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Implementation of the Proposed Clean Fuels II Regulation in South Africa

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A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

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ABSTRACT

The South African government gazetted petroleum products specification regulation, better known as Clean Fuels II (CFII) in 2012. This regulation seeks to improve air quality via improved quality of petroleum products that are used in vehicles.

To comply with the regulation requirements, oil companies will have to upgrade their existing refineries, which will require capital investment. The industry has indicated that they cannot meet the requirements of the regulation without government's assistance via either subsidies or cost recovery mechanisms. They have further indicated that if the government goes ahead with this regulation, as is, they might have to shut down some of their refineries, thus putting the country's security of petroleum product supply a risk. The petroleum industry is responsible for the production, importing and selling of petroleum products that are needed for almost all productive activities of our economy.

The purpose of this study was to investigate what is the best way of implementing the proposed regulation to include cost recovery mechanisms that will ensure the preservation of the SA market size.

This was an interpretative case study on the petroleum industry that looked at the best practices from other countries that have been through this journey and also sought views from the industries' subject matter expects. Data were collected via semi-structured interview guides. The data were later analysed and interpreted.

The research found that regulating was the best way of ensuring that the quality of petroleum products produced by refineries improves, thus helping to improve our air quality. The research also concluded that subsidies through price increases, such as levies, are the most effective way of ensuring a successful implementation of the regulation.

DECLARATION

I, Simphiwe Clifton Mhlongo, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the University of Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

SIMPHIWE C. MHLONGO

Signed at……

On the…….day of…….2016

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Table of Contents

ABSTRACT ..... **i**

DECLARATION ..... **ii**

ACKNOWLEDMENTS ..... **iii**

LIST OF TABLES ..... **vii**

LIST OF FIGURES ..... **ix**

CHAPTER 1. INTRODUCTION **1**

1.1 Context Of The Study 1
1.1.1 Petroleum Industry 2
1.1.2 Challenges Faced By Refiners In South Africa 2
1.2 Problem Statement 4
1.2.1 Main Problem 4
1.3 Purpose Of The Study 5
1.4 Research Propositions 5
1.5 Significance Of The Study 5
1.6 Delimitations Of The Study 7
1.7 Definitions Of Terms And Abbreviations 7
1.8 Assumptions 8

CHAPTER 2. LITERATURE REVIEW **9**

2.1 Introduction 9
2.2 Clean Fuels II And The South African Petroleum Industry 10
2.2.1 Clean Fuels II 10
2.2.2 South African Petroleum Industry 12
2.3 The Concepts And Principles Of Government Regulations 14
2.3.1 Regulatory Impact Assessment (RIA) 16
2.4 Clean Fuels II Best Practices 16
2.5 Uncertainty Of Cost Recovery Mechanisms 19
2.5.1 Research Proposition 1 21
2.6 Reduction In The Market Size 21
2.6.1 Research Proposition 2 24
2.7 Conclusion of Literature Review 24
2.7.1 Research Proposition 1 24

2.7.2 RESEARCH PROPOSITION 2: 24

CHAPTER 3. RESEARCH METHODOLOGY 25

3.1 RESEARCH METHODOLOGY/PARADIGM 25
3.2 RESEARCH DESIGN 26
3.3 POPULATION AND SAMPLE 26
3.3.1 POPULATION 26
3.3.2 SAMPLE AND SAMPLING METHOD 26
3.4 THE RESEARCH INSTRUMENT 27
3.5 DATA ANALYSIS AND INTERPRETATION 28
3.6 LIMITATIONS OF THE STUDY 28
3.7 VALIDITY AND RELIABILITY 28
3.7.1 EXTERNAL VALIDITY 29
3.7.2 INTERNAL VALIDITY 30
3.7.3 RELIABILITY 30

CHAPTER 4. PRESENTATION OF RESULTS 31

4.1 INTRODUCTION 31
4.2 RESULTS PERTAINING TO PROPOSITION 1 31
4.2.1 UNDERSTANDING THE PROPOSED REGULATION 31
4.2.2 UNDERSTANDING THE COST RECOVERY MECHANISMS 36
4.2.3 SUMMARY OF RESULTS 42
4.3 RESULTS PERTAINING TO PROPOSITION 2 43
4.3.1 UNDERSTANDING THE IMPACT ON MARKET SHARE 43
4.3.2 SUMMARY OF RESULTS 47

