trade meant a great deal especially for oil buyers who had limitations on trade such as apartheid South Africa.

Arguably the institution that suffered most from the changes in the global oil trade was the OPEC cartel. The history of the institution that would come to be known as the Organization of Petroleum Exporting Countries began in 1949 at the call of Iran and Venezuela for oil exporting countries to coordinate oil production in order to get the most favourable prices for

³⁴⁰ Epstein, G. *Financialization and the World Economy* (Massachusetts, 2005), pg. 3.

³⁴¹ *Ibid.*

their produce.³⁴² Along with Kuwait, Iraq and Saudi Arabia (many other countries joined later), OPEC managed to coordinate production to determine prices which were most favourable to them; most notably between 1973 and 1979. In order to achieve this pricing goal, OPEC members were simply asked to coordinate and unify their petroleum policies in order to give the market a unified perspective as to their collective oil production.³⁴³ Probably the most unique aspect of OPEC in this regard is that it is one of very few functioning international cartels.³⁴⁴ This is even more unique when considering that there are no legally binding contracts that govern the behaviour of each member state: all agreements between nations are simply based on trust and there are no legal consequences for countries that break the agreements.³⁴⁵ Indeed, the OPEC cartel was actually modelled on the collusive cartel-like behaviour which the Seven Sisters exhibited with regards to their production and sales of oil.³⁴⁶ Although OPEC has become a more complex institution since its founding, the principles of the cartel remain the same: to get the best price for their oil.

One of the problematic aspects of OPEC is whether it is (or ever has been) a fully functioning cartel. Indeed, the fact that the members of OPEC are not legally bound to follow production quotas means that there is little incentive for countries to follow the policies adopted by members on production limits.³⁴⁷ This means that the self-imposed production ceiling committed to by OPEC members is often violated.³⁴⁸ However, the ceiling has at times proved to be a major catalyst for price changes. Arguably the most notable example of this is the four-fold increase in prices in the six to eight months following the imposition of the Oil Embargo in 1973.³⁴⁹ In terms of cartel-like market manipulation ability, OPEC has always faced two main issues: The first is that OPEC has often lost the battle to keep oil prices high even when imposing quotas on its members, indicating that national interest and independent sovereign decision making often seems to trump the collective interests of the cartel as a whole.³⁵⁰ The second is that there are numerous large oil producers that are not a part of OPEC who (when OPEC tries to cut production) will raise their own production to meet the

³⁴² Falola, T & Genova, A. *The Politics of the Global Oil Industry* (Connecticut, 2005), pg. 67.

³⁴³ *Ibid.*

³⁴⁴ *Ibid.*

³⁴⁵ *Ibid.*

³⁴⁶ *Ibid.*

³⁴⁷ Mathur, S. *Trade, the WTO and Energy Security: Mapping the Linkages for India* (New York, 2014), pg. 155.

³⁴⁸ *Ibid.*

³⁴⁹ *Ibid.*

³⁵⁰ *Ibid.*

market shortfall, hence the overall objective of OPEC to cut world production ultimately fails.³⁵¹ The most notable countries with large production capacity in this regard are Russia, the US, China and Canada: outside of OPEC oil producers, these four countries are the largest producers of oil and often increase or decrease their oil production in direct contrast to OPEC.³⁵² Studies on the effectiveness of OPEC as a cartel also indicated that coordinated production between members seems to be limited to specific countries. For example, the UAE, Venezuela and Libya seem to generally coordinate their production in line with OPEC policies whereas the remainder of the countries do not seem to act as a collusive whole.³⁵³ As such, the effectiveness of OPEC as a cartel is limited due to the fact that the members do not always abide by the policies set out by the institution. Another issue is that regardless of coordination, OPEC only meets approximately half of the world's daily oil demand.³⁵⁴ This would indicate that the explanations for various price changes would not be due to the actions of OPEC and its member countries, but from factors outside the OPEC sphere of control.³⁵⁵

The relative effectiveness of the OPEC cartel had a significant impact on South Africa during the late-1970s and early-1980s. As highlighted previously, because OPEC members were not legally bound to the policies of the organization, there were no legal consequences for breaking said policies. In reference to apartheid South Africa, this was a significant loophole: although the Arab oil embargo on South Africa was (to a certain extent) a policy of the organization, Iran covertly carried on supplying South Africa with oil during embargo.³⁵⁶ Despite the fact that this trade relationship between South Africa and Iran was against OPEC policy, OPEC and its members could not force Iran to follow the policies from a legal perspective thus allowing South Africa to continue purchasing oil from an OPEC member. Although OPEC had managed to pressure other countries to abide by the embargo, in this particular instance, OPEC was unable to enforce compliance; rendering the policy (in the case of South Africa at least) largely redundant. However, it should be noted that Iran did not explicitly defy the policies, but rather turned a blind eye to the actions of traders like Marc

³⁵¹ *Ibid.*

³⁵² Ramcharan, H. 'Oil production responses to price changes: an empirical application of the competitive model to OPEC and non-OPEC countries', *Energy Economics*, 24, 2, (March, 2002). Pg. 99-105.

³⁵³ Mathur, S. *Trade, the WTO and Energy Security: Mapping the Linkages for India* (New York, 2014), pg. 155.

³⁵⁴ *Ibid.*

³⁵⁵ *Ibid.*

³⁵⁶ Skeet, I. *OPEC: Twenty-Five Years of Prices and Politics* (CUP Archive, 1991), pg. 100.

Rich and John Deuss which implicitly allowed the traders to circumvent the policies.³⁵⁷

Although in hindsight the OPEC cartel was, and remains, a flawed institution, the threat that it posed when its member states were colluding effectively was significant. However, due to the inherent flaws in OPEC's structural effectiveness, this collusion more often than not was subverted by certain members of the cartel. If the quotas imposed by OPEC had been legally binding, the apartheid government may have found itself in a significantly different position throughout the embargo period.

Another significant institutional actor with regards to pricing and supply were the commodities exchanges, the NYMEX in particular.

The New York Mercantile Exchange (abbreviated to NYMEX) was founded in 1882 in order to facilitate the trading of farmed goods through standardized contracts.³⁵⁸ The reason for this is that, during the late- 19th and early- 20th century, owing largely to inadequate preservation of perishable goods and lack of refrigeration, the quality of each good (e.g. cheese) differed substantially from one producer to the next. Furthermore, because each trade relationship between buyers and sellers was almost completely independent of one another, the trading agreements themselves were all different as well. In order to create a universal set of trading rules, quality control, and standardization, a handful of standardized contracts were created for a few goods (namely poultry, canned goods, dried fruits, butter, cheese and eggs).³⁵⁹ Once these contracts were created and started trading, the NYMEX progressively grew in size and trade volume. Furthermore, it spawned a number of ancillary industries which supported the trading floor such as warehousing.³⁶⁰ For approximately the next 80 years, the NYMEX performed its function well, setting up willing buyers with willing sellers and standardizing everything from the contract to which they both agreed, to the quality of the goods that the buyer would deliver to the seller. However, despite the relatively smooth progression of the NYMEX, market manipulation was a serious issue at the exchange; particularly in the

³⁵⁷ United Nations Centre Against Apartheid. 'Notes and Documents', *Department of Political and Security Council Affairs*, 1978, pg. 79.

³⁵⁸ McGrath Goodman, L. *The Asylum: The Renegades Who Hijacked the World's Oil Market* (New York, 2013), pg. 30.

³⁵⁹ *Ibid.*

³⁶⁰ *Ibid.*, pg. 36-37.

perishable commodities markets.³⁶¹ Indeed, it was the Maine potato contract (the largest commodity traded by value on the NYMEX at the time) which was manipulated the most frequently. Everybody from the potato inspectors (who made sure the quality standards were met) to the traders used privileged knowledge and information to manipulate the price of potatoes in their favour.³⁶² However, combined with a number of other factors, the potato price manipulators took their actions too far and ultimately created a catastrophe in the market. In 1976, the price of potatoes increased roughly fourfold in a few weeks due to a number of unfulfilled contracts owing to market chaos related to the massive short position initiated by J. R. Simplot.³⁶³ Although the price rise put notable pressure on consumers from an inflationary perspective, the NYMEX too had to shoulder pressure for the reckless behaviour of its traders and staff. Due to the unfulfilled contracts (contracts which were paid for but were not delivered in a satisfactory condition or time period), the NYMEX was held accountable for not adhering to the contract terms. Ultimately, the potato contract was subsequently withdrawn from the NYMEX contract list at the instruction of the newly formed Commodities and Futures Trading Commission (CFTC), and the NYMEX was further barred from creating new contracts based on other commodities.³⁶⁴ This was a significant financial setback for the exchange and almost wiped the potato trade off the exchange entirely.

Two years after the 1976 potato shortage, the NYMEX selected a new chairperson by the name of Michel David Marks. Despite the fact that Marks was only 27 years of age at the time of the appointment (the youngest chairperson in the US at the time), he had come from a family steeped in the traditions and ways of the trading floor.³⁶⁵ For Marks, this was his most valuable asset: he understood the traders who (in essence) ran the exchange in the open cry pit. Furthermore, he realized that without the creation of new contracts, the exchange would ultimately fail. Despite the new contract ban placed on the NYMEX by the CFTC, Marks managed to list a new crude oil contract which allowed for crude oil to be traded by the

³⁶¹ *Ibid.*, pg. 40-41.

³⁶² McGrath Goodman, L. *The Asylum: The Renegades Who Hijacked the World's Oil Market* (New York, 2013), pg. 46.

³⁶³ *Ibid.* pg. 46-53.

³⁶⁴ *Ibid.*, pg. 47-54.

³⁶⁵ *Ibid.*, pg. xiv.

traders; a first for the exchange.³⁶⁶ Although the contract did struggle for a time, the oil market volatility that followed 1973 meant that a great deal of oil buyers began to turn to exchanges in order to buy oil due to its relative reliability and price transparency.³⁶⁷ Ultimately, the oil trade moved away from oil companies making individual deals with oil buyers, and moved towards selling oil on the NYMEX at the market price. This was a particularly significant change which, ultimately, took the crude oil pricing power away from the oil companies and gave it to the oil traders. Needless to say, this kind of price transparency would prove to be problematic for countries like apartheid South Africa that were banned from trading on global platforms such as the NYMEX. As has been previously alluded to, the apartheid government paid roughly \$2 billion per year in oil premiums to suppliers during the late-1970s and early-1980s in order to circumvent the sanctions on the country.³⁶⁸ Furthermore, apartheid South Africa purchased oil based on the market based oil price (determined primarily by the NYMEX and later the ICE exchange), which often meant that they paid more than other bulk buyers who purchased oil directly from the big oil producing companies.³⁶⁹ The rapid growth of oil trading via the NYMEX through their exchange platform is another example of how far-flung market changes drastically impacted the South African economy. The move from independent oil contract being negotiated between buyers and sellers often created a sense of stability in the relationship between the two. However, with oil now being traded on open markets which were subjected to the kinds of volatility that stocks and bonds were accustomed to, there was increasing uncertainty for large buyers (like the South African government) as to what the price for their consignments might be in future months and years. Thus, despite the fact that the NYMEX and its traders were far removed from the South African economy geographically and (arguably) ideologically, the very existence and popularity of the exchange impacted apartheid South Africa significantly from a monetary perspective. Significant price volatility in the oil market initiated by the oil traded on exchanges had a material effect on the apartheid economy and oil purchasing policy.

³⁶⁶ *Ibid.*, pg. 89.

³⁶⁷ *Ibid.*, pg. 45-83.

³⁶⁸ Davis, J. 'Squeezing Apartheid', *Bulletin of Atomic Scientists*, (November, 1993), pg. 5.

³⁶⁹ McGrath Goodman, L. *The Asylum: The Renegades Who Hijacked the World's Oil Market* (New York, 2013), pg. 46-60.

International free markets posed a significant problem for the apartheid economy. By its very nature, the apartheid economy was not free: the ability for individuals to operate in the South African marketplace was constrained not only by the colour of their skin, but the intentions of their actions as well.³⁷⁰ In other words, you could only operate businesses (and do business with other countries) if you were towing the official political line prescribed by the apartheid government. Hence, the supposed ‘free market’ that existed in apartheid South Africa was actually not as free as it was made out to be. Indeed, African-American economist and distinguished Professor of Economics at George Mason University, Walter Williams, commented that, “[t]he whole ugly history of apartheid has been an attack on free markets and the rights of individuals, and glorification of centralised government power”.³⁷¹ Regardless of one’s individual preference regarding economic philosophy and ideology, the top-down governance of the South African economy was one of the mechanisms by which the apartheid government reinforced the apartheid system through economic structures. Indeed, anti-capitalist sentiment had been present in white segregationist politics before apartheid officially began. It is believed that Jan Smuts stated that the, “[Afrikaners], insignificant as we are, should be amongst the first people to begin the struggle against the new world tyranny of capitalism”.³⁷² Author Stephen Mulholland (although hardly the final word on the subject) takes this assertion a step further and states that, “[i]t is one of the great tragedies that free markets were identified with apartheid”.³⁷³ Although the apartheid government allowed *some* businesses to operate with total freedom, most other businesses were dictated to by government as to how they could behave (such as the oil companies with operations in South Africa e.g. Caltex and Engen). From a global perspective, this lack of commercial freedom did create issues for domestic economic growth and stability. By the mid-1980s, global trade had begun to move away from the trade between nation states, and had adopted globalized markets as the preferred place of trade.³⁷⁴ This was problematic for the apartheid government because, in contrast to the domestic South African market, global markets could not be dictated to by a nation state unless they held a monopoly over a particular resource. Although South Africa was the largest global gold producer at the time, this market was not significant enough to allow the apartheid government to manipulate

³⁷⁰ Mulholland, S. *Another Voice II* (Cape Town, 2002), pg. 5.

³⁷¹ Mulholland, S. *Another Voice II* (Cape Town, 2002), pg. 5.

³⁷² *Ibid.*

³⁷³ *Ibid.*

³⁷⁴ Dubow, S. *Apartheid, 1948-1994* (Oxford, 2014), pg. 274.

global trade. As a result of this lack of power, the South African government was largely shut out of global trade due to its racial segregationist policies.

When considering the global oil paradigm during the change from independent pricing to transparent market pricing, a particular emphasis needs to be placed on the role that the oil traders played. Although nation states and large oil companies led the industry in terms of trade up to the mid-1970s, by the mid-1990s the trade was dominated primarily by traders (also referred to as speculators). To a certain extent, this was due to the computerization of oil trading. Although it did not start with oil, a move to electronic trading in commodities began once the capabilities of the internet were fully understood. Arguably the pioneers of this type of electronic trade were Enron which created a standardized contract for natural gas which it traded on its online trading platform, EnronOnline.³⁷⁵ Platforms like EnronOnline, along with the ability to trade commodities on margin,³⁷⁶ meant that independent traders could enter the commodities market and make a significant impact therein despite their ‘outsider’ status in the market place. Indeed, many of these traders actually existed within the trading houses themselves.

The newly globalized nature of the oil trade by the 1980s meant that trying to track the buying and selling of the commodity in South Africa was particularly difficult. Indeed, the majority of the international oil supplies to South Africa were clandestine by nature. Thus in order to identify the embargo busting traders, a highly sophisticated anti-apartheid movement by the name of the Shipping Research Bureau, set out to determine how much oil was being shipped to South Africa through a refined system of spies, informers and agents tracking the various movements of ships moving around the world.³⁷⁷ With the help of centralized researchers, the Shipping Research Bureau attempted to identify many ships trying to keep their identities secret through this organized network.³⁷⁸ Indeed, the Shipping Research Bureau were not alone in their attempts to track and stop oil shipments to South Africa. In

³⁷⁵ McLean, B & Elkind, P. *The Smartest Guys in the Room: The Amazing Rise and Fall of Enron* (London, 2013), pg. 26-29.

³⁷⁶ Meaning that you only put up a portion of the money you trade as a deposit, e.g. 10% of the total amount traded.

³⁷⁷ Hengeveld, R & Rodenburg, J. *Embargo: Apartheid's Oil Secrets* (Amsterdam, 1995), pg. 113.

³⁷⁸ *Ibid.*

1978 the then President of the ANC, O.R. Tambo, formed an 'oil unit' within the London branch of the organization with the explicit intention of not only trying to, "stop oil from going to South Africa, but to first find out what was going on. We had been given papers exposing the role of Mobil in Rhodesia, we had been working with Kairos on Shell. Others had been working on the oil embargo, but what was new was that the ANC was taking a direct and deliberate interest in it."³⁷⁹ The hope of these efforts by both the ANC and the Shipping Research Bureau was to identify the main suppliers of crude oil to South Africa and make meaningful attempts to stop them doing so. In many cases, these efforts proved to be fruitful: Both John Deuss and Marc Rich (in their capacity as oil suppliers to South Africa) were discovered by the Shipping Research Bureau and subsequently exposed as such.³⁸⁰ Rich in particular became a focal point of the Shipping Research Bureau research team. By 1984, the data on Rich's trade with South Africa was substantial. Through his companies (Marc Rich & Company and Minoil), it became clear that Rich was arguably one of South Africa's largest independent oil suppliers.³⁸¹ Initially, this came as a surprise to the Shipping Research Bureau. For the most part, the focus of the organization had been multinational oil companies who appeared to be the backbone of the supply to apartheid South Africa. However, as the organization matured and the research data began to paint a clearer picture of the oil trade with South Africa, the magnitude of the role played by independent traders like Rich began to subvert the organizations' strict focus on multinationals.³⁸² In order to try and stop traders like Deuss and Rich, the Shipping Research Bureau began to shift emphasis within the organization in order to create a unified legislative and enforcement structure with regards to the oil embargo on South Africa.³⁸³ Although this goal was ultimately never realized, the pressure that was put on independent oil traders through organizations such as the Shipping Research Bureau did create an atmosphere of public pressure on these traders to cease trading. Although Rich continued trading, John Deuss ultimately stopped trading oil with South Africa in 1987 justifying his decision by saying that, "the change we had hoped for has not come about. We don't believe in sanctions. They will not work. But that does not mean that we have to continue trading with South Africa".³⁸⁴

³⁷⁹ *Ibid.*, pg. 95.

³⁸⁰ Hengeveld, R & Rodenburg, J. *Embargo: Apartheid's Oil Secrets* (Amsterdam, 1995), pg. 113.

³⁸¹ *Ibid.*

³⁸² *Ibid.*, pg. 138.

³⁸³ *Ibid.*, pg. 175.

³⁸⁴ LeVine, S. *The Oil and the Glory: The Pursuit of Empire and Fortune on the Caspian Sea* (New York, 2007), pg. 134.

The liberalization of the global oil market through financialization created both obstacles and opportunities for the apartheid government with regards to oil supply. From a price perspective, apartheid South Africa was forced to pay significantly more for its oil due to the new spot-market pricing structures and the decline of independent supply deals between buyers and sellers. Furthermore, the intervention of OPEC in the oil market from 1973 onwards created yet more obstacles to the South African oil supply paradigm due to at least half the world's production base being unwilling to sell to South Africa. Indeed, along with imports of oil by multinational oil companies being a significant source of crude, it was ultimately the black market oil imports into South Africa by individuals such as Marc Rich and John Deuss which met the total demand for oil in the country at the time. However, due to the work done by organizations such as the Shipping Research Bureau, the South African oil supply position ultimately moved away from independent suppliers by the late-1980s. Although there is still debate regarding the successes that the oil embargo achieved (along with the impact that traders such as Deuss and Rich had on said embargo) the reality is that, for the most part, the demand for oil within South Africa was met during the apartheid era.

Geological Reassessment of the Oil-Bearing Prospects within the Onshore Algoa Basin

By the early 1990s, South Africa was being gradually reintegrated into the world community following the reforming of apartheid's segregationist policies. Although much was still to be done politically, the economic situation in the country began to improve significantly due to the relative tempering of international sanctions against the South African business sector. In particular, the South African resources market (namely metals, minerals and energy commodities) began to gain significant attention from foreign companies hoping to invest in resources which had been significantly underexploited due to trade embargos against apartheid South Africa. Although the primary focus of these foreign companies was on precious metals reserves as well as iron and coal deposits, there were a number of institutions looking into South Africa's oil and gas potential. Indeed, once the Moss gas came online in 1992, it did appear that there might well be more commercially viable deposits of oil and gas within the country and its territorial waters. Another important aspect of oil and gas exploration in South Africa was that a number of significant exploration efforts had already taken place in the country spearheaded by Soekor. Although the Moss gas reserves were the only deposits being exploited at the time, the hydrocarbon information Soekor collected gave companies a clearer indication of where the best exploration areas were and, more importantly, where the 'dead' areas were. In particular, Soekor's efforts in exploring the region between the Free State and KwaZulu Natal drilling over 30 exploration boreholes, the Great Karoo basin, and the Northern Cape largely indicated the relative lack of prospects in these regions.³⁸⁵ Hence, excluding two oil shows that occurred in northern KwaZulu Natal, the only other meaningful oil show was that found in the onshore Algoa basin.³⁸⁶ Furthermore, an article penned by Jean A. Malan (who at one point served as the chief geologist at Soekor) brought renewed interest in the onshore Algoa basin and its potential as a possible petroleum system location.³⁸⁷

³⁸⁵ Petroleum Agency of South Africa (PASA). 'Mesozoic and Tertiary: Algoa and Gamtoos basins', internal PASA document, *author is not explicitly recognized*, pg. 4.

³⁸⁶ *Ibid.*

³⁸⁷ The maps used in this assessment are within Malan's Oil & Gas Journal article.

Despite previous exploration of the onshore Algoa basin yielding minimal hydrocarbon prospectivity, the potential thereof required further exploration from a geological standpoint. The key aspect of the onshore Algoa basin that needed to be deciphered was the highly complex subsurface stratigraphy of the prospect area. In particular, the rift structures that exist within the Algoa basin (both onshore and offshore) indicate that large oil and gas accumulations may exist therein.³⁸⁸ The problem that was faced by early prospectors in the Basin was that the rifts themselves are caught in a highly complex stratigraphic area which makes it difficult to interpret the best potential areas in which to drill.³⁸⁹ However, the significance of the rift needs to be seen in conjunction with the existence of a suitable source rock and reservoir structures. In this respect, the Colchester member certainly indicated that productive source rock was present in the basin and may be in the same prospect area as the rifts that existed on the outer edges thereof.³⁹⁰ Due to the rifting at the outer edges of the basin, a number of faults emerged therein which would indicate the potential for suitable hydrocarbon traps. Although a small portion of this knowledge was known to the Soekor drillers in the late-1960s and early-1970s, it was certainly not fully understood. Indeed, much of this knowledge only came to light with different interpretations of the geology decades later. Ultimately, the rifting of the Basin did provide a significant indication that notable trapping mechanisms may exist in the onshore Algoa basin.

Although early interpretations of the rifted sections of the Basin did not lead to a conclusive view of the petroleum system potential thereof, more recent interpretations indicate that most notable deposits of hydrocarbons (assuming suitable reservoir and cap rocks are in place) would be in the actual rifts themselves. It seems that the most prolific trapping mechanisms associated with the onshore Algoa basin rift are the numerous half-grabens that exist therein.³⁹¹ However, trying to interpret the complex of half-grabens has proved to be difficult: without sufficiently helpful seismic mapping of the area, as well as the lack of impetus (both past and present) to do so, indicates that the best potential reservoirs in this

³⁸⁸ Malan, J. 'Geology, Potential of Algoa, Gamtoos Basins of South Africa', *Oil & Gas Journal*, 91, 46, 15 November (1993), pg. 1.

³⁸⁹ Despite the complexity, rift structures are worth pursuing: a great deal of the worlds' conventional oil reserve are trapped in such structures.

³⁹⁰ Van Wyk, S.J. 'Geological Well Completion Report of Borehole AL 1/69', *Soekor (Pty) Ltd*, August 1971, pg. 4 & 5.

³⁹¹ Malan, J. 'Geology, Potential of Algoa, Gamtoos Basins of South Africa', *Oil & Gas Journal*, 91, 46, 15 November (1993), pg. 1.

area are not yet clear.³⁹² The primary reason for this complexity is that the Algoa basin is comprised of three sub-basins (these being the Port Elizabeth, Uitenhage, and Sundays River troughs). The area drilled by Soekor in the late-1960s and early-1970s was largely a part of the Sundays River trough, an important fact considering that the Colchester member source rock was discovered in said area.³⁹³ Furthermore, the portion of the Uitenhage trough that developed onshore is located between the Sundays River trough and Coega fault.³⁹⁴ Although the Algoa basin is the primary area of interest here, it needs to be illustrated that the sedimentary composition of the Algoa basin is also (to a certain extent) shared with the Gamtoos basin. As a result, the layering of the sediments composing the Algoa and Gamtoos basins have been divided into the following four categories: 1) the synrift, 2) the early drift, 3) the canyon fill, 4) the thermal subsidence.³⁹⁵ As to the onshore geological makeup of the Algoa basin, the sediments encountered included quartzite's from the Ordovician to Silurian Table Mountain group, and slates from the Devonian Bokkeveld group.³⁹⁶ Another assertion made by Malan regarding the geology and tectonic setting of the Algoa basin was that as, "east and west Gondwana separated along the dextral Agulhas/Falkland transform, structural features-attributed to the tectonic strain-developed".³⁹⁷ This was a significant assessment of the structural features that formed, not because Malan's version was necessarily correct, but rather because it was the first assessment of its kind.

Another potential trap formed by the tectonic changes in the Algoa basin, as asserted by Malan, are anticlines. The primary reason for this is the anticlinal features exhibited not only in the Algoa basin but in the Gamtoos basin as well.³⁹⁸ From a trapping perspective, anticlines house some of the largest oil reserves in the world. For example, the two largest oil fields in Saudi Arabia, the Ghawar and Abqaiq fields, are both trapped by anticline structures.³⁹⁹ Thus, the presence of such anticlinal structures was a promising discovery by Malan, adding a new perspective on possible traps. As such, the tectonic and geological

³⁹² *Ibid.*

³⁹³ Malan, J. 'Geology, Potential of Algoa, Gamtoos Basins of South Africa', *Oil & Gas Journal*, 91, 46, 15 November (1993), pg. 2.

³⁹⁴ *Ibid.*

³⁹⁵ *Ibid.*

³⁹⁶ *Ibid.*

³⁹⁷ *Ibid.*

³⁹⁸ *Ibid.*

³⁹⁹ Nairan, A & Alsharhan, A. *Sedimentary Basins and Petroleum Geology of the Middle East* (Amsterdam, 1997), pg. 484.

setting of the onshore portion of the Algoa basin does present an attractive option from a trapping perspective. However, despite this attractiveness, the existence of a complete petroleum system is contingent on the remaining factors of the subsurface reservoir and hydrocarbon expelling structures.

From a petroleum geology perspective, Malan and other revisionists of the petroleum potential of the onshore Algoa basin mostly reiterated the original assessments thereof. However, there were a number of important new interpretations (and an emphasis placed on previous assessments) made by Malan in particular reinforced the view that a petroleum system could exist within the onshore Algoa basin. Writing more generally on the geological traits of the Algoa and Gamtoos basins, Malan first makes the point that, “[d]ry gas and oil prone source rocks are present” therein. This is an important point considering the fact that any doubt over the hydrocarbon expelling source rock could potentially render the prospectivity of the region redundant.⁴⁰⁰ Although the Gamtoos basin housed Kimmeridgian and Portlandian source rocks which indicated a potentially high hydrocarbon yield, the Port Elizabeth trough (largely a part of the Algoa basin) indicated the best potential source rocks.⁴⁰¹ The source rocks intersected by boreholes drilled in the half-graben (i.e. the Port Elizabeth trough) were approximately 60m thick, consisting of marginally mature marine shales with a potential yield of 8.1 kg/ton of rock.⁴⁰² The potential of this source rock is also further improved by seismic results which indicate that the deeper parts of the trough containing the source rock may have a higher yield due to improved maturity thereof.⁴⁰³ Considering that the minimum expulsion from source rock required for suitable oil reservoir creation is approximately 2 kg/ton, the Port Elizabeth trough source rock most certainly provides significant oil potential.⁴⁰⁴ There is also an indication by Malan that the ‘unexplored’ south-eastern region of the Uitenhage trough may also house said source rock along with the yields previously indicated.⁴⁰⁵

⁴⁰⁰ Malan, J. ‘Geology, Potential of Algoa, Gamtoos Basins of South Africa’, *Oil & Gas Journal*, 91, 46, 15 November (1993), pg. 3.

⁴⁰¹ *Ibid.*

⁴⁰² *Ibid.*

⁴⁰³ *Ibid.*

⁴⁰⁴ Scholl, D & Vallier, T. *Geology and Offshore Resources of Pacific Island Arcs: Tonga Region* (Virginia, 1985), pg. 344.

⁴⁰⁵ It should be noted that the south-eastern part of the Uitenhage trough was unexplored at the time this article was penned (i.e. 1993). It has subsequently been explored, although not thoroughly.

The onshore Algoa basin also provided some new potential opportunities relating to promising petroleum geological formations. The Sundays River trough in particular appeared to be a prospective area. Malan was of the view that the late-Jurassic source rocks therein (consisting mainly of shales) may be even higher in total yield than those encountered in the Uitenhage trough, producing somewhere between 8-12 kg/ton of rock.⁴⁰⁶ It should be noted that the views on the productivity of the source rocks are simply estimates due to the fact that not many samples had been taken from the area (especially since the 1970s); however the available information on the organic content of the source rock indicates good potential.⁴⁰⁷ Unfortunately, the onshore source rocks present in both the onshore Algoa and Gamtoos basins are notably thinner and less dense than the offshore source rock. Whereas the onshore source rocks are approximately 60m thick, the offshore source rocks are 130m thick indicating that the expulsion of hydrocarbons from said rocks to be significantly more on offshore sites.⁴⁰⁸ Although this does provide a certain limitation as to the potential of the onshore sites, the offshore sites may be far more difficult and expensive to drill which may potentially make the onshore sites attractive (assuming a fully functioning petroleum system is in place). As such, Malan implies the view that exploration in both areas may be warranted.

In terms of suitable reservoir structures being in place within the onshore Algoa basin, much of the geological studies done thereon indicate that the area could be conducive to housing oil and/or gas reserves. With regards to the reservoir rocks within the Uitenhage trough in particular, there are sandstones therein with reservoir qualities. Indeed, Malan believes that these sandstones could have a maximum porosity of 25% and permeability of 400 md.⁴⁰⁹ From a strictly objective (and largely superficial) standpoint, a sandstone with these permeability and porosity figures should be more than suitable as a reservoir rock. However, it may not be the case that the highly porous and permeable rocks are found together in situ. In order for a rock structure to be considered a suitable reservoir, the porous and permeable rock needs to exist *within the same space*.⁴¹⁰ The issue here is that subsurface rocks are (by

⁴⁰⁶ Malan, J. 'Geology, Potential of Algoa, Gamtoos Basins of South Africa', *Oil & Gas Journal*, 91, 46, 15 November (1993), pg. 3.

⁴⁰⁷ *Ibid.*

⁴⁰⁸ *Ibid.*

⁴⁰⁹ *Ibid.*

⁴¹⁰ Shepherd, M. *Oil Field Production Geology: AAPG Memoir 91* (Oklahoma, 2009), pg. 42.

their very nature) not homogenous units. At one level a reservoir rock might be highly permeable and at other level impermeable. The same is true of porosities. Thus, in order for a rock structure to be considered a suitable reservoir rock, there would need to be at least one level of rock where both high permeability and porosity are encountered simultaneously. Due largely to the limited testing of the area, it is not clear that this is the case. This is not to say that there is not a reservoir rock that contains these traits simultaneously; however it still needs to be proven that it does exist. In the case that the sandstone has the correct permeability and porosity within the same level, there are promising signs that a suitable petroleum system might exist. In particular, the composition of the synrift succession within the Uitenhage trough is 40% sandstone, indicating that this area could likely be the best starting point for exploration therein.⁴¹¹ Although not as promising as the synrift succession, there are sandstones of a slightly poorer quality within the, “canyon fill sequences”.⁴¹² Despite being outside the purview of this paper, it should also be noted that potential sandstone reservoirs appear to exist in the onshore Gamtoos basin as well (there were also gas stacks encountered when drilling in the region took place within sandstone reservoirs).⁴¹³ This would support the view that notwithstanding the lack of proven reserves, there are onshore locations which might well be conducive to producing oil and gas. As to the existence of trapping mechanisms, there seem to be many. Largely owing to the notably volatile and complex tectonic history of the area, there seems to be no lack of potential trapping sites. Along with the regionally developed claystone seals in existence; the numerous unconformities, subcrops, anticlines, and tilted fault blocks provide, in the words of Malan, “exciting exploration opportunities”.⁴¹⁴ As such, Malan asserts that the fundamental petroleum geology of the general Eastern Cape onshore basins, and the onshore Algoa basin in particular, do offer enough positive evidence to warrant renewed oil and gas exploration in the region.

Despite the fact that Malan asserted almost no new finding in his reassessment of the onshore Algoa and Gamtoos basins, he did indicate that the oil and gas prospectivity in the region was positive. In particular, the fact that an onshore drill stem test produced 36 gravity oil (albeit at

⁴¹¹ Malan, J. ‘Geology, Potential of Algoa, Gamtoos Basins of South Africa’, *Oil & Gas Journal*, 91, 46, 15 November (1993), pg. 4.

⁴¹² *Ibid.*

⁴¹³ *Ibid.*

⁴¹⁴ *Ibid.*

an insignificant flow rate) within the region proves that oil and gas is present therein.⁴¹⁵ Furthermore, Malan makes particular mention of a log evaluation (along with oil shows) that indicated the presence of a potential oil reservoir in close proximity to the initial drill site.⁴¹⁶ Although subsequent drilling in the area failed to find the reservoir in question, Malan still asserted that reserves probably exist in that area; although he goes on to say that these hoped for reserves are likely trapped within fractures.⁴¹⁷ Through Malan and others' work, it has also become apparent that due to the distribution of the reservoirs and source rocks, the most attractive exploration areas are most likely the undrilled southern Port Elizabeth and southern Uitenhage troughs.⁴¹⁸ The projected prospect is that the various stratigraphic traps present within the Basin should hold at least one commercially exploitable reserve. However, the complexity of the potential stratigraphic traps may indicate limitations from a commercial perspective. Thorough exploration of complex structural and stratigraphic sequences has precedent, although the complex areas explored often promise a much higher yield than the onshore Algoa basin. For example, the North Sea petroleum systems are also found in highly complex stratigraphic structures.⁴¹⁹ However, the search for oil within the North Sea was far more prospective than the onshore Algoa basin thus justifying the enormous costs associated therewith. One should be mindful of these large potential costs of further exploring the Basin. Fortunately, further exploration of the Basin is supported by the fact that a great deal of seismic data was collected from the 22 boreholes that were drilled during late-1960s and early-1970s. Although this information is more certainly incomplete, Malan makes the assertion that this should serve as the basis for further exploration in the area (which, under Exxoteq, it did).⁴²⁰ Although penned in 1993, Malan's paper likely served as the catalyst of renewed interest in the onshore Algoa basin. Despite the fact that much work still needed to be done regarding data collection etc., there was enough evidence of potential petroleum systems within the Basin that Malan believed that continued exploration therein was justified.

⁴¹⁵ *Ibid.*

⁴¹⁶ *Ibid.*

⁴¹⁷ Malan, J. 'Geology, Potential of Algoa, Gamtoos Basins of South Africa', *Oil & Gas Journal*, 91, 46, 15 November (1993), pg. 4.

⁴¹⁸ *Ibid.*

⁴¹⁹ Norsk Petroleumsforening. *Sequence Stratigraphy on the Northwest European Margin: Proceedings of the Norwegian Petroleum Society Conference, 1-3 February 1993, Stavanger, Norway* (London, 1995), pg. 443.

⁴²⁰ Malan, J. 'Geology, Potential of Algoa, Gamtoos Basins of South Africa', *Oil & Gas Journal*, 91, 46, 15 November (1993), pg. 5.