CHAPTER 5. DISCUSSION OF THE RESULTS 49

5.1 INTRODUCTION 49
5.2 THE IMPORTANCE OF THE CLEAN FUELS II REGULATION 49
5.3 THE IMPORTANCE OF SUBSIDIES IN THE IMPLEMENTATION OF THE CLEAN FUELS II REGULATION 50
5.4 THE EFFECT OF THE REGULATION ON THE PETROLEUM INDUSTRY MARKET SIZE. 52
5.5 CONCLUSION 53

CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS 54

6.1 INTRODUCTION 54
6.2 CONCLUSIONS OF THE STUDY 54
6.2.1 CONCLUSIONS TO PROPOSITION 1 55
6.2.2 CONCLUSIONS TO PROPOSITION 2 56
6.3 RECOMMENDATIONS 56

6.4 SUGGESTIONS FOR FURTHER RESEARCH 57

REFERENCE LIST 59

APPENDIX A: Euro 5 Specifications 62

APPENDIX B: Interview Guide 63

LIST OF TABLES

Table 1: List of South African Refineries 2

Table 2: Sulphur Content In Petrol And Diesel For Some Developing Countries 12

Table 3: Developed Countries: Comparison Of Regulations 20

Table 4: Why is the government planning on implementing the regulation? 32

Table 5: Is the regulation necessary for the petroleum industry? 33

Table 6: What are the benefits for the oil companies regarding the proposed regulation? 34

Table 7: Who will benefit the most from the implementation of the regulation?..... 35

Table 8: Are subsidies the right approach to ensure implementation? 37

Table 9: Will refineries voluntarily comply with the proposed regulation if subsidies are offered? 38

Table 10: Which subsidy approach will ensure the quickest adoption of the regulation? 39

Table 11: Why did refineries not request subsidies when the previous regulation, Clean Fuels I was approved? 40

Table 12: How have other countries approached this regulation? 41

Table 13: What is the most cost-effective approach? 41

Table 14: What are the risks to the industry if the proposed regulation is implemented? 43

Table 15: What are the reasons for refinery closures? 44

Table 16: Production impacts 45

Table 17: Financial impacts 45

Table 18: Competition impacts 46

Table 19: Is the timing of the proposed CFII Regulation right for South Africa? 47

LIST OF FIGURES

Figure 1: CFII Journey..... 11

Figure 2: Highlights Of The KPMG Clean Fuels II Study..... 23

CHAPTER 1. INTRODUCTION

1.1 Context Of The Study

The proposed Clean Fuels II Regulation is a continuation of tightening the petroleum specifications (as announced in the Government Gazette Notice 431 of 2012). In 2006, the South African government banned the addition of lead to petrol and as a result the country currently sells only unleaded petrol. In addition, the amount of sulphur in diesel was reduced from 3000 parts per million (ppm) to 500ppm.

The Petroleum Specifications (CF2) Regulation seeks to improve air quality by regulating the quality of liquid fuels that can be sold in South Africa. The emissions from car exhausts have been linked negatively to environmental and health impacts(Woodcock, Edwards et al. 2009)

This proposed regulation requires refineries to produce petrol and diesel that meet the Euro 5 standards (e.g. 10ppm (parts per million) diesel, 35% aromatics in petrol) in an effort to ensure that greenhouse gases from car exhausts are reduced.

As part of the open global market, the South African government also seeks to align its environmental policies with that of its trading partners. The Kyoto Protocol is one such policy that aims to reduce greenhouse gases.

Other benefits of cleaner fuels are:

- Fuel efficiency and lower maintenance costs in motor vehicles.
- Improved international trade within the car manufacturing sector. The manufacturers will no longer have to produce vehicle suited for local fuel specifications.
- Refinery upgrades will help the government’s job creation initiatives.

1.1.1 Petroleum Industry

The South African energy sector incorporates electricity generation and the petroleum industry. This research report focuses on the petroleum industry, which is also known as the liquid fuels industry. The industry produces petrol, diesel, jet fuel, paraffin and Liquefied Petroleum Gas (LPG) as its main products. These products are derived from gas (5%), coal (35%), imported crude (50%) and imported finished products (10%) (SAPIA, 2015).

South Africa consumes approximately 600 000bpd (barrels per day) of petroleum products a day.