The revisions of the oil and gas prospectivity of the onshore Algoa basin (which Malan initiated in 1993 with the publishing of his *Oil & Gas Journal* article) in hindsight seem to be justified. The first point that is made pertains to the subsurface complexity of the stratigraphic structures in place. Indeed, early drilling efforts in the area may well have failed simply due to the fact that the unknowns of the complex and volatile stratigraphy made hitting the right formation highly unlikely the first time around. Indeed, the assertion (post-exploration) that the onshore Algoa basin took the form of a rift basin provided clues as to where the more prospective traps and seals may be. Furthermore, the view (again, post-exploration) that the most promising exploration areas may actually be in the rifted sections, suggested that the initial wells drilled by Soekor and its partners may have been in the wrong locations. Had it been known prior to Soekor's earliest drilling efforts that a number of half-grabens existed within the rifted section, it would have likely altered its approach to prospective areas.⁴²¹ This is also true of the anticlinal structures, considering the success of said structures as large oil and gas traps. Another important geological point that was reinforced by Malan was the quality of the source rocks encountered within the Basin. Not only were the source rocks high yielding and relatively thick, they also appeared to exist within the trough areas where the best trapping mechanisms seemed to be present. Regarding troughs, the Port Elizabeth and Sundays River troughs appear to be the most exciting sites from an exploration perspective, according to Malan. One of the most notable changes in the revised view of the onshore Algoa basin's potential was the potential quality of the reservoir rocks in the area. The early data results that came from Soekor's exploration in the area indicated that despite good porosity therein, the permeability within the structures may be problematic. However, Malan stated that the permeability may be as high as 400 md. Although there was not incontrovertible evidence to support Malan's proposition, any such potential would give a significant boost to the prospectivity of the region. All these combined factors (although not proving anything beyond a reasonable doubt) substantiated the view that renewed interest in the onshore Algoa basin was indeed defensible.

⁴²¹ It can be argued that this was indeed partially known by Soekor et. al. prior to exploration (primarily by topographical illustrations), but was made far clearer by the work done regarding the seismic mapping and sampling done during the exploration thereof.

Chapter 3

*Monetization & Disillusion: The New Investors, The
New Riches, and The Collapse*

The New South African Economic & Commercial Model

In the years leading up to the end of apartheid in 1994, one of the foremost ideological debates that took place between the apartheid state (including the private business sector) and the various opposition institutions (primarily represented by the Tripartite Alliance) concerned the structure and management of the South African economy. In order to provide a concise yet ample overview of the structures in which South African businesses have been expected to operate within post-1994, it is essential to understand the policies and ideological frameworks which have governed the private sector since the birth of the new South Africa. Hence, the first focus of this subsection will be to determine what the characteristics of the South African economic policies implemented up to the present day represent from an ideological standpoint. Furthermore, it will also be necessary to assess the tangible outcomes of said policies in order to determine if the implementation has achieved the intended ideological objectives used as the basis thereof. The second focus of this subsection will be the role that the resource sector played in influencing these economic policies. In particular, there will be a strong emphasis placed on the ideological compromises made by the ANC (and, ultimately, the Tripartite Alliance as a whole) to join the global ‘free market’ structures in order to benefit from global trade networks and market systems. This chapter offers a basic perspective of the South African business environment and what that meant for businesses created post-1994.

From the late-1970s onwards, drastic changes took place within the world economy. Indeed, due to its status as the world’s biggest economy at the time, many of these changes were initiated by the US in response to the various economic obstacles they needed to overcome.⁴²² In conjunction with the social unease pertaining to the peak of Civil Rights Movement and the loss of the Vietnam War, the early 1970s were a difficult time for the US both politically and economically. The combination of the Watergate scandal, the Arab oil embargo, the Iranian Revolution, domestic tax rises and slowing economic growth exposed

⁴²² Terreblanche, S. *Lost in Transformation: South Africa’s Search for a New Future Since 1994* (Johannesburg, 2012), pg. 22-23.

cracks in the US façade of the super power.⁴²³ From an economic perspective, it became an imperative for the US government to institute significant structural changes in order to kick-start the growth engines of the country. Probably the most significant economic change within the US (and, ultimately, with all of its trading partners) was the Nixon administration's relinquishing of the Gold Standard.⁴²⁴ The US's relinquishing of the Gold Standard and the subsequent collapse of the Bretton Woods system that underpinned the currency agreements between the world's major trading nations ultimately led to significant trade imbalances in the following years.⁴²⁵ Although short lived, the rapid dollar devaluation that took place thereafter created major trade advantages for the US government and corporations.⁴²⁶ However, more important than this competitive advantage that was created by and for the US, was the effective 'exporting' of neoliberal currency mechanisms to Europe and the rest of the world.⁴²⁷ In this sense, the US ultimately forced its neoliberal view of how currency markets should operate on the rest of the world simply by dropping the Gold Standard and Bretton Woods; an effect that South Africa did not escape. It should be noted at this point that the neoliberal culture that came to dominate the world economy from the mid-1980s onwards had a distinctly American flavour. However, Terreblanche argues that the American and British notions of *laissez-faire* capitalism and free market structures (at least as they are broadly interpreted today) have significant differences regarding their inclusion of global market structures.⁴²⁸ Early British ideologues believed that within the constraints of the British free-trade empire, the government should allow the economy to be regarded as a self-regulating mechanism which (they believed) should find equilibrium if left to its own devices.⁴²⁹ Although largely similar, the American model differed in one critical respect: the American version of free market fundamentalism by the end of the 20th century took the position that the self-regulating free market structure should apply to all nations, on condition that said nations also allowed their economies to adopt *laissez-faire* economic policies.⁴³⁰

⁴²³ *Ibid.*, pg. 23.

⁴²⁴ Terreblanche, S. *Lost in Transformation: South Africa's Search for a New Future Since 1994* (Johannesburg, 2012), pg. 23.

⁴²⁵ Bordo, M & Eichengreen, B. *A Retrospective on the Bretton Woods System: Lessons for International Monetary Reform* (Chicago, 2007), pg. 3.

⁴²⁶ Terreblanche, S. *Lost in Transformation: South Africa's Search for a New Future Since 1994* (Johannesburg, 2012), pg. 23.

⁴²⁷ By exported, it is simply meant that in order to stay globally competitive, Europe and other large global trade nations had to apply free-market mechanism to their currency controls.

⁴²⁸ Terreblanche, S. *Lost in Transformation: South Africa's Search for a New Future Since 1994* (Johannesburg, 2012), pg. 31.

⁴²⁹ *Ibid.*

⁴³⁰ *Ibid.*

The implied assumptions therein were that the competition taking place between these nations would, “create an equilibrium in the global market that would be to the advantage of all the people on the globe - if not immediately then in the course of time!”⁴³¹ Regardless of the merits and demerits of such positions, it was ultimately the American ideology that came to dominate global economic trade simply because the US was the largest economy and global trader at the time (the US was even beginning to experience trade deficits due to its imports from other countries, meaning its trade policies had a material impact on the countries with whom it traded).⁴³² In conjunction with the American neoliberal model being largely adopted globally from the mid-1980s onwards, the rest of the world also began adopting the American capitalist ‘style’; with this ‘style’ referring particularly to mass consumerism and the various ancillary industries that supported it (e.g. mass media, advertising etc.).⁴³³

The American-led neoliberal ideology was, to a large extent, adopted by apartheid South Africa. However, many of the notions of ‘privatized gain’ and ‘state deregulation’ were interpreted differently by the apartheid government. Instead of the state disengaging from the private sector, the apartheid state actually began to use the private sector for its own gain. Needless to say, this practise created situations which can at best be described as unethical, and at worst illegal. One example of illegal collusive practises between businesses and the apartheid government was the Muldergate scandal where the apartheid government redirected state funds to bribe international news agencies in exchange for their support.⁴³⁴ However, many of the relationships between state and private enterprises, despite not being illegal, were most certainly unethical. The establishment of Armscor is an example of such a relationship. The resource companies within South Africa greatly benefited financially from the establishment of Armscor and cozied up to the apartheid state while at the same time making deals with the opposition movements in the build up to the collapse of the apartheid

⁴³¹ Terreblanche, S. *Lost in Transformation: South Africa's Search for a New Future Since 1994* (Johannesburg, 2012), pg. 32.

⁴³² Cline, W. *Trade and Income Distribution* (Washington DC, 1997), pg. 69.

⁴³³ Terreblanche, S. *Lost in Transformation: South Africa's Search for a New Future Since 1994* (Johannesburg, 2012), pg. 33.

⁴³⁴ Rees, M & Day, C. *Muldergate: The Story of the Info Scandal* (Johannesburg, 1980), pg. 32-43.

system.⁴³⁵ As such, the South African economy had strong American neoliberal traits, but twisted the ideology to benefit the white business sector as much as possible.

Following the enactment of the Comprehensive Anti-Apartheid Act by the US Congress in October 1986, the South African economic (and, by extension, political) climate began to change fairly rapidly relative to past action. Furthermore, it was becoming increasingly clear that political inclusion of struggle groups (primarily the ANC and the Tripartite Alliance) in political and economic negotiations and decision making was becoming increasingly necessary. However, despite the seemingly inevitable political changes on the horizon, both apartheid politicians and the South African business sector were trying to solidify their financial position in the country regardless of the political changes that might take place. In particular, they needed to convince the ANC to break with their socialist positioning, and ensure that a populist mass redistribution of the country's business and governmental assets did not take place, and that the dominant corporations under apartheid remained so in the new political construct⁴³⁶ However, the white business sector was facing problems in the process: the first was trying to find a working framework from which it could interact positively with the trade union movement; and secondly, they had to try convince the National Party (NP) members (especially the *verkramptes*) that making a deal with the ANC was not only inevitable, but in the best interests of the white business in South Africa.⁴³⁷ Indeed, the main drivers within the business sector who were looking for this reform are broadly referred to as the Mineral Energy Complex (MEC).⁴³⁸ In the late-1980s and early-1990s, the MEC pushed hard to get both the ANC and the NP to accept the neoliberal economic framework which would allow the MEC to maintain their economic might.⁴³⁹ Despite the many difficulties faced by the MEC in trying to get the NP to accept its views on the composition of a democratic South Africa, a middle ground was eventually reached. In 1993, the NP published its 'Normative Economic Model' as its view of the economic framework that should govern a

⁴³⁵ Terreblanche, S. *Lost in Transformation: South Africa's Search for a New Future Since 1994* (Johannesburg, 2012), pg. 57.

⁴³⁶ *Ibid.*, pg. 59.

⁴³⁷ *Ibid.*

⁴³⁸ It should be noted at this point that the use of the 'Mineral Energy Complex' in this paper refers to the normative view put forward by Sampie Terreblanche in *Lost in Translation*. All problematized or revisionist adaptation of this moniker are not applicable to how it should be understood in this paper.

⁴³⁹ Terreblanche, S. *Lost in Transformation: South Africa's Search for a New Future Since 1994* (Johannesburg, 2012), pg. 60.

democratic South Africa.⁴⁴⁰ Indeed, the views put forward in the Normative Economic Model memorandum were heavily influenced by the MEC and had a strong economic ideological bent in favour of American neoliberal thought, particularly pertaining to the notion of globalized free markets.⁴⁴¹ Although the MEC managed to partner with the NP on touting its view of the future South African economy from the outset (in spite of the various difficulties), the initial approach of the ANC by the MEC was not as fruitful.⁴⁴² By the late-1980s and early-1990s, it became clear that a leader/spokesperson of the MEC needed to engage in a more constructive and personal basis with the ANC. As a result of this new thinking, Dr Zach de Beer (an executive director of Anglo-American at that time) was asked to try and tame the socialist rhetoric coming out of the ANC.⁴⁴³ Although most of de Beers' attempts at creating a working environment between the MEC and ANC ultimately failed, it seems to (at the very least) have brought the relationship of the resources sector with the struggle movements into the public eye. This, it must be noted, was an important step. Although de Beer would have likely harboured pro-capitalist views,⁴⁴⁴ he still went so far as to say that, "[b]usiness was [in 1986] prepared to go to greater lengths than ever before in urging liberal change."⁴⁴⁵ Indeed, it was due to the engagement of white business representatives such as de Beer which (to a large extent) influenced the ideological shifts that took place within the ANC between 1990 and 1996.⁴⁴⁶ Concerning the actual change in official ANC ideology, the organization went from taking an explicitly socialist and redistributive position to the American neoliberal free market system. Although this change in ideology may now not seem particularly revolutionary, Nelson Mandela stated when released from prison that, "the nationalization of mines, banks and monopoly industry is the policy of the ANC and a change or modification of our views in this regard is inconceivable".⁴⁴⁷ Needless to say, this was a significant change and doubtless would have involved serious machinations within the organization. An example of the deliberate cosy

⁴⁴⁰ Terreblanche, S. *Lost in Transformation: South Africa's Search for a New Future Since 1994* (Johannesburg, 2012), pg. 60.

⁴⁴¹ *Ibid.*

⁴⁴² The primary aim of the reference to relationship between struggle movements and the MEC is to focus on the effects that came out from the adoption of neo-liberal economic policies by the ANC-led government. The history of why neo-liberal economic policies were adopted is, for the purposes of this thesis, of less importance than the consequences that the adoption of the policies had on South Africa.

⁴⁴³ *Ibid.*

⁴⁴⁴ Sellstrom, T. *Sweden and National Liberation in Southern Africa: Solidarity and Assistance, 1970-1994* (Uppsala, 2002), pg. 847.

⁴⁴⁵ Terreblanche, S. *Lost in Transformation: South Africa's Search for a New Future Since 1994* (Johannesburg, 2012), pg. 60.

⁴⁴⁶ *Ibid.*, pg. 63.

⁴⁴⁷ Taylor, I. *Stuck in Middle GEAR: South Africa's Post-apartheid Foreign Relations* (Connecticut, 2001), pg. 37.

relationship that was developing between the ANC business leaders was that from 1990 onwards, Nelson Mandela and Nicky Oppenheimer met regularly for lunches and dinners.⁴⁴⁸ In fact, the leadership of the core of the ANC and the main players in the Mineral Energy Complex often met at Little Brenthurst, the Oppenheimer family estate.⁴⁴⁹ The pressure put upon the ANC to change its official ideology was also influenced by international neoliberal institutions. One of these institutions was the IMF which, in exchange for an \$850 million loan to South Africa in order to stem the cash haemorrhage created by a negative balance of payments, attached conditions to the loan pertaining to the regulation of business in the country. The conditions have subsequently come to be known as the GEAR economic policies implemented in South Africa in the following years.⁴⁵⁰

Post-1994, the alignment of the ANC to neoliberal policy became (to a certain extent) explicit. An example of this was a statement made by Mandela asserting that, “in our economic policies... there is not a single reference to things like nationalization, and this is not accidental. There is not a single slogan that will connect us with any Marxist ideology”.⁴⁵¹ In particular reference to the place of the ANC within the Tripartite Alliance, this was a significant position to take and (strangely) did not seem to get significant public push back from the other members of the Alliance. In terms of resource control (including the potential oil and gas reserves that were being explored for at the time), this move by the ANC was significant. Had the ANC continued its push for the vaguely socialist platform on which to build the new South Africa, it would have probably impacted the resources and energy sectors the most significantly. The about-face that the ANC had with regards to its adoption of neoliberal policies from which to govern South Africa is significant in terms of the operations of the business sector more generally post-1994. Had the socialist alignment of the ANC during the early stages of democracy materialized into actual policy, it would have created a significantly different operating environment for business and industry. Additionally, the change in the official ideological position of the ANC could have potentially alienated some of its largest national supporters (e.g. Cuba and Libya) from a

⁴⁴⁸ *Ibid.*

⁴⁴⁹ Terreblanche, S. *Lost in Transformation: South Africa's Search for a New Future Since 1994* (Johannesburg, 2012), pg. 63.

⁴⁵⁰ *Ibid.*

⁴⁵¹ Taylor, I. *Stuck in Middle GEAR: South Africa's Post-apartheid Foreign Relations* (Connecticut, 2001), pg. 37.

foreign relations perspective (although this appears not to have happened).⁴⁵² Hence, the ANC ultimately has had to play a dynamic role in trying to still tout its commitment to state support of its population while still adhering to the global neoliberal trade community in which it finds itself.

Ultimately, the decision taken by the ANC to adopt a neoliberal approach to managing the South African economy significantly altered the landscape of South African business. Regardless of the ideological issues that came about after the ANC opted for the neoliberal approach, ultimately the predominant white owners of the resource sector were arguably the main beneficiaries of this economic departure point. However, with regards to the betterment of the predominantly black workforce therein, there remained much room for improvement. In terms of the underpinnings of the Tripartite Alliance, this would have been considered a significant setback: The Alliance was premised on the notion of creating a more equitable and just work environment as well as pay structure for the poorest workers, not the stability of the owners of the means of production (especially in the resources sector). Furthermore, the inclusion of South Africa back into the global marketplace did create a different dynamic with regards to the priorities of policy makers and the South African government. With the benefit of hindsight, had the ANC chosen to follow a socialist agenda, it would most likely have been limited with regard to global trade in a similar manner to other socialist states e.g. Cuba. However, the adoption of neoliberal policies did leave many of the structural inequalities created by apartheid, cementing the significant challenges faced by the ANC government in the years following its election in 1994.

⁴⁵² *ibid.*, pg. 38.

The Onshore Algoa Basin Lease

The revitalization of interest in the onshore Algoa basin, initiated largely by Jean Malan's Oil & Gas Journal article in 1993, ultimately led a number of geologists to investigate (once again) the petroleum system potential within the Basin. One of the main geologists in this regard was Gerhard Brink, a Rhodes University trained petroleum geologist who began to dig quite deeply into the research and data collected from early exploration efforts in the Basin.⁴⁵³ Ultimately, it seems that Brink was the primary catalyst for the commercial interest in the Basin beginning in the early 2000s. As such, it would be pertinent to illustrate Brink's viewpoints on the Basin and what he believed its potential was. In order to do this, it will be necessary to determine what Brink thought were the most attractive geological aspects of the Basin and whether he thought they could be exploited successfully. In particular, there will be a particular focus on Brink's assertions pertaining to the Basins' source rocks as well as its tectonic setting, stratigraphy, migration pathways and trapping mechanisms. Furthermore, there will be a further emphasis placed on the reservoir and seal rocks within the Basin in an attempt to provide a more detailed analysis of the reservoir potential within the Basin. There will also be particular attention paid to the points which Brink presented as the most encouraging signs that petroleum systems may exist within the Basin.

In an approach that focused on the commercial prospects of the onshore Algoa basin, Brink co-authored an article for the Oil & Gas Journal in early 2005 in which he clarified what he believed to be the most promising petroleum system features within the Basin.⁴⁵⁴ Brink's first macro assumption related to the fact that the Algoa basin developed during the Cretaceous period, a period characterized by the creation of the, "most proven oil generation and entrapment in southern Africa".⁴⁵⁵ Although not indicative of outright success, this fact in and of itself lent credence to the notion that oil exploration within the Basin should not be dismissed out of hand. Furthermore, Brink found interesting features within the Basins'

⁴⁵³ LinkedIn at: <http://za.linkedin.com/in/gerhardbrink>.