Table 1: List of South African Refineries

Organisation		BSPD	% BSPD	Raw Material
Chevron	Chevron	100	14%	Crude
ENGEN	Engen	125	18%	Crude
SASOL TOTAL	Sasol/ Total	92	13%	Crude
bp Shell	Shell/BP	180	26%	Crude
SASOL	Sasol	150	22%	Coal & Gas
PetroSA	PetroSA	45	7%	Gas
Total		692	100%	

*BSPD: Barrels per stream day

** Adapted from: SAPIA - Industry overview, 2009. (http://www.sapia.co.za/industry-overview/fuel-industry.html)

1.1.2 Challenges Faced By Refiners In South Africa

The proposed CFII (Clean Fuels II) intervention seeks to shift the allocation of state resources towards the provision of cleaner fuels that are beneficial to the health of South African citizens. The refineries argue that such regulations will shrink their margins and result in refinery shut downs in some cases due to the high Capital Expenditure (CAPEX) required to upgrade the existing infrastructure. Refining businesses – especially crude refining – are small margins businesses. In 2012, an average refinery margin was seven US dollars profit per barrel of processed crude

($7/bbl) (Statoil, 2012). In South Africa these margins are put under more strain because we import crude from other countries.

If the South African government goes ahead with CFII, it might result in marginal costs (upgrades in capital investment) that are greater than marginal benefit (clean environment), which is not an optimum allocation of resources. The government, however, looks at the whole economy (i.e. people, the environment and job creation) and has a duty to protect the environment.

The estimated CAPEX requirement for all refinery upgrades is R40 billion (SAPIA, 2015). Refineries have stated they will invest in the upgrades if the government commits to cost recovery mechanisms that will compensate for the estimated R40 billion the companies will have to spend to meet the new specifications.

The proposed cost recovery mechanisms options are listed below:

- Incentives paid on output – Government pays a certain amount per litre of clean fuel produced.
- Incentive paid on 50% of investment – Government pays half of the capital spent by refineries.
- Incentive based on 100% of investment.

The South African government had given a deadline of 2017 for refineries to comply but has failed to announce cost recovery mechanisms and this has resulted in a stalemate within the industry. Some companies (Sasol, BP and Shell) are supporting the proposed regulation and have committed capital for the project but only if the government meets them halfway.

The capital required in meeting these specifications might be high in the short term but the benefits to the refineries and the environment could be greater in the long run (Zaidi 1995).

Petroleum products are essential in driving economic growth and that is why the government is evaluating options of assisting the refineries. The government also does not want to push the regulation and put the security of petroleum products supply at risk. The government also needs to weigh the benefits of funding these refineries against its other developmental priorities such as infrastructure development, job creation and poverty elevation.

1.2 Problem Statement

1.2.1 *Main Problem*

Government has proposed a regulation on petroleum fuel specifications. Once implemented, this regulation will require refineries to produce fuels that meet European quality specifications (Euro 5), see Appendix A. The high capital required to upgrade refineries to produce this quality of product might result in other refineries closing down if they are not subsidized by the government. If the government is unable to subsidize the upgrades and decides not to continue with the regulation, it will mean that South Africa will continue to sell products of poor quality, thus failing to improve air quality.

Clean fuels help to reduce air pollution caused by vehicle emissions. Good quality fuel forms an important component of an effective emission reduction strategy. For Government to achieve an improvement in the quality of fuels, they have to regulate the quality of products that can be sold in the country. These regulations, however; must be accompanied by a form of subsidy to help speed up the availability of these products in the market.

All producers and retailers of petroleum products are, according to the proposed regulation, supposed to comply by 2017 to the new specifications. This deadline was later removed by the government as they had not yet finalized the cost recovery (subsidy) mechanisms.

The main challenge with the proposed regulation is to reach an agreement on cost recovery mechanisms and how to implement them Sub-problem

The proposed regulation has a potential of reducing the market size of the petroleum industry due to refineries shutting down.

1.3 Purpose Of The Study

The purpose of this study is to investigate the best way of implementing the proposed regulation to include cost recovery mechanisms that will ensure the preservation of the South African market size.

1.4 Research Propositions

The literature review gave rise to the following research propositions:

Research proposition 1:

A successful implementation of the Clean Fuels II Regulation is dependent on Government providing cost recovery mechanisms to refineries.

Research proposition 2:

The proposed Clean Fuels II Regulation will result in a reduction of the South African petroleum industry market size.

1.5 Significance Of The Study

The South African petroleum industry contributes around 600 000 direct and indirect employment opportunities. In 2012, the industry also contributed 6.48% of the Gross Domestic Product (GDP) and contributed R3 billion income tax (CHIETA, 2014). The proposed regulation will, therefore, have a financial impact on this industry and has the potential to reduce the market size if refineries are unable to raise capital for the required upgrades. As Madhu Khanna mentioned, the benefit of

the regulation must be far greater than the perceived costs(Khanna 2001). This study will evaluate how this regulation can best be implemented to benefit all stakeholders.

The security of supply for petroleum products is one of the key priorities for the government as security petroleum products are required for almost all economic activities. The South African government thus have a vested interest in ensuring that the industry is protected.

The petroleum industry will benefit from this research and it will help them in formulating business strategies regarding government regulations. The policy makers, Government, will also benefit from this study as it will outline some of the best practices from other countries when formulating environmental regulations.

The drive towards cleaner fuels through regulation has occurred in other countries such as in the North Americas and Europe. This drive is in line with tighter environmental regulations in these countries. The difference between South Africa and these countries is that South Africa is classified as a developing country, whereas the United States of America is a developed First World country. This research will evaluate this proposed CFII environmental regulation in a South African context.

Most of the current literature around the introduction of the proposed Clean Fuels II is driven by the two main interested/affected parties: the Department of Energy (DoE) and SAPIA (South African Petroleum Industry Association). There is currently a gap in independent studies that are investigating the alternatives that either SAPIA or the government can consider for arriving at the most cost-effective solution for Clean Fuels II. South Africa also has limited literature available that covers regulations of the petroleum industry in general. This research also seeks to provide an independent proposal for a way forward with regard to the implementation of Cleans Fuels II.

1.6 Delimitations Of The Study

This research study investigated the impact of the proposed Cleaner Fuels II Regulation on the petroleum industry of South Africa, as was outlined in a previous section. The research, however; did not focus on the impact that this regulation will have on related industries such as the car manufacturing industry.

The study was conducted in 2015 at a time where the crude oil prices had plummeted to record lows reaching below $40. These low crude prices meant that appetites for capital intensive projects were low within the petroleum industry.

The sample for the study included representatives from oil companies operating in South Africa. These respondents included senior managers within these organizations with more than ten years' experience in the industry. The sample contained Regulatory Compliance Managers, Business Development Managers, Heads of Refining, Principal Process Engineers and Strategy Managers. Some of the company representatives refused to participate in the research due to the competition laws of South Africa that aim to prevent collusive behaviour. This meant that the sample did not cover all of the representatives in companies. The respondents were, however; not asked to share company views or positions but rather their opinions as subject matter experts or experienced individuals in the industry.

1.7 Definitions Of Terms And Abbreviations

Government regulations: "The diverse set of instruments by which governments set requirements on enterprises and citizens. Regulations include laws, formal and informal orders, and sub-ordinates rules issued by all levels of governmental or self-regulatory bodies to whom governments have delegated regulatory powers" (Guidelines for the implementation of the regulatory impact

	analysis/assessment (RIA) process in South Africa, 2012).
Oil refineries:	Processing plants that convert crude oil, coal or natural gas into petroleum products such as petrol, diesel, LPG or paraffin.
Petroleum products:	Products produced in refineries such as diesel, gasoline (petrol), Liquefied Petroleum Gas (LPG) and some other chemicals.
Refinery margin:	This is a gross profit from refinery operations. It is the revenue generated from products minus feedstock and operating costs.
CFII:	Clean Fuels II
DoE:	Department of Energy
SAPIA	South African Petroleum Industry Association
GDP	Gross Domestic Product
CAPEX	Capital Expenditure

1.8 Assumptions

This proposed regulation will have an impact on all petroleum products sold in South Africa, including imported finished products.

This proposed regulation will not be enforced sooner than 2017. The South African government will propose a revised date for all refineries to comply by.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

The increased global focus on greenhouse gas emissions has presented refineries with a lot of challenges such as the need for a reduction in gas emissions, a cleaner fuels quality demand and an increased pressure on profitability. All these needs will affect the industry and change it significantly(Szklo and Schaeffer 2007). The refineries are, therefore; left with no other option but to find solutions to comply with the ever increasing environmental protection regulations. To gain a better understanding of potential impacts on the proposed regulation, the study firstly looked at the work that has already been done in this area to give us a starting point to proceed with our research.