⁴⁵⁴ It should be noted from the outset that although I assign most of the views put forward within the O&G Journal article to Brink, it is not entirely clear that he agreed with each point made therein. Hence, throughout the article I will refer to 'Brink' as a singular, but indicating the thoughts of him *and* the co-authors of the article.

⁴⁵⁵ Brink, G *et al.* 'New interpretation reveals potential in onshore Algoa basin, South Africa', *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 34.

tectonic setting which (owing to the breakup of Gondwanaland) created numerous Mesozoic half grabens as well as extensive erosion during which “new base levels were established on the continent”.⁴⁵⁶ Although Brink is largely restating information and data gathered during Soekor’s exploration of the Basin, he does provide a more nuanced exposition of where the best potential exploration areas are; specifically focusing on the half grabens which survived the regional uplift and thermal subsidence to become onshore paleo-basins.⁴⁵⁷ As such, the onshore Algoa basin serves as the largest onshore extension of these various rift basins.⁴⁵⁸ Additionally, Brink indicates that the collapse of various boundary faults created a number of Mesozoic depocentres, specifically naming the, “Sundays River, Uitenhage, and Port Elizabeth troughs”.⁴⁵⁹

Brink also paid particular attention to the stratigraphy of the onshore Algoa basin, pertaining especially to the rift-fill areas. The rift-fill areas seemed to comprise primarily of Enon conglomerates, which are present throughout much of the present-day Eastern Cape including the Gamtoos region and Baviaanskloof.⁴⁶⁰ According to Brink, it appears as though the conglomerates themselves are interbedded with varying levels of subordinate sandstones and claystones.⁴⁶¹ In terms of how the Enon conglomerates grade into the Kirkwood formation (in which the Colchester member is found), it appears that there is both vertical and lateral integration therein.⁴⁶² Moreover, corroborating and emphasizing the Soekor findings, Brink asserts that there is also a strong presence of marine, lacustrine and fluvial sands and muds therein.⁴⁶³ However, regarding the stratigraphy of the Basin, the key emphasis from a petroleum perspective is squarely on the Colchester member. It also seems clear that the thickness of the Kirkwood formation (approximately 200m) could be a positive sign that the oil expelling capabilities of the member would likely result in significant reserves being accumulated; assuming that suitable trapping mechanisms are in place therein.⁴⁶⁴ Once again

⁴⁵⁶ Brink, G *et al.* ‘New interpretation reveals potential in onshore Algoa basin, South Africa’, *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 35.

⁴⁵⁷ *Ibid.*, pg. 36.

⁴⁵⁸ *Ibid.*

⁴⁵⁹ *Ibid.*

⁴⁶⁰ Lubke, R & De Moor, I. *Field Guide to the Eastern & Southern Cape Coasts* (Cape Town, 1998), pg. 16.

⁴⁶¹ Brink, G *et al.* ‘New interpretation reveals potential in onshore Algoa basin, South Africa’, *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 37.

⁴⁶² *Ibid.*

⁴⁶³ *Ibid.*

⁴⁶⁴ *Ibid.*

Brink largely confirms the findings made by Soekor that the Colchester member should be considered the main oil expelling source rock within the onshore portion of the Basin, pointing to the data obtained from the exploratory wells drilled therein.⁴⁶⁵

Due to the vital role that source rocks play within any potential petroleum system, significant weight was placed by Brink on the Colchester member. Owing to data obtained by Soekor during its exploration of the onshore Algoa basin, it was determined that the layers of dark organic-rich shales of which the Colchester member is primarily comprised has potential as a liquid hydrocarbon expelling source.⁴⁶⁶ Likewise, as has been previously alluded to, these shales seem to have been deposited under marine and lacustrine conditions.⁴⁶⁷ As such, it is likely that the organic-rich content thereof would advance the notion of the Colchester member being a suitable liquid hydrocarbon expelling source.⁴⁶⁸ The total organic carbon for the darkest shales within the Colchester member average approximately 3% and increases to 6% in isolated areas.⁴⁶⁹ Relative to other examples of total organic carbon found in members within other Mesozoic basins, an average of 3% would be considered, “good oil-prone source rocks”.⁴⁷⁰ Serving to confirm the oil-prone nature of the shales that were encountered, the hydrogen index for the shales approached 500 indicating that approximately 50% of the organic material therein can be converted into hydrocarbons.⁴⁷¹ These various data points, according to Brink, indicate the suitability of the Colchester member as a suitable oil-prone source rock.

Although most aspects of the onshore Algoa basin point towards a petroleum system being in place, the actual reservoirs had potential geological pitfalls. Although the sandstones in place

⁴⁶⁵ Brink, G *et al.* ‘New interpretation reveals potential in onshore Algoa basin, South Africa’, *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 37.

⁴⁶⁶ *Ibid.*

⁴⁶⁷ *Ibid.*

⁴⁶⁸ Kelts, K. ‘Environments of deposition of lacustrine petroleum source rocks: an introduction’, *Geological Society, London, Special Publications*, 40, (1988), pg. 3.

⁴⁶⁹ Brink, G *et al.* ‘New interpretation reveals potential in onshore Algoa basin, South Africa’, *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 37.

⁴⁷⁰ Example is specific to Northwest Europe, cited from: Fleet, A & Boldy, S. *Petroleum Geology of Northwest Europe: Proceedings of the 5th Conference, Volume 2* (London, 1999), pg. 471.

⁴⁷¹ Brink, G *et al.* ‘New interpretation reveals potential in onshore Algoa basin, South Africa’, *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 37, and further technical information on the hydrogen index coming from, Ramburg, I. *The Making of a Land: Geology of Norway* (London, 2008), pg. 398.

within the Basin have good porosities between 10-12%, there are questions over the levels of permeability within those sandstones.⁴⁷² Brink refers to the permeability within the sandstones as being, “low”.⁴⁷³ However, despite Brink pointing to the low permeability of the reservoir rocks, he still indicates that he believes that a minimum flowrate of a few hundred barrels of oil per day could be attained based on the pressures and thickness values of the Colchester member within the Kirkwood formation.⁴⁷⁴ Although Brink never addresses the issue of low permeability outright, he does indicate that he believes that the reservoir sandstone should improve, “east of Coega”.⁴⁷⁵ However, despite Brink indicating that the permeability may improve further east, the low millidarcy numbers indicate that some type of fracturing may be needed to create suitable pathways through which the oil and gas can migrate. Brink’s lack of meaningful commentary on this point is particularly telling. Although he acknowledges the low permeability of the potential sandstone reservoirs and indicates that said situation should improve closer to Coega, he never remarks explicitly on how the low permeability situation could be remedied. It would be incorrect to say the low permeability would nullify Brink’s views on the potential oil-in-place; however that lack of sufficient permeability may indicate that although the oil may be in place, there may be significant issues in trying to produce that oil. Keep in mind that horizontal hydraulic fracturing was not, outside of the Eagle formation in the US, in wide use at the time (2005) and had not been applied to tight oil reserves at that point (this happened primarily in the Bakken formation in 2008).⁴⁷⁶ If he believed the technology had potential with regards to the onshore Algoa basin, Brink would likely have mentioned it in his article.

With regards to stratigraphic seals, Brink indicates that he believed that sufficient seal intervals existed. His justification thereof came from the sequence stratigraphic modelling signifying that the, “shaleout of barrier bar reservoir sandstones, the downdip facies changes to inner neritic shales, and the updip facies changes to lacustrine shales” were sufficiently associated with the seal intervals presented in the stratigraphic models.⁴⁷⁷ Brink also took the

⁴⁷² Brink, G *et al.* ‘New interpretation reveals potential in onshore Algoa basin, South Africa’, *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 37.

⁴⁷³ *Ibid.*

⁴⁷⁴ *Ibid.*

⁴⁷⁵ *Ibid.*

⁴⁷⁶ Selley, R & Sonnenburg, S. *Elements of Petroleum Geology* (Massachusetts, 2014), pg. 459.

⁴⁷⁷ Brink, G *et al.* ‘New interpretation reveals potential in onshore Algoa basin, South Africa’, *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 38.

position that although the shales were likely marine and/or lacustrine in nature, he believed that they could serve as sufficient sandstone reservoir base and top seals.⁴⁷⁸ Although Brink's language in communicating this point is not entirely convincing,⁴⁷⁹ it is an argument that could contain some merit. However, it is an argument that could easily be turned on its head. Due to the absolute importance of seals within a functioning petroleum system, his remarks should be read with caution. Although by no means a damning indictment of the potential of the onshore Basin as housing a petroleum system(s), it should be a point of further investigation.

In terms of where exploration efforts should begin in the Basin, Brink makes it quite clear that it should revolve around stratigraphic trapping mechanisms. Brink indicates that due to the fact that 2D seismic surveys of the prospect areas show a lack of fault-related traps therein, the focus should be on updip stratigraphic closures which resulted from a sandy coastal system to lacustrine shale(s).⁴⁸⁰ He further states that these stratigraphic closures can be determined using the geophysical log data previously collected by drillers such as Soekor.⁴⁸¹ It also appears that, according to Brink, the stratigraphic trapping mechanisms in the area are largely localized to an area which straddles the coastline for approximately 15km beginning at the Colchester wells' drilling sites moving eastwards.⁴⁸² Adding to the appropriateness of the trapping mechanisms is the conjoined issue of the migration pathways between the source rock and trapping mechanisms. On this point, Brink believes there to be a short distance migration between the Colchester member and the updip stratigraphic closures which he believes to be the most promising initial exploration points.⁴⁸³ Additionally, it seems that the migration pathways themselves are integrated with and along the bedding alignments which conform to the geometry of the, "Colchester depocenter".⁴⁸⁴ These observations made relating to the ability of oil to migrate into a trapping mechanism in

⁴⁷⁸ Brink, G *et al.* 'New interpretation reveals potential in onshore Algoa basin, South Africa', *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 38.

⁴⁷⁹ He states that the shales "may be effective" as seals; a use of 'soft' language by him which is not common throughout the rest of his piece, indicating doubt on his part.

⁴⁸⁰ Brink, G *et al.* 'New interpretation reveals potential in onshore Algoa basin, South Africa', *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 39.

⁴⁸¹ *Ibid.*

⁴⁸² *Ibid.*

⁴⁸³ *Ibid.*

⁴⁸⁴ *Ibid.*

conjunction with the strong, “petrophysical evidence” of “movable oil” collectively provides a potentially promising exploratory starting point therein.⁴⁸⁵

In terms of actually pinpointing a prospect area in which to drill, Brink and his co-authors made some fairly unambiguous statements. Regarding the sedimentary level with the most promise, the interval reached between 11 700 ft. and 12 500 ft. in well AL 1/69 was referred to as the, “primary target interval in the prospect area”.⁴⁸⁶ Although, it should again be noted, that although Brink refers to low permeability (pertaining to a lack of flow testing during the original exploratory drilling), he again makes no comment as to what this may indicate for the future production from said reservoir rock.⁴⁸⁷ However, regardless of this potential issue, estimations were made by Brink and his co-authors as to the Oil in Place (OIP) and well as how much of that was recoverable. The fairly well justified figures in this regard were the total Oil in Place to be 79.3 million barrels with recoverable oil being pegged at being between 2.6 million and 5.7 million barrels.⁴⁸⁸ Based on these subjective accounts of the petroleum system potential of the prospect area, the onshore Algoa basin would have had (and still does have) the latent possibility of being a viable crude oil source. Although the reserves would not be large in size when viewed from a national scale, they would most certainly be a sizeable asset for whoever owned the lease (which, at the time the article was written, was Brink’s Sequence Oil & Gas).⁴⁸⁹ However, it should be noted at this point that Brink would have been in a position of a conflict of interest when he participated in the writing of this article. At the same time as he and his co-authors were writing on the merits of the onshore Algoa basin, he was financially invested therein; thus giving him a potential reason to distort the facts in his favour.

Although Brink and his co-authors largely reiterated the findings of Soekor and their exploration of the onshore Algoa basin, his amalgamation of the various geological reports to date of the Basin projected a potentially bankable asset. Although there are still questions

⁴⁸⁵ Brink, G *et al.* ‘New interpretation reveals potential in onshore Algoa basin, South Africa’, *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 41.

⁴⁸⁶ *Ibid.*

⁴⁸⁷ *Ibid.*

⁴⁸⁸ *Ibid.*

⁴⁸⁹ Exxoteq (Pty) Ltd. ‘Exxoteq Prospectus’, The prospectus given to potential investors in Exxoteq which was to list of the Johannesburg Stock Exchange (JSE), pg. 1-30.

surrounding certain geological weak points (such as the low permeability encountered within the sandstone reservoir rocks), it seems that a petroleum system could exist on condition that certain geological assumptions about increased permeability etc. prove to be correct. Hence, it was under these fairly strong assumptions of the potential of the onshore Algoa basin that (as mentioned before), Brink (along with a few business partners) bought a lease which allowed for exploration within the Basin.

Exxoteq: The Move towards Monetization

Once the revisiting of the onshore Algoa basin had provided a suitable indication that there was strong oil and gas prospectivity therein, Gerhard Brink in conjunction with a few other colleagues formed Sequence Oil & Gas and purchased an exploration right for the area in which they believed there was the most potential.⁴⁹⁰ However, as a start up with little capital to begin operations, Sequence needed to find a source of funding to finance planned exploratory drilling and the various tests necessary to pinpoint the best areas in which to drill. This funding came in the form of an all share acquisition of Sequence by Exxoteq, a multinational junior oil company led by Indian national, Prem Sawney.⁴⁹¹ Ultimately, the rationale for the purchase by Exxoteq was simple: Exxoteq would create a local subsidiary in South Africa (it did not have one prior to this venture; hence it purchased Wild Rush Trading 12 Ltd. as the shell company and changed the name), list the Exxoteq Ltd. assets on the Johannesburg Stock Exchange (JSE), and use the proceeds from the stock listing to fund the drilling of the well. This would allow the onshore Algoa basin lease to be thoroughly explored and hopefully turn into a producing asset.

Given the significance of the Exxoteq Ltd. stock listing on the JSE, it would be necessary to provide some background on the public justification for this listing. However, from the outset the intention of the business is confusing: the Exxoteq prospectus under its 'Nature of Business' definition does not reference the onshore Algoa basin lease at all.⁴⁹² Considering that Exxoteq's pro forma balance sheet adjustments before capital raising indicates that the Algoa lease is valued by them at R418 million (56% of its total asset value), this is quite a startling omission.⁴⁹³ Furthermore, the same pro forma balance sheet reflects a balance of R280 million in intangible assets, presumably made up of the rights to Exxoteq Corporations Floating Production and Storage Unit (FPSO) technology.⁴⁹⁴ Furthermore, the FPSO

⁴⁹⁰ Exxoteq (Pty) Ltd. 'Exxoteq Prospectus', The prospectus given to potential investors in Exxoteq which was to list of the Johannesburg Stock Exchange (JSE), pg. 100-120.

⁴⁹¹ *Ibid.*, pg. 14.

⁴⁹² *Ibid.*, pg. 2

⁴⁹³ *Ibid.*

⁴⁹⁴ Hasenfuss, M. 'Dig deep into the prospectus', *Finance Week*, 20 October (2003), pg. 13.

technology that Exxoteq listed as an intangible asset would only have actual value if it could be utilized by an oil producing asset. Considering that Exxoteq's only asset was the Algoa lease, and that they made no reference in their prospectus to other potential customers for their FPSO technology, it seems that the value of the FPSO technology was contingent on the production that would come from the Algoa lease (which, in practise, still had yet to have conclusively proved the existence of an oil reserve). The company also makes many references to business prospects in West Africa in the same 'Nature of Business' definition, but provides little-to-no substance in its prospectus to reinforce this claim. Hence, on closer inspection of the pro forma balance sheet, it appeared from the outset that Exxoteq was relying almost entirely on the success of the Algoa lease. The prospectus also makes claims (within its 'Prospects' definition) about its hopes to enter the marginal oil field space and capitalize on these unutilized assets.⁴⁹⁵ However, once again, the company does not actually provide *any* details on where these leases may be bought or even where it believes the best prospective regions are.⁴⁹⁶ In essence, it seems that in the 'Prospects' definition, Exxoteq are illustrating what they were hoping to become as a business, and not what their immediate prospects were. Although there is nothing wrong with this in theory, one cannot help but think that the only reason they are talking about future prospects is because their current projects (i.e. the Algoa lease and FPSO hopes) were not particularly promising.⁴⁹⁷

One of the interesting aspects of Exxoteq's structure from a personnel perspective was its non-executive directors and Black Economic Empowerment (BEE) partners. Arguably the two most notable of these were Lonwabo 'Fez' Mahlati and Moss Leoka, both deeply involved in South African BEE transactions and business development within the mining, finance and consumer brands space.⁴⁹⁸ Both Mahlati and Leoka were named as non-executive directors and had been paid directors fees of R750 000 and R1 000 000 worth of shares for the year ending 28 February 2004.⁴⁹⁹ Although these shares inferred a significant cash value

⁴⁹⁵ Exxoteq (Pty) Ltd. 'Exxoteq Prospectus', The prospectus given to potential investors in Exxoteq which was to list of the Johannesburg Stock Exchange (JSE), pg. 2.

⁴⁹⁶ *Ibid.*

⁴⁹⁷ It should be noted that this is the authors' unsubstantiated opinion.

⁴⁹⁸ Exxoteq (Pty) Ltd. 'Exxoteq Prospectus', The prospectus given to potential investors in Exxoteq which was to list of the Johannesburg Stock Exchange (JSE), pg. 14.

⁴⁹⁹ *Ibid.*, pg. 16.

for the financial year ended 28 February 2004⁵⁰⁰ they were relatively minor shareholders at the time of the listing (pre-5 November 2003) holding just under 3% of Exxoteq Ltd.⁵⁰¹ The director with the largest stake in the company was Prem Sawney, holding just over 42% of the company prior to the public share offer and private share placement(s).⁵⁰² Strictly from the perspective of aligning the incentives of the shareholders and management of Exxoteq, this would have been seen as a positive sign: the notion that (as large shareholders in Exxoteq) it was in the best interests of the Exxoteq board and management to adopt best practise, prospective shareholders in the company would have been encouraged that the management of the company had a great deal of ‘skin in the game’, thus aligning the incentives of management and shareholders.⁵⁰³

One pertinent issue that is addressed in the first thirty pages of the Exxoteq prospectus pertains to the financing of the company’s planned projects. From the outset, the prospectus declares that the company has no cash flows (this is often the case when a listing is valued primarily on an unexploited underlying asset).⁵⁰⁴ Hence, the aim of the listing is to raise the cash necessary to exploit the asset that is being listed in order to create a cash flow.⁵⁰⁵ This means that the cash generated from the initial public offering and the private placements must (for the most part) cover the costs of turning the latent asset into a cash generating asset. In the case of Exxoteq, it was not clear that their public and private share placement would be adequate to meet this need: the hope of the company was to list a minimum of 2 275 000 shares at a price of 500 cents making the cash value of the listing R11 375 000.⁵⁰⁶ With this cash, the company would have to meet all its operational capital needs (i.e. salaries, rent etc.) and project capital needs (i.e. seismic testing, drilling rig hire, above ground infrastructure, transportation infrastructure etc.). Furthermore, the prospectus also alludes to one key point:

⁵⁰⁰ It’s not clear that either Mahlali or Leoka managed to realize any of this value due to subsequent collapse of Exxoteq.