There is not a lot of local literature available that has looked at current regulations pertaining to the petroleum industry in South Africa. Even the previous regulation that banned the addition of lead to petrol was not sufficiently researched, except research completed for the Department of Minerals and Energy and the industry association board, SAPIA. This lack in research has necessitated the review of literature in other countries that have undergone regulation changes that aim to tighten fuels specifications.

The United States of America (USA) and European countries have been in the forefront with regard to the drive towards clean fuels. Even in these countries, especially the USA, most of the research focus on single point emissions – manufacturing plants. The proposed CFII Regulation is based on the European Euro 5 specifications.

The literature review begins by first describing the proposed Clean Fuels II Regulation and the South African petroleum industry to provide context of the industry the report is focusing on. Then the following areas that are important in

understanding the best practices in implementation and the impact the regulation will have once implemented are reviewed:

- Concepts and principles of government regulations.
- Best practices around the world.
- Studies on the specification of fuels.
- Findings and lessons learnt applicable to the South African industry.

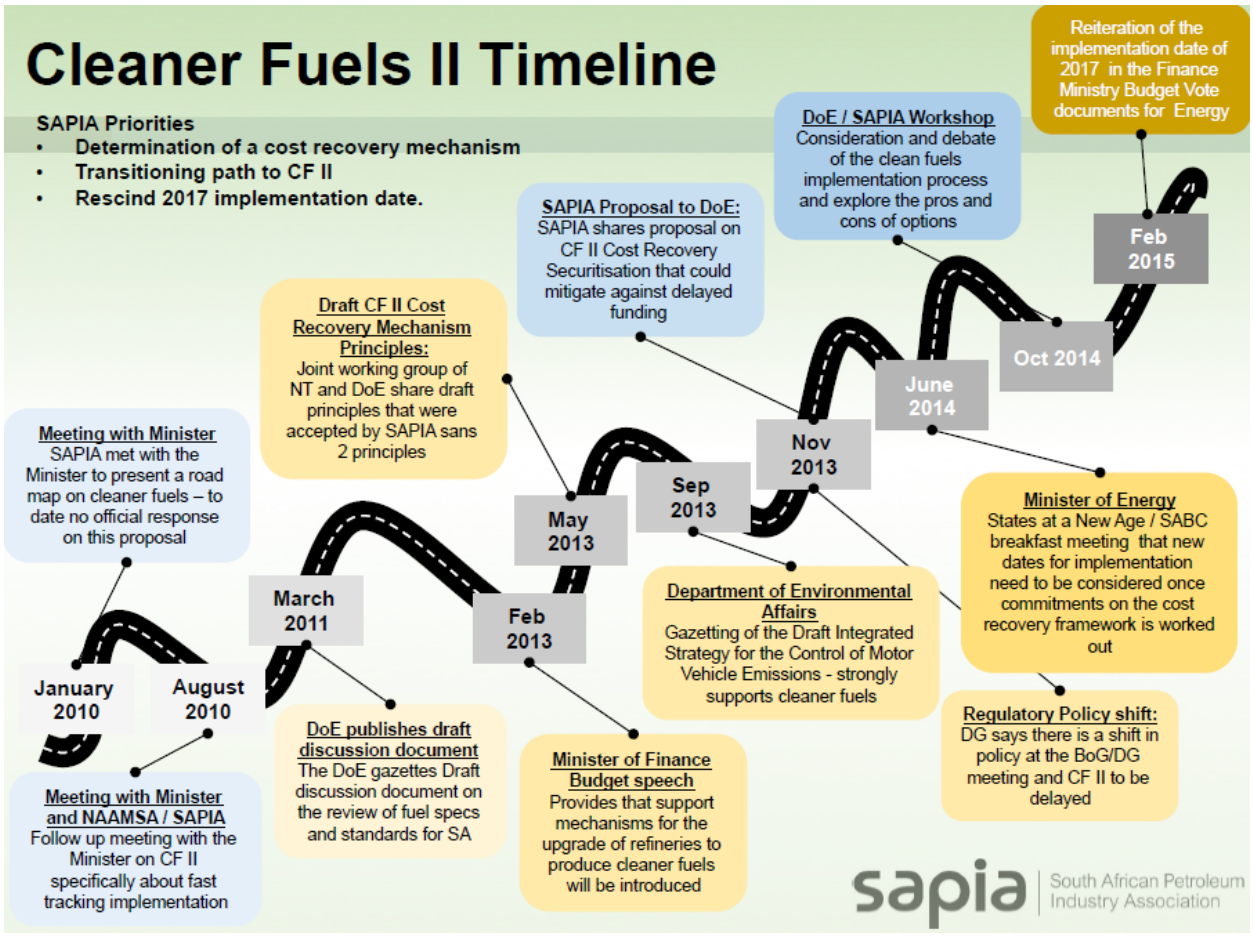
2.2 Clean Fuels II And The South African Petroleum Industry