⁵⁰¹ Exxoteq (Pty) Ltd. ‘Exxoteq Prospectus’, The prospectus given to potential investors in Exxoteq which was to list of the Johannesburg Stock Exchange (JSE), pg. 17.

⁵⁰² *Ibid.*

⁵⁰³ Keasey, K. *et al. Corporate Governance: Accountability, Enterprise and International Comparisons* (New Jersey, 2005), pg. 143.

⁵⁰⁴ Antill, N & Arnott, R. *Valuing Oil and Gas Companies: A Guide to the Assessment and Evaluation of Assets, Performance and Prospects* (Cambridge, 2000), pg. 108-110.

⁵⁰⁵ *Ibid.*

⁵⁰⁶ Exxoteq (Pty) Ltd. ‘Exxoteq Prospectus’, The prospectus given to potential investors in Exxoteq which was to list of the Johannesburg Stock Exchange (JSE), pg. 1 & 20.

the capital raised will only fund the company for 12 months after the listing.⁵⁰⁷ Needless to say, this should have been considered a red flag. Owing to the complexity and high capital requirements of an oil exploration effort, a significant margin of error would need to be built into future projections. This does not seem to have been done by Exxoteq: a 12 month timeframe is very narrow in terms of an oil exploration project. The prospectus also provides no indication of what the contingency plan would be if the capital raised via the listing was not sufficient. In hindsight, a lack of capital would come to haunt Exxoteq and ultimately force the project into being an unviable business.

The capital requirements of Exxoteq also need to be seen within the context of the payments made (in both cash and stock) to the directors of the company and its key employees. For example, of the R11 million raised from the share offering, R900 000 of that was essentially allocated to Gerhard Brink as a salary.⁵⁰⁸ That means that an eleventh of all cash raised from the listing would go to paying the salary of one individual. Without wishing to pass on the value of Brink to Exxoteq, that provision seems steep for a company that (at that point) generated no cash. It also seemed that in the lead up to the listing, Exxoteq management did not sell the company using its own financial robustness, but rather by making weak comparisons to companies *they* believed it to be similar to. In a mass mailing to potential investors, Exxoteq management stated that JSE listed energy company Energy Africa, “listed in 1995 at ±R10 and is now trading in the region of R50”, implying that somehow Energy Africa (an asset spinoff from Engen) and Exxoteq were comparable in some way.⁵⁰⁹ This was clearly a disingenuous comparison. The other aspect of the Exxoteq Ltd. public relations strategy was its constant alignment with Exxoteq Corporation listed on the Bombay Stock Exchange. Despite the best efforts of Sawney to vaunt Exxoteq Corporation as a, “multinational oil company”, the reality was that at the time of the listing the company had no actual financial history available aside from pro forma statements for the purposes of the listing.⁵¹⁰

⁵⁰⁷ Exxoteq (Pty) Ltd. ‘Exxoteq Prospectus’, The prospectus given to potential investors in Exxoteq which was to list of the Johannesburg Stock Exchange (JSE), pg. 20.

⁵⁰⁸ *Ibid.*, pg. 16.

⁵⁰⁹ L. Jones. ‘Oily disclaimer’, *Finance Week*, 13 October (2003), pg. 18.

⁵¹⁰ *Ibid.*

Confidence in the Exxoteq listing would have been based primarily on the investor(s) confidence in the company's management, financials and pro forma projections. As such, a detailed breakdown of the credibility of all three of these components would need to be scrutinized. Regarding the directors, most of the information stipulated within the prospectus had been standardized and there was little untoward with regards to the information provided. However, one aspect could have raised suspicions: the first section of the first appendix dealt specifically with the ability of directors to borrow funds from the company.⁵¹¹ Although there is a precedent of directors borrowing from the companies on which they sit, Exxoteq is not a typical company in this regard. In a situation where directors borrow from the company, there are generally restrictions in most countries (both legal and implemented by the company itself) as to how and when such borrowings can take place and when they are appropriate.⁵¹² Such restrictions are not present (or at least not clearly alluded to) in the Exxoteq's prospectus in any meaningful form. Furthermore, it seems strange that such concessions are trying to be made in a company that had no cash flow to lend out. Again, there is nothing illegal or ethically wrong with this paragraph; however it does seem that making the borrowing ability of the directors such a priority in the prospectus could have indicated a potential lack of shareholder focus.

Another questionable assumption in the Exxoteq prospectus is the approved valuation of the Sequence Oil & Gas asset by Fisher Hoffman PKF accountants. The Fisher Hoffman accountants state that, "the historical financial information of Sequence Oil & Gas... fairly represents in all material respects, the financial position of the company and the results of its operations".⁵¹³ Although it appears that Fischer Hoffman did carry out their valuations in accordance with South African Statements of Generally Accepted Accounting Practise, a logical approach to the valuation of the Algoa lease would indicate otherwise. Being the accountants for the Exxoteq listing, it is assumed that Fischer Hoffman would have had to accept (to a greater or lesser extent) the pro forma balance sheet provided in the prospectus. As such, they would have accepted the R418 million value placed on the 'prospecting option'

⁵¹¹ Exxoteq (Pty) Ltd. 'Exxoteq Prospectus', The prospectus given to potential investors in Exxoteq which was to list of the Johannesburg Stock Exchange (JSE), pg. 29.

⁵¹² Sharma, A. *Company Law: BBA III* (New Delhi, 2010), pg. 228.

⁵¹³ Exxoteq (Pty) Ltd. 'Exxoteq Prospectus', The prospectus given to potential investors in Exxoteq which was to list of the Johannesburg Stock Exchange (JSE), pg. 32.

(i.e. the Algoa lease) therein.⁵¹⁴ This means that the firm valued an asset which Brink believed had approximately 3.8 million barrels of recoverable oil at the time at R418 million.⁵¹⁵ Indeed, this valuation for a nonproducing asset is very rich. Based on the US Securities and Exchange Commission's general discounted cash flow value of nonproducing of assets of approximately 10% (also known as the 'SEC 10'), however the Algoa lease did not have the necessary capital in place to launch the project or justify a valuation on this basis which would leave the best valuation method to be the unofficial industry standard of the cash value of the asset being $\pm 10\%$ of the total revenue that could be generated therefrom.⁵¹⁶ Taking the average oil price in 2003 to be \$30, this means that the value of the asset prior to discount would have been \$114 million.⁵¹⁷ However, putting into effect the 10% discount rate, this valuation would then become \$14 million dollars and, taking the average rand/dollar exchange rate during 2003, of approximately R7.80 to \$1, the value of the asset (using the prevailing US exchange model) would have been approximately R109 million.⁵¹⁸ This valuation, done using the unofficial industry approach and predominately accurate exchange rates and oil prices, is vastly different to the R418 million pro forma valuation provided by the Exxoteq prospectus and (by extension) Fischer Hoffman. Although the author makes no claim that the R109 million valuation is completely accurate, it is so heavily discounted to the R418 million proposed figure in the prospectus that it begs the question as to how the R418 million valuation was calculated in the first place. Although the numbers used in the calculating of the R109 million valuation could be incorrect by as much as 30-50%, it is still not possible to reconcile a number that would be acceptable to the number provided by Exxoteq in their prospectus. Furthermore, it appears that Sequence was purchased by Exxoteq for R50 million in a share swap arrangement.⁵¹⁹ Hence, it appears that between the purchase of Sequence for R50 million (whose only underlying asset was the Algoa lease) and the listing of Exxoteq, the lease had increased in value by R368 million. Due to the fact that no comment was made on why this revaluation was so significant, it makes little sense as to why Fisher Hoffman would have agreed with this valuation. Furthermore, it makes little sense that

⁵¹⁴ *Ibid.*, pg. 6.

⁵¹⁵ Brink, G *et al.* 'New interpretation reveals potential in onshore Algoa basin, South Africa', *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 41.

⁵¹⁶ Howard, A. 'Oil and Gas Company Valuations', *Business Valuation Review*, 28, 1, (2009), pg. 32.

⁵¹⁷ Winkler, H. *Taking Action on Climate Change: Long Term Mitigation Scenarios in South Africa* (Cape Town, 2010), pg. 51.

⁵¹⁸ Tsangarides, C. *Exchange Rate Analysis in Support of IMF Surveillance: A Collection of Empirical Studies* (Washington D.C., 2008), pg. 146.

⁵¹⁹ Exxoteq (Pty) Ltd. 'Exxoteq Prospectus', The prospectus given to potential investors in Exxoteq which was to list of the Johannesburg Stock Exchange (JSE), pg. 47.

Gerhard Brink and the other Sequence shareholders would sell an asset which was being valued by Exxoteq R418 million to that company for only R50 million. Assuming they (Brink et al.) too valued the Algoa asset at the Exxoteq valuation, they would have been forfeiting significant gains for no tangible reason. Due to these wildly divergent (and largely improbable) valuations, there seems to have a genuine lack of a coherent corporate view by Exxoteq on what the actual *fair* value of the asset was at the time. These huge value discrepancies should have at least been addressed by Fischer Hoffman in their reports within the prospectus.

In reference to their *opinions* on the pro forma balance sheet of Exxoteq, Fischer Hoffman makes the point that the opinions were, “free of material misstatement”.⁵²⁰ However, they then go on to say that because their auditing of the Exxoteq pro forma balance sheet is not in accordance with the statements of the South African Auditing Standards, they would not express, “any assurance on the pro forma balance sheet, other than that listed in the opinion paragraph”.⁵²¹ Needless to say, this should have been a worrying statement for any potential investor. Due to the fact that no assurance was made with regards to the pro forma balance sheet in any meaningful way, the valuations on the assets was not assured either. With this information, it becomes easy to understand how such inflated values were put not only on the Algoa lease, but also on the FPSO technology: nobody would be held accountable if the values were unrealistically high, hence nobody objected to this material value falsification. This point needs to be reiterated: according to the information contained in the prospectus, nobody was actually legally accountable for these valuations. Although this flies in the face of common sense notions of company practise, it seems that it managed to get through the listing period simply because it was plausible from a legal perspective. This should have been a worry for any investor and should have been considered by all the analysts who provided public views on the listing and the stock.

Exxoteq’s minimum subscription share allocation should have also served as a worrying sign. As mentioned earlier, the minimum share allocation was 2 275 000 at an inferred valued of approximately R11 million.⁵²² For a company that had comprised of 100 000 00 shares and

⁵²⁰ Exxoteq (Pty) Ltd. ‘Exxoteq Prospectus’, The prospectus given to potential investors in Exxoteq which was to list of the Johannesburg Stock Exchange (JSE), pg. 51.

⁵²¹ *Ibid.*

⁵²² *Ibid.*, pg. 16.

an inferred valuation of R500 million, this should have also been yet another red flag. The fact that they only managed to place 2.2% of the company's shares on the public market should have been a reflection that the valuation put on the company was simply unrealistic. It is also not the case that Exxoteq management chose to only list a small portion of the shares: they had been struggling to meet the minimum subscription due to a lack of demand.⁵²³ This indicated that although Exxoteq had a substantial valuation at the time of its listing, that valuation was based on a very small portion of the shareholder base which ultimately led to the positions in Exxoteq being highly illiquid. This would have been of significance not only to those shareholders who subscribed to the Exxoteq listing, but the shareholders of Exxoteq who were subsequently brought into Exxoteq by the Sequence Oil & Gas acquisition. Although Brink took a central role in Exxoteq after the Sequence buyout, many of the other large Sequence shareholders did not. As such, it is not clear what the performance of the Exxoteq listing was on their financial position. According to the information contained in the Exxoteq prospectus pertaining to the Sequence acquisition, Fiesta Datacomm Ltd. was the largest shareholder in Sequence Oil & Gas at the time of the acquisition.⁵²⁴ Furthermore, pertaining to payment of Exxoteq shares in exchange for 100% of the Sequence shares, 3 000 000 of the 10 000 000 went to Meckel Investments Ltd. and Bergplaas Development Trust, respectively.⁵²⁵ However, both Bergplaas and Meckel were not actually shareholders in Sequence and no information is provided as to why they got 30% of the Exxoteq shares allocated to the acquisition. Additionally, there appears to be no information in the prospectus pertaining to the former Sequence share vendors as to when they had the right to sell their shares.

Regarding the assessment of the suitability of the onshore Algoa basin as a potential petroleum play, it was necessary for Exxoteq to complete and include a 'Competent Persons Report' of the geological and economic prospectivity of the proposed drilling area. The purpose of this report is to provide an expert opinion on the value of its prospective projects. In the case of Exxoteq, this responsibility was given to Dr Frank Brown Jr., who earned his PhD in Geological and Geophysical Sciences and was a Professor emeritus and research

⁵²³ Hasenfuss, M. 'Stags (f)ailed again', *Finance Week*, 24 November (2003), pg. 34.

⁵²⁴ Exxoteq (Pty) Ltd. 'Exxoteq Prospectus', The prospectus given to potential investors in Exxoteq which was to list of the Johannesburg Stock Exchange (JSE), pg. 67.

⁵²⁵ *ibid.*

Professor at The University of Texas in Austin.⁵²⁶ Although the report itself will be dealt with in detail in the following paragraphs, the cover letter provided by Dr Brown indicates his general position on the prospects of the Algoa lease. Indeed, it is one comment in particular that is of significant interest: Brown seems to have been responsible for the R418 million inferred valuation placed on the lease area.⁵²⁷ It is hence assumed that the valuation used in the pro forma balance sheets did not come from the Exxoteq executives, the Fischer Hoffman accountants or the lawyers at Piet Van Zyl Attorneys but instead came solely from Dr Brown.⁵²⁸ Due to the fact that the vast majority of the issues pertaining to the exorbitant market capitalization of Exxoteq stemmed from its Algoa lease value, it seems essential that this valuation is thoroughly dissected.

The 'Competent Persons Report' conducted by Dr Brown is extensive and detailed. Although much of the information dealt with in the report has a great deal of overlap with much of the geological data and information drawn from the original Soekor sources, it is necessary to dissect and analyse each section of Dr Brown's report in order to ensure its accuracy and, ultimately, its validity. As has been mentioned previously, Brown put a value of R418 million on the lease, a number which most investors rejected and was one of the principle factors that led to only the minimum share subscription being raised.⁵²⁹ As such, any material information that was considered by Brown in his assessment of the Algoa lease needs to be addressed in order to fully understand his somewhat perplexing valuation. However, any data or information that have been dealt with herein thus far will only be reiterated, pertaining to Dr Brown's report, on condition that he takes a contrarian view on a position or uses the position to strongly substantiate his valuation. Hence, the intention of the forthcoming analysis is strictly to attempt a match between the data he provides and his valuation. Thereafter, a judgement call can be made on whether his assessment has shortcomings and how significant their impact was on his valuation.

⁵²⁶ *Ibid.*, pg. 69.

⁵²⁷ *Ibid.*

⁵²⁸ Exxoteq (Pty) Ltd. 'Exxoteq Prospectus', The prospectus given to potential investors in Exxoteq which was to list of the Johannesburg Stock Exchange (JSE), pg. 1.

⁵²⁹ *Ibid.*, pg. 67.

From the outset, Dr Brown indicates the premises on which the revision of the prospectivity of the onshore Algoa basin is based on. There are two key premises in this regard: 1) the use of advanced stratigraphic sequence interpretation concepts, 2) new technology which should significantly increase the oil recovery from the target zone (done through hydraulic fracturing).⁵³⁰ These two premises were used in conjunction with the various data and information that had already been compiled on the onshore Algoa basin and, ultimately, became the basis on which Exxoteq believed the Algoa lease could be exploited profitably. Within Browns report, the AL 1/69 borehole drilled by Soekor was the area of primary interest at the depths between 11800 ft. and 12200 ft.⁵³¹ Although Brown did indicate that the potential presence of a functioning petroleum system may be present therein, he also did cite the reservoir sandstones' quality and thickness pose as "the principle geological risk factor" (it is assumed that the lack of permeability would probably be the key area of concern).⁵³² He also takes the position that the prospect area would have an estimated 3.8 million stock tank barrels of recoverable oil to be in place based on a 50% weighted probability scale.⁵³³ Regarding Browns position on the potential of the Algoa lease, his estimates on the quantity of recoverable oil and the potential issues around the quality and thickness of the reservoir sandstone are largely in line with the information and data that came out of previous exploration efforts in the area; a position this author has been in agreement with thus far. Brown further alludes to the fact that renewed interest by Sequence would have been unlikely if the advanced concepts pertaining to sequence stratigraphy had not been applied to the site and data associated therewith.⁵³⁴

Much of the data used in Dr Brown's report related to the exploration efforts by Soekor and its partners between the mid-1960s and early-1970s. However, subsequent seismic profiles and interpretations of the sequence stratigraphy provided a new vantage point from which to perceive the potential of a petroleum system within the onshore Algoa basin. From the outset, Dr Brown states that the, "presence of an effective petroleum system has essentially been

⁵³⁰ *Ibid.*, pg. 71.

⁵³¹ Exxoteq (Pty) Ltd. 'Exxoteq Prospectus', The prospectus given to potential investors in Exxoteq which was to list of the Johannesburg Stock Exchange (JSE), pg. 71.

⁵³² *Ibid.*

⁵³³ *Ibid.*

⁵³⁴ *Ibid.*

proven”.⁵³⁵ Considering the legal implications of this statement (the main justification of the lease potential within the prospectus), this is a strong position for Brown to have taken bearing in mind the financial commitments made to the company as a result. Aside from referring to the signs that sufficient source rocks and potential trapping mechanisms were in place, Brown also goes on say that the potential of stratigraphic trapping mechanisms (as opposed to structural trapping mechanisms) was not fully appreciated during the early exploration efforts.⁵³⁶ With regards to the suitability of the source rocks within the Basin, Brown largely reiterates what was deduced by Soekor, essentially taking the position that they are comprised of adequate organic matter and should have ample oil expulsion.⁵³⁷ However, Brown takes an altogether more sophisticated and nuanced view of the sealing and trapping potential of the Basin. Brown states that the sealing for any potential traps within the Basin would likely be updip lacustrine shales interlayed with marine shales, forming what Brown believes, “may constitute effective base and top seals”.⁵³⁸ As has been mentioned previously, Brown largely reiterates what has been found in preceding exploration attempts. As such, positions taken on the positivity of the petroleum prospectivity of the onshore Algoa basin still largely hold when viewed in conjunction with Browns report. Furthermore, his views on potential seals and traps (as well as the extraction therefrom) are revised and bolster the evidence pointing to a functioning petroleum system.

The primary area of concern with respect to Brown’s report pertains to the valuation. Prior to his valuation of the Algoa asset, Brown puts the exploration costs for the project between June 2003 and June 2005 at R3.9 million.⁵³⁹ It should be noted that this is simply the cost of exploration activities, *not* any production activities. This simply means the costs associated with determining the reserves in place within the Algoa lease would be R3.9 million. However, in Brown’s valuation of the Algoa lease he uses the, “standard international oil practise for mature exploration projects” valuation method which is created using a base case production and turnover budget.⁵⁴⁰ This essentially means that the asset will be valued on the discounted foreseeable production value of the asset. A valuation of the asset is then made on

⁵³⁵ *Ibid.*, pg. 85.

⁵³⁶ *Ibid.*, pg. 86.

⁵³⁷ Exxoteq (Pty) Ltd. ‘Exxoteq Prospectus’, The prospectus given to potential investors in Exxoteq which was to list of the Johannesburg Stock Exchange (JSE), pg. 86-87.

⁵³⁸ *Ibid.*, pg. 87.

⁵³⁹ *Ibid.*, pg. 97.

⁵⁴⁰ *Ibid.*

a net present value calculation discounting free cash flow per annum at 10% per year.⁵⁴¹ It should be noted at this point that this is similar but different to the SEC 10 rule of thumb alluded to earlier due to the fact that a ‘mature exploration project’, as described by Brown, has (by implied definition) imminent prospects of becoming a production asset.⁵⁴²

Furthermore, any asset whose value is based on its future production value *must surely be in a position to demonstrate that future production is a realistic possibility*. Brown seems to omit one key aspect of demonstrable necessity to turning the Algoa lease into a production asset: capital financing. If the valuation of the Algoa lease is its future production capacity, then it is absolutely necessary for Brown to prove beyond a reasonable doubt that financing will be available to fund the capital expenditure necessary therefore. This seems logical: if the developers of the asset cannot prove beyond a reasonable doubt that funding is (or will shortly be) available to fund production of the asset, then you cannot value the asset on its future production value because it has no imminent prospects of becoming a production asset. In the case of Exxoteq, there was most certainly no indication beyond a reasonable doubt that production funding was going to be readily available post its public listing. As such, a fair valuation of Exxoteq would have been to value the asset as is *without* taking into account its potential future production value because it did not prove that it would be in the position to finance its production capacity. It was likely the case that Exxoteq executives provided anecdotal reasons as to why they believed that they could obtain financing during the pre-listing roadshow, but no explicit mention was made in the prospectus of how this would be done. Simply put, the value of a company cannot be based on future production value if the company has no imminent prospects of producing anything. In the case of Exxoteq, they did not demonstrate that they had the financing in place to turn the Algoa lease into a production asset. Thus, the Algoa lease should not have been valued as such.

There is nothing untoward in the listing of a hard commodity asset (such as oil and gas reserves, gold or coal deposits etc.) for the expressed intention of using the money raised to turn it into a producing asset. This is practised on stock exchanges worldwide and serves an important funding mechanism for potentially valuable assets. However, the value of the listed asset is contingent on the funding raised as being sufficient to initiate production capacity. In the case of Exxoteq, the prospectus did not demonstrate this to be the case. The company

⁵⁴¹ *Ibid.*

⁵⁴² *Ibid.*

was, on account of its lack of demonstrable funding sources, not in a position to finance the capital expenditure necessary to turn it into a production asset. This ultimately means the Dr Brown's valuation of the Algoa lease held by Exxoteq was, at best, misguided.

The Exxoteq IPO and Disillusion

In spite of the various inconsistencies and value discrepancies within the Exxoteq pro forma balance sheet and statements made within the prospectus, the company managed to publicly list on the Johannesburg Stock Exchange (JSE) on 5 November 2003. Although there were a number of individuals and institutions that put their faith and money into the Exxoteq listing, there remained serious questions about the future viability of Exxoteq as a potential oil producer. These suspicions were shared by the finance media, and in particular the Finance Week publication (subsequently abbreviated to Finweek). As a high quality and trusted source of information on the financial fortitude of public traded companies, the publication had a handful of journalists who covered the Exxoteq story at length. At the forefront of this coverage was Marc Hasenfuss. Although Hasenfuss and a handful of colleagues at Finweek repeatedly warned the public about the high risk nature of investing in Exxoteq, most of their warnings went either unheeded or unnoticed. As was subsequently proven, the concerns raised by Hasenfuss and others were well placed: after a confusing and turbulent 10 months of trading post-IPO, Exxoteq share trading was halted on 3 September 2004 and remained halted until the company was delisted on 11 June 2007.⁵⁴³

The period between the public listing of Exxoteq, its subsequent share trade halt and delisting was difficult for shareholders and the general public to follow. As such, attempting to create a chronological sequence of events based on information that was available to the public would be useful and provide a clearer representation of the collapse of Exxoteq. Although there will be necessary overlap between many of the articles and discussion pieces consulted, the correct chronological sequencing of the public comments made on Exxoteq will be the focus. This will hopefully provide a coherent and understandable approach to reinforcing and expanding upon the sentiments that were present within the financial media at the time. As such, there will be 3 main periodizations pertaining to media reports on Exxoteq. The first will primarily focus on the pieces published on Exxoteq prior to the company's listing. This will hopefully provide an insight into the sentiment on the company prior to the issues the company faced. The second will focus on the media reports on the company between its IPO

⁵⁴³ Johannesburg Stock Exchange (JSE). 'Daily trading history of Exxoteq', 5 November 2003-11 June 2007.

and share trading halt. The intention therein will be to illustrate what the public representations made on the company illustrated during the price decline from 500c per share to 20c per share.⁵⁴⁴ The third and final periodization will look primarily at the media portrayals of the company after the share halt took place and the comments made on the company thereafter. These three analyses will hopefully illustrate as clearly as possible what the public representations made on the company demonstrated about the media's view on the longevity of the company.

The first notable mention of Exxoteq took place in in the 13 October 2003 edition of Finance Week. In an article written by Llewellyn Jones, a fairly critical take on Exxoteq's potential as a future oil producer is called into question. From the outset, Jones alluded to Exxoteq's self-promotion in the lead up roadshow to the listing by punting its 'discounted' pre-listing investment price of 400c per year on which potential investors could make a quick profit.⁵⁴⁵ Needless to say, such sales tactics were necessary considering that the company had no financial history and two assets which seemed to be overpriced. Jones also indicated that Exxoteq was also basing its future cash generating potential on oil assets which had, "already been rejected by some major oil companies".⁵⁴⁶ From there, Jones simply goes on to state that investors should consider the disclaimer on Exxoteq's website limiting its liability as a warning. Needless to say, this was not a particularly supportive article seeing as Exxoteq would be listing in less than a month after the article was published. However, it was not the last article Finance Week would publish on Exxoteq in the lead up to the listing. In the next edition of Finance Week published for the period 20-24 October 2003, a full page article is written by Marc Hasenfuss on his scepticism regarding Exxoteq's prospectus. Rather than engaging in superficial commentary on the company, Hasenfuss looks in depth at the details provided in the prospectus in order to make a value judgement on the company. Hasenfuss looks specifically at the valuation of Exxoteq's assets. He states that the R280 million valuation put on the FPSO technology could only be justified once the technology had been proven on a marginal oilfield first, in spite of the fact that Fisher Hoffman had given 'fair and

⁵⁴⁴ Johannesburg Stock Exchange (JSE). 'Daily trading history of Exxoteq', 5 November 2003-11 June 2007.

⁵⁴⁵ Jones, L. 'Oily disclaimer', *Finance Week*, 13 October (2003), pg. 18.

⁵⁴⁶ *Ibid.*

reasonable' assurances on the value provided.⁵⁴⁷ Hasenfuss then goes on to challenge the Algoa lease. Although he does not actively attack the R418 million valuation put on the lease (although he does state it would require a "leap of faith"), he does express his confusion at why companies such as Soekor and Energy Africa did not take an active position in pursuing the lease.⁵⁴⁸ Following the publishing of the Finance Week article, Exxoteq went on to a poor debut on the JSE on 5 November 2003. By the end of the first seven days of trading, the share price had almost halved from the 500c per share listing price to 255c per share.⁵⁴⁹ In the Finance Week edition covering 10-14 November 2003, Hasenfuss (having had his suspicions largely confirmed) titled his follow-up article on Exxoteq 'Crude form over substance', an apt title considering the market pressure on the company's share price.⁵⁵⁰ In the article, Hasenfuss points to the fact that the listing seems to have faced pressure due to the fact that the company provided little evidence of, "tangible assets and operational track record".⁵⁵¹ The article is largely a reiteration of the parameters in which Exxoteq listed. However, Hasenfuss did point to rumours that Exxoteq was in talks with PetroSA regarding a partnership pertaining to the drilling of the Algoa lease.⁵⁵² Whether or not these talks were actually taking place clearly did not influence market sentiment: the share price continued to decline over the next eight trading days reaching a low of 60c, a 88% collapse from the 500c listing price in just 16 days of trading.⁵⁵³ Although the Exxoteq share price did recover in the following weeks, the collapse largely set the trajectory of the share price thereafter

Before the end of 2003, Finance Week published two more articles related to Exxoteq and its poor share price performance. Hasenfuss penned an article titled 'Stags (f)oiled again' in which he provides a succinct assessment of Exxoteq's performance on the JSE since listing. Pointing to the relative collapse of the share price by 60% at the time the article was written, Hasenfuss made mention that some of the opinions coming from the "murky investment fringes" believed the markets' downward pressure on the share price might well be overdone.⁵⁵⁴ However, as is made quite clear by Hasenfuss, there is nothing to substantiate

⁵⁴⁷ Hasenfuss, M. 'Dig deep into the prospectus', *Finance Week*, 20 October (2003), pg. 13.

⁵⁴⁸ Hasenfuss, M. 'Dig deep into the prospectus', *Finance Week*, 20 October (2003), pg. 13.

⁵⁴⁹ Johannesburg Stock Exchange (JSE). 'Daily trading history of Exxoteq', 5 November 2003-11 June 2007.

⁵⁵⁰ Hasenfuss, M. 'Crude form over substance', *Finance Week*, 10 November (2003), pg. 15.

⁵⁵¹ *Ibid.*

⁵⁵² *Ibid.*

⁵⁵³ Johannesburg Stock Exchange (JSE). 'Daily trading history of Exxoteq', 5 November 2003-11 June 2007.

⁵⁵⁴ Hasenfuss, M. 'Stags (f)oiled again', *Finance Week*, 24 November (2003), pg. 34.

the markets' dim view of Exxoteq: at the time of writing serious institutional investors were steering clear of Exxoteq meaning no backstop to the price fall was in place, the company had no deal flow to gauge the health of the company, and Exxoteq had only managed to raise R11 million which was hardly significant enough to bolster its financial position.⁵⁵⁵ In a follow-up mention in 'THE GOOD, THE BAD & THE UGLY' column in the 1-5 December edition of Finance Week, Hasenfuss mentions that many of the Exxoteq shareholders were experiencing significant paper losses from the collapse in market value.⁵⁵⁶ He also mentioned that some of the main shareholders may benefit more than others: investors such as BEE partner Fez Mahlati had no cash payments from the business meaning that most all his investment in the company was in paper form, whereas Gerhard Brink was earning a R900 000 salary and a R1 million bonus in cash on top of the shares he owned.⁵⁵⁷ Hasenfuss makes an important assertion in this regard namely that Brinks salary and bonus was more than 10% of the total cash raised in the listing, showing a lack of overhead management in order to conserve cash until the next projected financing project.⁵⁵⁸ Although Exxoteq managed to successfully list on the JSE, the reports from the financial press indicated that significant problems existed with Exxoteq's business proposition. Largely confirming these fears, Exxoteq's share price dropped from the listing pop to 520c and proceeded to crash down to 93c by 31 December 2003.⁵⁵⁹ From this point onwards, Exxoteq's business began to collapse.

In the first February edition of Finance Week in 2004, Marc Hasenfuss once again penned a half page article on the state of Exxoteq. At the time of writing, Exxoteq's share price was hovering around the 70c mark, a significant discount to the listing price.⁵⁶⁰ However, despite the strong market sentiments against Exxoteq, Hasenfuss stated that the resulting market capitalization (approximately R70 million to R80 million) was more typical of the pricing associated with a strictly speculative exploration market play.⁵⁶¹ Yet, in spite of the massive valuation correction in the market capitalization of Exxoteq, other problems were beginning to plague Exxoteq at this time. Companies that list strictly as exploration plays still need to

⁵⁵⁵ Hasenfuss, M. 'Stags (f)ooled again', *Finance Week*, 24 November (2003), pg. 34.

⁵⁵⁶ Hasenfuss, M. 'THE GOOD, THE BAD & THE UGLY', *Finance Week*, 27 July (2005), pg. 36.

⁵⁵⁷ *Ibid.*

⁵⁵⁸ *Ibid.*

⁵⁵⁹ Johannesburg Stock Exchange (JSE). 'Daily trading history of Exxoteq', 5 November 2003-11 June 2007.

⁵⁶⁰ Hasenfuss, M. 'The price of impatience', *Finance Week*, 2 February (2004), pg. 18.

⁵⁶¹ *Ibid.*

generate business activity in order to justify their value as a listed company. In the case of Exxoteq (which had no immediate prospects of generating a cash flow from its group of assets), the only way to generate business activity would be through deal flow: doing deals with other holders of promising leases. As Hasenfuss insisted, it was also essential that Exxoteq should have constantly been communicating its views on potential future projects in order to keep shareholders on board.⁵⁶² Instead, Exxoteq (and in particular Prem Sawney) were largely silent on their internal projects since the murmurings of the PetroSA deal surfaced in November 2003.⁵⁶³ By March of 2004, the damage had been done: despite announcing a deal with Strong Energy Resource based in Texas, Exxoteq's share price remained around the 60c price level.⁵⁶⁴ Hasenfuss points to the fact that many other purely exploration stocks that had been listed in the past on the JSE (namely Zarara, OTK, Whetstone, Rareco and Century Carbon) had either collapsed or were just managing to stay afloat.⁵⁶⁵ Furthermore, the deal between Exxoteq and Strong Energy itself seemed a bit confusing: Strong Energy had given Exxoteq a 95% effective share of its concession in Angola for what appeared to be a funding deal whereby Exxoteq would fund the exploration operation and Strong would simply retain a 5% interest.⁵⁶⁶ Needless to say, it seems strange that Strong Energy would essentially give away 95% of a lease unless they believed that the concession did not hold much potential.⁵⁶⁷ By the end of March, the Strong Energy deal had done little to improve the market feeling pertaining to Exxoteq with the share price sitting at 36c on the last day of that month.⁵⁶⁸ The hoped for deal between Exxoteq and PetroSA also seemed not to be materializing fast enough to quell market concern. In a statement on the intended deal by the company, the intention of the deal revolved around the ability of the two companies to "benefit from each other's skills" and to "jointly realis[e]... exploration and development of hydrocarbons predominantly in southern Africa".⁵⁶⁹

After yet another tumultuous period on the stock market, a 3 page cover story was written on Exxoteq by Finance Week in their last June edition for 2004. The reason that Exxoteq was

⁵⁶² Hasenfuss, M. 'The price of impatience', *Finance Week*, 2 February (2004), pg. 18.

⁵⁶³ *Ibid.*

⁵⁶⁴ Hasenfuss, M. 'Sentiment still not gushing', *Finance Week*, 1 March (2004), pg. 30.

⁵⁶⁵ *Ibid.*

⁵⁶⁶ *Ibid.*

⁵⁶⁷ *Ibid.*

⁵⁶⁸ Johannesburg Stock Exchange (JSE). 'Daily trading history of Exxoteq', 5 November 2003-11 June 2007.

⁵⁶⁹ Hasenfuss, M. 'THE GOOD, THE BAD & THE UGLY', *Finance Week*, 29 March (2004), pg. 30.

now on the front cover of *Finance Week* was because it was running out of cash.⁵⁷⁰ Owing to numerous factors, including the unfortunate and untimely death of Exxoteq founder Prem Sawney in Dubai, Exxoteq was struggling to stay solvent.⁵⁷¹ Within the first six months of operations, Exxoteq had all but spent the R11 million raised from their JSE listing and by the end of June needed to raise \$5 million, “to stay afloat”.⁵⁷² Due to the fact that the share price had recently hit 15c and only valued the company at only R15 million, the ability to raise funds was near on impossible due to the fact that no assets (other than the Algoa lease) could be used as collateral on the deal.⁵⁷³ Even if investors were prepared to fund the \$5 million fund raising in exchange for the lease, it would have seemed unlikely at the time that such an injection could save the business: if the company had managed to spend R11 million in just 6 months, it seems reasonable to assume that the cash burn rate for the further \$5 million would remain largely the same. Hasenfuss also noted that it was strange that Exxoteq Corporation, the parent company of Exxoteq Ltd based in India, did not attempt to raise funds for its South African subsidiary.⁵⁷⁴ From a financial perspective, the lack of funding was the beginning of the end for Exxoteq.

Following the nonstarter deals that Exxoteq had planned with various partners and the death of Prem Sawney, the financial media once again took aim at Exxoteq’s balance sheet. Probably the most significant corporate action that took place at Exxoteq during the first half of 2004 was the write down in value of its two main assets: the FPSO technology transfer from Exxoteq Corporation and the Algoa lease.⁵⁷⁵ With regards to the FPSO technology transfer from Exxoteq Corporation to Exxoteq Ltd, the deal was that Exxoteq Ltd would purchase the rights to the technology for R280 million in Exxoteq shares (no cash) once the technology could be used in projects.⁵⁷⁶ However, by mid-2004, Exxoteq did not have any projects to which it could apply the FPSO technology due to the fact that Exxoteq Ltd had not raised enough funding to begin production activities in the Algoa basin. Regardless of the fact that FPSO technology did not have application within Exxoteq Ltd by mid-2004, a more problematic challenge came from the death of Prem Sawney and the way in which his estate

⁵⁷⁰ Hasenfuss, M. ‘Gotcha!’, *Finance Week*, 28 June (2004), pg. 8.