2.2.1 *Clean Fuels II*

The aim of the proposed Clean Fuels II is to tighten fuel specifications in such a manner that they are in line with improved vehicle technology which helps to reduce the omission of greenhouse gases from exhaust gas.

The Department of Energy published the amendments to the fuel specifications in June, 2012. The amendments were aimed at the quality of petrol and diesel specifications that can be sold in South Africa. This is a continuation from regulations with regard to other petroleum products that the government has made before. In 2001, the amount of sulphur in diesel was reduced from 5000ppm to 3000ppm. In 2006, this amount was further reduced to 500ppm. The addition of lead in petrol products was also prohibited in 2006 (Regulation No 8493, 2006).

The deadline for companies to comply with this new regulation was set for 2017. The DoE then announced in 2014 that this deadline has been removed as cost recovery mechanisms have not been finalized. The CFII journey thus far was presented by SAPIA in an engagement workshop in May 2015 and is outlined in Figure 1 below:



SOURCE: SAPIA Cleaner Fuels and Refinery Upgrades, 2015

Figure 1: CFII Journey

The changing of fuel specifications is not new, as indicated in Figure 1. What makes CFII interesting is the amount of capital that will be required for refinery upgrades to meet these specifications. Moreover, some role-players argue there is currently a small market available in South Africa and in the rest of Africa for these products that meet European specifications. South Africa is already ahead of its African peers as indicated in Table 2 below.

These changes will bring the specifications in line with European specifications – termed Euro 5. The highlights for these proposed changes are shown below and the detailed specifications are outlined in Appendix A.

Petrol: Reduce sulphur, benzene, aromatics, and olefins content

Diesel: Reducing sulphur and polycyclic aromatic hydrocarbons (PAH) content (NEMAI, 2014)

Table 2: Sulphur Content In Petrol And Diesel For Some Developing Countries

Country		Diesel (D) Petrol (P)	Current Standards	Future Standards
Egypt		D & P	5,000 ppm & 500 ppm	
Syria		D & P	6,500 ppm & 1,500 ppm	
Yemen		D & P	10,000 ppm & 1,500 ppm	
Mexico	Metropolitan	D & P	300 ppm & 300 ppm (avg), 500 ppm (max)	D- 15 ppm US-Mexico border (2007), major cities (2009) and rest of the country (2010). P- 30 ppm (avg), max allowable 80 ppm (starting 2006)
	Non-metropolitan	D & P	500 ppm & 1,000 ppm	15 ppm (mid 2009)
Brazil	Metropolitan	D & P	500 ppm & 1,000 ppm	D- 50 ppm (2009) P- 50 ppm (2009)
	Non-metropolitan	D & P	2,000 ppm & 1,000 ppm	D- 50 ppm (2009) P- 50 ppm (2009)
Venezuela		D & P	5,000 ppm & 600 ppm	
South Africa		D & P	500 ppm & 500 ppm	50 ppm (2010)
Zambia		D & P	7,500 ppm & 1,000 ppm	
Ivory Coast		D & P	5,000 ppm & 500 ppm	

SOURCE: http:www.unep.org/PCFV/data

2.2.2 *South African* Petroleum Industry

The South African petroleum industry is comprised of seven key role-players who market and supply finished products mainly through their retail stores (petrol stations). These key role-players are companies such as Sasol, Shell, BP, Engen,

Total, Chevron (Caltex) and PetroSA. Most of these companies are multi-national oil companies with the exception of Sasol and PetroSA. PetroSA is a state-owned oil company and does not have any retail presence (SAPIA, 2015).

The majority of South Africa's petroleum products are produced at six refineries. The feedstock to the refineries differs from crude oil, natural gas to coal. The refineries are either wholly owned by these companies or held as joint venture ownerships.