⁵⁷¹ Hasenfuss, M. ‘Gotcha!’, *Finance Week*, 28 June (2004), pg. 8.

⁵⁷² *Ibid.*

⁵⁷³ *Ibid.*, pg. 9.

⁵⁷⁴ *Ibid.*

⁵⁷⁵ Hasenfuss, M. ‘The big write-off’, *Finance Week*, 12 July (2004), pg. 23.

⁵⁷⁶ *Ibid.*

was dealing with the deal transfer. Due to the fact that 56 million shares were purportedly owed to Exxoteq Corporation as payment for the FPSO technology, it would have been difficult (to say the least) to incorporate this significant shareholding into the rescue plan to raise \$4 million to continue operations within the company. The shares, by the time the estate had become involved in the deal, were losing value very quickly and would hardly suffice as a sufficient medium of payment.⁵⁷⁷ However, more worrying than the issues surrounding the FPSO deal was Exxoteq Ltd's write-down of the Algoa lease: the asset value had been written-down from R418 million at the time of the listing just 6 months earlier to zero.⁵⁷⁸ In other words, the biggest asset on the Exxoteq balance sheet had been declared as having no monetary value. Needless to say, an oil company without an oil asset is worthless, and Exxoteq, having written down the value of the asset to zero, were publicly acknowledging (for whatever reason) that their main oil asset no longer held any value. Although it was never really made clear why this write-down to zero actually took place, it seems to have been reflective of the markets' view of the value of Exxoteq as a company.

On 2 September 2004, Exxoteq Ltd's share trading on the JSE was suspended. According to Hasenfuss, having been the most prominent and prolific journalist to write on Exxoteq, the only surprise therein was that it took the, "JSE so long" to deal with the rogue financials and stock performance of Exxoteq.⁵⁷⁹ The suspension price of 20c per share was not the lowest the share price had gone either: on 12 July the price closed at 6c, giving the company an inferred value of just R6 million.⁵⁸⁰ Given that Exxoteq had R11 million in cash just 6 months prior and was now effectively bankrupt indicates the relative recklessness with regards to spending that must have taken place within the company.⁵⁸¹ Hasenfuss also believed that in order to give the investors at the time peace of mind, the Sequence Oil & Gas shareholders should make public whether they offloaded their shares in Exxoteq prior to its suspension or profited despite the company's collapse.⁵⁸² Even more worrying than this were the so-called 'incentive bonuses' that were to be paid to Exxoteq employees.⁵⁸³ One of these

⁵⁷⁷ Hasenfuss, M. 'The big write-off', *Finance Week*, 12 July (2004), pg. 23.

⁵⁷⁸ *Ibid.*

⁵⁷⁹ Hasenfuss, M. 'THE GOOD, THE BAD & THE UGLY', *Finance Week*, 13 September (2004), pg. 38.

⁵⁸⁰ Johannesburg Stock Exchange (JSE). 'Daily trading history of Exxoteq', 5 November 2003-11 June 2007.

⁵⁸¹ Hasenfuss, M. 'THE GOOD, THE BAD & THE UGLY', *Finance Week*, 13 September (2004), pg. 38.

⁵⁸² *Ibid.*

⁵⁸³ Hasenfuss, M. 'A highly irregular annual report', *Finance Week*, 20 September (2004), pg. 34.

employees was Gerhard Brink who appeared to have been given a bonus of R538 000.⁵⁸⁴ This seems absurd considering that during his six month tenure as MD of Exxoteq as a listed company, Brink oversaw a share devaluation of 98% and spent nearly R11 million in cash.⁵⁸⁵ Furthermore, one of the debt settlements paid out of the R11 million cash pile was an amount of R1.6 million to Rawtech CC whose directors are the same directors of Sequence (including Brink).⁵⁸⁶ It seems strange that this debt was not paid in shares like other deals which were contingent on the success of Exxoteq Ltd as a company. It would seem then that Brink and other shareholders in Exxoteq were trying to get as much money out of the business as possible before it collapsed. To a certain extent, the behaviour of Brink and the Sequence-turned-Exxoteq shareholders was similar to that of Jeff Skilling and Ken Lay in the build up to the collapse of Enron only a few years earlier: cashing in before the collapse.⁵⁸⁷ The proposed bonus payments to Brink and the cash payments to Rawtech CC included in the annual report that would have indicated that there were significant doubts as to whether Exxoteq would remain a going concern.

Exxoteq's future prospects seemed even more confusing and unclear after the annual shareholders meeting in late 2004. Despite the significant financial difficulties which Exxoteq was facing, reports indicated that the AGM itself was fairly docile.⁵⁸⁸ The message from Gerhard Brink was that there were a number of potential investors who were prepared to invest in Exxoteq to boost its cash position although, once again, his evidence of these discussions was anecdotal and could well be described as conjecture.⁵⁸⁹ The only aspect of the AGM that was more peculiar than Brink's assured position that Exxoteq's future was bright was the relative lack of pushback from the shareholders that were present at the meeting. Indeed, the shareholders present actually signed off on resolutions that would allow share dilutions in order to get an injection of liquidity.⁵⁹⁰ Indeed, Marc Hasenfuss had strong words for the relative lack of backbone demonstrated by investors present at the AGM: "[i]f that's how SA investors respond to being ripped off, then expect more overvalued, overhyped

⁵⁸⁴ *Ibid.*

⁵⁸⁵ Hasenfuss, M. 'A highly irregular annual report', *Finance Week*, 20 September (2004), pg. 34.

⁵⁸⁶ *Ibid.*

⁵⁸⁷ *Enron: The Smartest Guys in the Room*. Alex Gibney, Magnolia Pictures.

⁵⁸⁸ Hasenfuss, M. 'Can it get any weirder?', *Finance Week*, 27 September (2004), pg. 14.

⁵⁸⁹ *Ibid.*

⁵⁹⁰ *Ibid.*

companies to start sucking for public funds”.⁵⁹¹ By the end of calendar year 2004, Exxoteq’s share suspension had still not been lifted and the company was, for all intents and purposes, no longer a business entity. In the final edition of Finance Week for 2004, Marc Hasenfuss gave the Exxoteq shareholders his ‘Victim Ludorum’ award for being, “duped into paying 500c/share for shares prior to the oil company listing late in 2003”.⁵⁹²

The beginning of 2005 began with yet more public promises by Exxoteq. After securing a R4 million cash injection in mid- to late-2004, sources within the company were once again murmuring that a R100 million investment was on the way.⁵⁹³ Based on the various public comments about deals which never came to fruition and investments that were not made, the R100 million hint appeared to be yet another statement full of ambition but with little substance. Moreover, Exxoteq Corporation were now handing back the 56 million shares issued to them by Exxoteq Ltd in exchange for the FPSO technology rights which had yet to be exercised.⁵⁹⁴ This came after a deal was reached with Prem Sawney’s estate on the matter. Pertaining to the outstanding 56 million shares, they were to be issued on the JSE in order to provide scrip in exchange for funding.⁵⁹⁵ In mid-March of 2005, this shares-for-cash deal took place. Inyanga Trading 199 purchased a 32% stake in Exxoteq for R15 million rand valuing the company at approximately R45 million; a R25 million market capitalization premium on the shares at the time of the suspension.⁵⁹⁶ Furthermore, Inyanga also acquired a 26% direct stake in the Sequence Oil & Gas subsidiary, probably as a contingency plan that if Exxoteq were to fold, they would still have a stake on the Algoa lease which was the only Exxoteq asset of any value.⁵⁹⁷ Exxoteq also had a new CEO by the end of March in the form of Gavin Zietsman who was recruited with the intention of pulling Exxoteq back onto an even keel.⁵⁹⁸ Although Zietsman indicated that he believed that Exxoteq would be producing cash flow in the near future, it is the same promise his predecessors made to shareholders with very little to show for it other than failure. The only way in which Exxoteq could have had any hope in developing a strong cash flow would have been to get the Algoa project

⁵⁹¹ *Ibid.*

⁵⁹² Hasenfuss, M. ‘VICTIM LUDORUM’, *Finance Week*, 20 December (2004), pg. 18.

⁵⁹³ Hasenfuss, M. ‘Second time lucky’, *Finance Week*, 31 January (2005), pg. 18.

⁵⁹⁴ *Ibid.*

⁵⁹⁵ *Ibid.*

⁵⁹⁶ Hasenfuss, M. ‘Crash and (money to) burn’, *Finance Week*, 28 March (2005), pg. 28.

⁵⁹⁷ *Ibid.*

⁵⁹⁸ *Ibid.*

online. Yet, experts at the time believed that bringing the project online would cost in the region of R50-R80 million.⁵⁹⁹ This was well short of the injection provided by Inyanga.

The Inyanga cash injection was much needed, but ultimately did not take place. For whatever reason (it still is not clear why the deal was not ratified), Inyanga got cold feet and did not front the cash.⁶⁰⁰ Following the failure of the Inyanga empowerment deal, the newly appointed Exxoteq CEO, Gavin Zietsmann, resigned from the company. Although there were a number of unofficial utterances that other funding sources were being investigated, none of these came to realization and Exxoteq Ltd fell dormant. Largely leaving shareholders in the lurch, Exxoteq did not officially disclose to shareholders their predicament but rather simply stopped answering their phones and ceased responding to emails and other communication attempts from all parties.⁶⁰¹ Furthermore, after the dissolution of the company and up until 2009, it was not clear where the Algoa concession lease had subsequently ended up. However, as of the beginning of 2013, the lease seems to be in the possession of Aberdeen Offshore Engineering. According to the company's CEO, Roy Mason-Brebner, the hope will be to turn the lease into a producing asset as soon as possible.

The history of Exxoteq Ltd and its various stake holders has largely tainted the image of oil exploration within the onshore Algoa basin. However, it should be noted that although Exxoteq itself was an unmitigated corporate and financial disaster, this was not due to the Algoa concessions' lack of potential. The corporate and financial mismanagement of Exxoteq is what ultimately led to the company's failure, not the failure of the Algoa lease as an asset of value. Because no drilling took place on the Algoa concession during Exxoteq's custodianship thereof, it is still yet to be seen whether or not the actual lease area itself has value. That job will be left to the current owner(s) of the lease to prove; and if not them, the next owner of the concession. Despite the promise that the Algoa concession has from a geological perspective, persistent human error in the management of the resource has ultimately led to it being largely unexplored and (possibly) unexploited.

⁵⁹⁹ *Ibid.*

⁶⁰⁰ Hasenfuss, M. 'AWOL from the JSE- The rogues' gallery', *FINWEEK*, 29 October (2009), pg. 18-20.

⁶⁰¹ *Ibid.*

Conclusion

The history of oil and gas exploration in the onshore Algoa basin is one characterized by commercial failure. However, these failures should be seen within the context of the petroleum prospectivity of the Basin. Although efforts to commercialize the Basin have failed thus far, the renewed interest therein needs to be assessed with respect to this prospectivity. As such, this conclusion will compartmentalize the various aspects of these operations which (when combined) will provide pointers to the success or failure of the Basin. Firstly, the primary points of petroleum prospectivity within the Basin need to be acknowledged and be assessed alongside the primary geological risk factors which will impact any exploration going forward. Secondly, there needs to be an assessment of the financial and operational risk factors could pose as much of a risk to the monetization of the Basin as the geological risk factors, as the past exploration of the Basin has illustrated. Compounding the geological and financial/operational risk factors within the Basin, the global oil market and price will necessarily play a large role in defining the context in which the continued exploration of the Basin takes place, or makes such operations viable. Hence, this factor will need to be addressed as well.

From a geological perspective, the Basin most certainly has some promising indications that a petroleum system exists. Beginning with the findings and subsequent appraisals by Soekor, there appeared to be some meaningful evidence of petroleum prospectivity. The largest macro indication of this petroleum prospectivity related to the link between Algoa Bay and the Falkland Islands following the break-up of Gondwanaland which partially served as the impetus for exploration within the Algoa basin at large. Soekor's subsequent focus on the onshore portion of the Algoa basin followed the findings of the offshore Algoa basin. Of the various wells that were drilled in the Basin, live oil shows were present as well as oil and gas trace within the core and stem samples that were collected from the exploration wells. However, the most meaningful discovery made during exploration drilling within the Basin was the discovery of the Colchester member within the Kirkwood formation. The Colchester member is the oil source rock from which the envisaged reserves within the Basin would have been fed. The existence of the Colchester member as a source rock is unique in South

Africa and is believed to be one of very few onshore petroleum source rocks present in the country. As such, the Colchester member serves as the key geological stratum in the petroleum prospectivity of the Basin. If further exploration of the Basin calls into question the Colchester member as a viable source rock, this would be a significant blow to the petroleum prospectivity of the Basin. Considering that the last documented time that the Colchester member was penetrated was during the Soekor exploration drilling in the 1960s, a revisiting of the data may present a different interpretation of the potential of the Colchester member.

Arguably the primary geological risk within the Basin is finding a reservoir rock with suitable permeability. Although Malan and other geologists did indicate that there may well be reservoir rock structures with suitable permeability, the findings made by Soekor in the late-1960s and early-1970s did not find reservoir structures which had meaningful permeability statistics. Furthermore, finding permeable rock without meaningful porosity would be equally unhelpful: good quality reservoir rock needs to contain suitable permeability *and* porosity simultaneously. Although there are areas within the Basin such as the Uitenhage trough which is 40% sandstone and could likely have such reservoir rock requirement, there has yet to be an actual finding from exploration drilling to corroborate this view.⁶⁰² Another issue with the view taken of the Uitenhage trough is that there is (to a certain extent) the implied assumption that the integrity and quality of the sandstone is largely uniform. Without evidence to test this assumption, it is not clear whether all of this sandstone will be appropriate reservoir rock. Hence, notwithstanding the fact that 40% of the Uitenhage trough is comprised of sandstone, only a portion of that sandstone may be of suitable quality to be considered reservoir rock. Although not a damning indictment of the potential of the Basin, it is most certainly a risk that needs to be considered and thoroughly assessed.

There are an abundance of trapping mechanisms within the Basin, but owing to the potential issues that exist with finding suitable reservoir rocks, finding *suitable* trapping mechanisms may be more difficult. In order for a suitable trap to be found, it will be necessary for the

⁶⁰² Malan, J. 'Geology, Potential of Algoa, Gamtoos Basins of South Africa', *Oil & Gas Journal*, 91, 46, 15 November (1993), pg. 4.

trapping mechanism to be found in the areas with suitable quality sandstone. Although there are many trapping mechanisms present within the Basin (the most prolific being half-grabens), it is not clear that they are located in areas with reservoir rocks of adequate quality.⁶⁰³ It will be necessary for further research to be done into finding subsurface structures which have both reservoir quality sandstone and trapping mechanisms. The subsurface stratigraphy is also, owing to its complexity, a hindrance in the process of trying to find the best quality areas in which to search for oil and gas reservoirs.⁶⁰⁴ It is likely that more seismic data will need to be collected to determine the most prospective trapping areas within this complex geological structure. Such research may also shed light on the anticlinal structures present within the Basin which may also serve as trapping mechanisms.

The risks in commercializing a potential petroleum system in the Basin are not confined to geology and include financial and operational risks as well. Probably the most difficult obstacle for the financial future of oil and gas exploration in the Basin pertains to funding both exploration and production programs therein. As the Exxoteq debacle proved, the financial risks associated with managing an oil and/or gas asset is complex and potentially volatile. As such, a particular effort will need to be made in choosing the correct funding mechanism and route to market. The listing of Exxoteq provided some important lessons that will need to be considered, should the same approach be taken again. Regardless of the perspective of the exchange with regards to the company's listing suitability, any attempt to list a lease in the Basin will need an accurate and credible appraisal. The appraisal of the Exxoteq lease by Dr. Frank Brown is an example of the detrimental effect that an inaccurate appraisal of a lease's potential can have on turning a lease into a production asset.

Furthermore, a fair value needs to be given to the appraised asset. The overvaluing of the Basin lease which served as the primary asset on the Exxoteq balance sheet is one of the key reasons that the Exxoteq listing (and subsequent trading) was so financially problematic and volatile. Indeed, if the valuation of the Basin lease had been more reasonable, it is likely that Exxoteq would have managed to secure a strong pre-listing subscription. Due to this history, it seems that any public offer of the lease in the future will need to be more reflective of what the market appetite for such an offering is.

⁶⁰³ Malan, J. 'Geology, Potential of Algoa, Gamtoos Basins of South Africa', *Oil & Gas Journal*, 91, 46, 15 November (1993), pg. 1.

⁶⁰⁴ *Ibid.*

Another key issue that arose in the Exxoteq listing was the minimum subscription level that was reached prior to the listing. The fact that Exxoteq only managed to place just over 2.2% of the company's total share allocation should have served as a significant red flag to the Exxoteq management that there was inadequate market appetite for the listing price.⁶⁰⁵

Another issue that should have been addressed by the Exxoteq management was the fact that the listing only managed to raise just over R11 million.⁶⁰⁶ Even at the time of the listing, it was clear that this would not provide sufficient cash to begin drilling operations within the Basin lease area. To compound the issues around availability of cash, Exxoteq took R900 000 of the R11 million raised and paid it to Brink as a salary.⁶⁰⁷ It should go without saying that spending nearly 10% of the money raised from shareholders on the salary of one person in the company is financially imprudent, if not reckless. Exxoteq's mishandling of the valuation and cash management served as the primary reason for the company's collapse and should be recognised as an area which will have to be assessed correctly by future fund raising attempts.

Many of the challenges in developing the hydrocarbon potential of the Basin will also be determined to some extent by the state of the global oil and gas market and its relationship to the South African economy. As has been illustrated throughout this thesis, local exploration efforts within the Basin cannot be divorced from events in the global oil market. In particular, the global oil price and the volatility of the price can have a direct impact on determining the viability of a drilling project at any given point in time. Hence, any future attempts to raise funds, hire drilling equipment, and collect seismic data will have to factor in the state of the global oil market. Furthermore, technological advances in oil and gas extraction techniques will also play a significant role in oil and gas production in South Africa (as is the case with potential shale gas production in the country).

⁶⁰⁵ Exxoteq (Pty) Ltd. 'Exxoteq Prospectus', The prospectus given to potential investors in Exxoteq which was to list on the Johannesburg Stock Exchange (JSE), pg. 1 & 20.

⁶⁰⁶ *Ibid.*

⁶⁰⁷ *Ibid.*

The history of oil and gas exploration within the onshore Algoa basin, although unsuccessful, should not be considered a death knell for future efforts. As has hopefully been demonstrated thus far, the Basin most certainly holds hydrocarbon producing potential. The information gleaned from the early exploration efforts carried out by Soekor indicate that there are sufficient signs of liquid hydrocarbon prospectivity to warrant further efforts to turn the region from an exploration play into a production play. That being said, there are still a number of geological risks which may well impede this process and require further seismic research and exploration drilling. Finding data which provide indications of the areas which are most likely to have trapping mechanisms in conjunction with good quality reservoir rock will be the first major geological obstacle which will need to be overcome. These findings, should they be made, would need to be corroborated by data from an actual well drilled in the region in order to solidify and confirm the findings. Without these two factors, it would be prohibitively risky to proceed with any kind of production project. This would also be a necessary step to take for further rounds of funding to take place.

Managing the funding of any production project would also be essential to the success of any development of a Basin lease. The route to market that Exxoteq took in order to obtain funding is considered the norm for undercapitalized companies which hold valuable commodity assets. Thus, it would probably be likely that any future attempts to fund a Basin lease would follow a similar course. However, as has been noted at numerous points throughout this thesis, there were a number of fundamental miscalculations that took place which ultimately led to the failure of the company as a listed entity. In order to avoid such a failure in the future, it is necessary that funding is premised on two key pillars. Firstly, the valuation of the asset which is being listed must be priced at a level that reflects that considerable risk that is associated with non-production commodity assets. If this is done correctly and value is demonstrated to potential shareholders, the share performance following the listing will likely be far less volatile and will consequently give the asset more financial stability; a key consideration for most investors. Secondly, it will be crucial to put apparatus and management structures in place that will allow for prudent financial management of cash. This will provide further financial stability for the company and will likely attract institutional investors, assuming the price is right. Institutional investors are also crucial to the success of such a listing. They will often provide a financial fall-back position should the company find itself in financial difficulty, assuming that they still believe that

there is value to be gained by remaining a shareholder. As to whether a well should be drilled at the present moment in time (assuming that the necessary structures and permissions are granted) is another matter. The future development of the Basin will need to take into account the current state of the global commodities market, the nature in which the project is developed (pertaining particularly to the actual drilling and production processes), and a thorough assessment of the unique geo- and socio-political risks associated with conducting mining businesses in South Africa. It would also be necessary to take into account a potential acquisition/sale of the asset in order to determine whether this may be a potential avenue for value realisation in the medium-term. The future of the onshore Algoa basin as an oil exploration and producing operation will almost certainly be difficult, but there is enough potential to justify the continued interest in the area.

Bibliography:

- Aberdeen Offshore Engineering, ‘Internal geology report extract: Links between South Africa & the Falklands’. *Extract 1*. Corporate interpretation of the synergies between South African and Falkland Islands’ potential hydrocarbon profile.
- Ammann, D. *The King of Oil: The Secret Lives of Marc Rich* (London, 2009).
- Antill, N & Arnott, R. *Valuing Oil and Gas Companies: A Guide to the Assessment and Evaluation of Assets, Performance and Prospects* (Cambridge, 2000).
- Bahadori, A *et al.* *Dictionary of Oil, Gas and Petrochemical Processing* (Florida, 2013).
- Bartolini *et al.* *Mesozoic Sedimentary and Tectonic History of North-central Mexico* (Colorado, 1999).
- Batchelor, P & Willet, S. *Disarmament, Defence and Industrial Adjustment in South Africa* (Oxford, 1998).
- Bate, K & Malan, J. ‘Tectonostratigraphic evolution of the Algoa, Gamtoos and Pletmos Basins, offshore South Africa’, *Soeker (Pty) Ltd*, pg. 61-73 in, M. De Wit & I. Ransome, *Inversion Tectonics of the Cape Fold Belt, Karoo and Cretaceous Basins of Southern Africa* (Rotterdam, 1992).
- Bate, K, Fouche, J & van der Merwe, R. ‘Plate tectonic setting of the Mesozoic Basins, southern offshore, South Africa: A review’, *Soeker (Pty) Ltd*, pg. 33-45 in, De Wit, M & Ransome, I. *Inversion Tectonics of the Cape Fold Belt, Karoo and Cretaceous Basins of Southern Africa* (Rotterdam, 1992).
- Bordo, M & Eichengreen, B. *A Retrospective on the Bretton Woods System: Lessons for International Monetary Reform* (Chicago, 2007).
- Brink, G *et al.* ‘New interpretation reveals potential in onshore Algoa basin, South Africa’, *Oil & Gas Journal*, 103, 1, 3 January (2005), pg. 34-46.
- Buryakovsky, L, *et al.* *Geology and Geochemistry of Oil and Gas* (Amsterdam, 2005).
- Clarke, D. *Economic Sanctions Against South Africa* (Natal, 1974).
- Cline, W. *Trade and Income Distribution* (Washington DC, 1997).

- Committee on Government Reform. ‘Justice Undone: Clemency Decisions in the Clinton White House’, *House Report 107-454*, Union Calendar No. 269 (U.S. Government Printing Office, 2002).
- Copetas, C. *Metal Men: Marc Rich and the \$10 Billion Scam* (New York, 2001).
- Crankshaw, O. *Race, Class and the Changing Division of Labour Under Apartheid* (Oxford, 2002).
- Davis, J. ‘Squeezing Apartheid’, *Bulletin of Atomic Scientists*, (November, 1993).
- De Klerk, A. *Fischer-Tropsch Refining* (New York, 2011).
- Domingo, V. *South Africa* (New York, 2004).
- Dry, M & Steynburg, A. *Fischer-Tropsch Technology* (Amsterdam, 2006).
- Dubow, S. *Apartheid, 1948-1994* (Oxford, 2014).
- EIA, Oil reserves by country.
<http://www.eia.gov/countries/index.cfm?view=reserves>.
- *Enron: The Smartest Guys in the Room*. Alex Gibney, Magnolia Pictures.
- Epstein, G. *Financialization and the World Economy* (Massachusetts, 2005).
- Evernick, J. *Introduction to Well Logs and Subsurface Maps* (Oklahoma, 2008).
- Exxoteq (Pty) Ltd. ‘Exxoteq Prospectus’, The prospectus given to potential investors in Exxoteq which was to list of the Johannesburg Stock Exchange (JSE).
- Falola, T & Genova, A. *The Politics of the Global Oil Industry* (Connecticut, 2005).
- Ferrier, R & Bamberg, J. *The History of the British Petroleum Company: Volume 1, The Developing Years, 1901-1932* (Cambridge, 1982).
- Fleet, A & Boldy, S. *Petroleum Geology of Northwest Europe: Proceedings of the 5th Conference, Volume 2* (London, 1999).
- Gibbons, C. ‘Deuss: From a Second-Hand Car Dealer to Controversial World Figure’, *The Bermuda Sun* (October, 2006) at
<http://bermudasun.bm/Content/NEWS/News/Article/Deuss--From-second-hand-car-dealer-to-controversial-world-figure/24/270/31102>.
- Gow, S & Gow B. *Roughnecks, Rock Bits and Rigs: The Evolution of Oil Well Drilling Technology in Alberta 1883-1970* (Calgary, 2005).
- Hanlon, J. *Beggar Your Neighbours: Apartheid Power in South Africa* (Indiana, 1986).

- Hasenfuss, M. ‘A highly irregular annual report’, *Finance Week*, 20 September (2004), pg. 34.
- Hasenfuss, M. ‘Algoa Basin oil exploration to be revisited’, *Business Day*, 4 September (2013).
- Hasenfuss, M. ‘AWOL from the JSE- The rogues’ gallery’, *FINWEEK*, 29 October (2009), pg. 18-20.
- Hasenfuss, M. ‘Can it get any weider?’, *Finance Week*, 27 September (2004), pg. 14.
- Hasenfuss, M. ‘Crash and (money to) burn’, *Finance Week*, 28 March (2005), pg. 28.
- Hasenfuss, M. ‘Crude form over substance’, *Finance Week*, 10 November (2003), pg. 15.
- Hasenfuss, M. ‘Dig deep into the prospectus’, *Finance Week*, 20 October (2003), pg. 13.
- Hasenfuss, M. ‘Gotcha!’, *Finance Week*, 28 June (2004), pg. 8.
- Hasenfuss, M. ‘Sentiment still not gushing’, *Finance Week*, 1 March (2004), pg. 30.
- Hasenfuss, M. ‘Second time lucky’, *Finance Week*, 31 January (2005), pg. 18.
- Hasenfuss, M. ‘Stags (f)oiled again’, *Finance Week*, 24 November (2003), pg. 34.
- Hasenfuss, M. ‘The big write-off’, *Finance Week*, 12 July (2004), pg. 23.
- Hasenfuss, M. ‘The price of impatience’, *Finance Week*, 2 February (2004), pg. 18.
- Hasenfuss, M. ‘THE GOOD, THE BAD & THE UGLY’, *Finance Week*, 29 March (2004), pg. 30.
- Hasenfuss, M. ‘THE GOOD, THE BAD & THE UGLY’, *Finance Week*, 13 September (2004), pg. 38.
- Hasenfuss, M. ‘THE GOOD, THE BAD & THE UGLY’, *Finance Week*, 27 July (2005), pg. 36.
- Hasenfuss, M. ‘VICTIM LUDORUM’, *Finance Week*, 20 December (2004), pg. 18.
- Hayward, S. *The Politically Incorrect Guide to the Presidents: From Wilson to Obama* (Washington, 2012).

- Hengeveld, R & Rodenburg, J. *Embargo: Apartheid's Oil Secrets* (Amsterdam, 1995).
- Hesse, M *et al. Pollen Terminology: An Illustrated Handbook* (New York, 2009).
- Hill, M. *Gold: The California Story* (California, 2002)
- Horowitz, R. *Communication and Democratic reform in South Africa* (Cambridge, 2001).
- Howard, A. 'Oil and Gas Company Valuations', *Business Valuation Review*, 28, 1, (2009).
- Isaacman, A. 'Portuguese Colonial Intervention, Regional Conflict and Post-Colonial Amnesia :Cahora Bassa Dam, Mozambique 1965-2002', *ICGC-McArthur Program*.
- Jia, C. *Characteristics of Chinese Petroleum Geology: Geological Features and Exploration Cases of Stratigraphic, Foreland and Deep Formation Traps* (Berlin, 2013).
- Johannesburg Stock Exchange (JSE). 'Daily trading history of Exxoteq', 5 November 2003-11 June 2007.
- Jones, C. *Geology* (Michigan, 2005).
- Jones, L. 'Oily disclaimer', *Finance Week*, 13 October (2003), pg. 18.
- Keasey, K. *et al. Corporate Governance: Accountability, Enterprise and International Comparisons* (New Jersey, 2005).
- Kelts, K. 'Environments of deposition of lacustrine petroleum source rocks: an introduction', *Geological Society, London, Special Publications*, 40, (1988), pg. 3-26.
- Knight, R. 'Sanctions, Disinvestment, and U.S. Corporations in South Africa'. Originally a chapter in Edgar, R. *Sanctioning Apartheid* (Africa World Press, 1990).
- Leith, M. 'A Summary of Drill Stem Test Data of the Algoa Basin Rotary Boreholes with Special Reference to Formation Damage', *Soekor (Pty) Ltd*, November 1971.
- Levey, P. 'Sanctions Against South Africa: What Did They Do?', *Economic Growth Center: Yale University*, (February 1999).
- LeVine, S. *The Oil and the Glory: The Pursuit of Empire and Fortune on the Caspian Sea* (New York, 2007).

- LinkedIn at: <http://za.linkedin.com/in/gerhardbrink>.
- Lowenberg, A & Kaempfer, W. *The Origins and Demise of South African Apartheid: A Public Choice Analysis* (Michigan, 1998).
- Lubke, R & De Moor, I. *Field Guide to the Eastern & Southern Cape Coasts* (Cape Town, 1998).
- Lyons, W, *et al.* *Standard Handbook of Petroleum and Natural Gas Engineering* (Houston, 2011).
- Mail & Guardian (Unnamed Staff Reporter). ‘Shah of Ogies and his field of black gold’, [online], Accessed on 23/06/2014 from: <http://mg.co.za/article/1996-10-25-shah-of-ogies-and-his-field-of-black-gold>.
- Malan, J. ‘Geology, Potential of Algoa, Gamtoos Basins of South Africa’, *Oil & Gas Journal*, 91, 46, 15 November (1993).
- Mariotti, M. *White Control of Black Employment: An Analysis of the Effects of Apartheid Era Labour Legislation on Black Employment in South Africa* (California, 2008).
- Mathur, S. *Trade, the WTO and Energy Security: Mapping the Linkages for India* (New York, 2014).
- McGrath Goodman, L. *The Asylum: Inside the Rise and Ruin of the Global Oil Market* (New York, 2013).
- McLachlan, I & Scott, L. ‘Algoa Basin Palynology: AL 1/69 and CK 1/68 Wells’, *Soekor (Pty) Ltd*, 15 January 1973.
- McLaren, P & Duff, D. *Holmes’ Principles of Physical Geology* (Oxford, 1993).
- McLean, B & Elkind, P. *The Smartest Guys in the Room: The Amazing Rise and Fall of Enron* (London, 2013)
- Mensah, I. ‘Ilc 76-Record of Proceedings’, *International Labour Organization*, (1990).
- Moll, T. ‘Did the Apartheid Economy Fail?’, *Journal of Southern African Studies*, 17, 2, (June, 1991).
- Mulholland, S. *Another Voice II* (Cape Town, 2002).
- Nairan, A & Alsharhan, A. *Sedimentary Basins and Petroleum Geology of the Middle East* (Amsterdam, 1997).

- Norsk Petroleumsforening. *Sequence Stratigraphy on the Northwest European Margin: Proceedings of the Norwegian Petroleum Society Conference, 1-3 February 1993, Stavanger, Norway* (London, 1995).
- Oil price history:
http://inflationdata.com/Inflation/Inflation_Rate/Historical_Oil_Prices_Table.asp.
- Palmer Smith, R. *Darkest Truths of Black Gold: An Oil Industry Executive Breaks the Industry's Code of Silence* (Indiana, 2007).
- Petroleum Agency of South Africa (PASA). 'History of Exploration and Production', [online], Accessed on 20/06/2014 from:
<http://www.petroleumagencysa.com/index.php/petroleum-geology-resources/exploration-history> .
- Petroleum Agency of South Africa (PASA). 'Mesozoic and Tertiary: Algoa and Gamtoos basins', internal PASA document, *author is not explicitly recognized*.
- Pipkin, B *et al.* *Geology and the Environment* (Massachusetts, 2010).
- Raymond, M & Leffler, W. *Oil and Gas Production in Nontechnical Language* (Oklahoma, 2006).
- Ramburg, I. *The Making of a Land: Geology of Norway* (London, 2008).
- Ramcharran, H. 'Oil production responses to price changes: an empirical application of the competitive model to OPEC and non-OPEC countries', *Energy Economics*, 24, 2, (March, 2002). Pg. 97-106.
- Rees, M & Day, C. *Muldergate: The Story of the Info Scandal* (Johannesburg, 1980).
- Rogers, B. 'South Africa and the Oil Embargo', *Africa Today*, 21, 2, (Spring 1974).
- Sahay, B. *Petroleum Exploration and Exploitation Practises* (New Delhi, 2001).
- Sahay, B. *Pressure Regimes in Oil and Gas Exploration* (New Delhi, 1999).
- Sampson, A. *The Seven Sisters: The Great Oil Companies and the World They Shaped* (Michigan, 1974).
- Sellstrom, T. *Sweden and National Liberation in Southern Africa: Solidarity and Assistance, 1970-1994* (Uppsala, 2002).
- South African Iron and Steel Institute (SAISI). *Primary Steel Works History SA*. (PDF), Accessed at: www.saisi.co.za .

- Scholl, D & Vallier, T. *Geology and Offshore Resources of Pacific Island Arcs: Tonga Region* (Virginia, 1985).
- Schutze, E. ‘Liquid fuel from Coal’, [online], Accessed on 19/06/2014 from: <http://www.mediaclubsouthafrica.com/component/content/article?id=123:liquid-fuel-from-coal>.
- Selley, R & Sonnenburg, S. *Elements of Petroleum Geology* (Massachusetts, 2014).
- Sharma, A. *Company Law: BBA III* (New Delhi, 2010).
- Shepherd, M. *Oil Field Production Geology: AAPG Memoir 91* (Oklahoma, 2009).
- Skeet, I. *OPEC: Twenty-Five Years of Prices and Politics* (CUP Archive, 1991).
- Study Commission on US Policy towards Southern Africa. *South Africa: Time Running Out* (California, 1981).
- Tanous, P & Cox, J. *Debt, Deficits, and the Demise of the American Economy* (New Jersey, 2011).
- Taylor, I. *Stuck in Middle GEAR: South Africa’s Post-apartheid Foreign Relations* (Connecticut, 2001).
- Terreblanche, S. *Lost in Transformation: South Africa’s Search for a New Future Since 1994* (Johannesburg, 2012).
- Tsangarides, C. *Exchange Rate Analysis in Support of IMF Surveillance: A Collection of Empirical Studies* (Washington D.C., 2008).
- United Nations Centre Against Apartheid. ‘Notes and Documents’, *Department of Political and Security Council Affairs*, 1978.
- United Nations Centre Against Apartheid. ‘Notes & Documents’, *Department of Political and Security Council Affairs*, 1985.
- US Department of Energy, 1977 Gas Mileage Guide: http://www.afdc.energy.gov/pdfs/1977_feg.pdf.
- Van Wyk, S.J. ‘Geological Well Completion Report of Borehole AL 1/69’, *Soekor (Pty) Ltd*, August 1971.
- Warren, J. *Evaporites: Sediments, Resources and Hydrocarbons* (Berlin, 2006).
- Winkler, H. *Taking Action on Climate Change: Long Term Mitigation Scenarios in South Africa* (Cape Town, 2010).

- Young, A. ‘Forty Years Ago The 1973 Arab Oil Embargo Battered The Global Economy, But It Also Helped Expedite Better Fuel Economy’, *International Business Times* (2013).