The petroleum industry produces a number of finished products, mainly petrol and diesel, but also jet fuel, paraffin and LPG as well as other chemicals or solvents. This industry is regulated by the South African government in terms of retail and wholesale prices for its products. The government determines the pump price for petrol and also sets the maximum whole price for diesel.

The South African petroleum companies belong to SAPIA, an association that was formed in 1994. SAPIA aims to represent the common interests of refining and the marketing of petroleum products. It also promotes the understanding of the company's contribution to the South African economy. SAPIA has been in the forefront in the understanding of and influencing the policy with regard to the proposed Clean Fuels II Regulation. As such, most of the research information concerning the proposed CFII regulation has come from SAPIA.

In response to the proposed regulation, SAPIA formed a clean fuels task team to provide expertise on industry issues related to the implementation of this regulation. The responsibilities of the task team were defined by SAPIA as follows:

- Ensure that clear and unambiguous Clean Fuels II regulations are adopted.
- Ensure that a sound "cost recovery"-mechanism is developed to facilitate the implementation of CFII.
- Maintain dialogue with competition commissions and the DoE to ensure that a sound solution is found for the quality and cost recovery of the introduction of transitional fuels into the market place.

- Coordinate the introduction of CFII into the market to ensure that there are no supply disruptions.

The South African refining companies have organized themselves around their industrial association to SAPIA to influence the policy formulation with regard to this proposed specification regulation. This is a normal practice for most companies that are faced with tightening regulations.

2.3 The Concepts And Principles Of Government Regulations

Environmental regulations are usually divided into two classifications: policies that provide little flexibility for companies ("command-and-control") and market-based or incentive-based mechanisms, which allow for flexibility in order to achieve a sustained environmental progress(Hahn 2000). However, a study by Burgemeestre (2009) found that these differences are not clear enough because there are usually consensus-reaching steps between parties during policy formulations and as a result a mixture of both classifications are used (Burgemeestre, Hulstijn et al. 2009).

The proposed Clean Fuels II Regulation will require all parties involved to comply with these new specifications, thereby suggesting a rule-based regulation. However, it does not seem to be the case. In formulating this regulation, there were a number of engagement stages with affected parties. The DoE also issued a discussion document for parties to comment on. This engagement process is in line with the South African government's practice of conducting a Regulatory Impact Analysis (RAI) before a policy is passed in parliament.

Another regulation approach was presented by Goldstein and Carruth (2003) who quoted a 1992 Rio Declaration on the precautionary principle: "Nations shall use the precautionary approach to protect the environment. Where there are threats of serious or irreversible damage, scientific uncertainty shall not be used to postpone cost-effective measures to prevent environmental degradation".

The precautionary principle appears to be underlining the South African government's intention of implementing this regulation that will improve air quality in South Africa, even though the cost might be huge and are currently not fully quantified.

The South African government Regulatory Impact Analysis (RIA) guidelines describe regulations as follows: "The diverse set of instruments by which governments set requirements on enterprises and citizens. Regulations include laws, formal and informal orders, and sub-ordinates rules issued by all levels of governmental or self-regulatory bodies to whom governments have delegated regulatory powers" (Guidelines for the implementation of the RIA process in South Africa, 2012). In general, regulations are introduced to help solve problems in societies.

The petroleum industry of South Africa is regulated by a number of governmental laws and regulations. These laws and regulations cover the production of products, supply, distribution and product pricing. Some of the key legislations are briefly explained below. The DoE is the body that oversees the petroleum or fuels industry. The proposed Clean Fuels II Regulation falls under the Regulation for Petroleum Products Specification and Standards.

> **Petroleum Products Act** – "To provide measures for the regulation of petroleum products and an economy with regard to the cost of the distribution thereof, and for the maintenance and control of prices, therefore; for control of the distribution of certain information regarding petroleum products; and for the rendering of services of a particular kind, or services of a particular standard in connection with motor vehicles; and to provide for matters incidental thereto" (Petroleum Product Act, 120 of 1977).
>
> **Regulation for Petroleum Products Specification and Standards** – The regulation outlines the specifications and standards of petroleum products that can be sold for consumption in South Africa (Regulation No 8493, 2006).

2.3.1 *Regulatory Impact Assessment (RIA)*

In 2007, the South African government adopted the use of a RIA in policies or regulation formulations to ensure effective governance. The RIA ensures that the correct information is available before decisions are made with regard to regulations.

This kind of approach in regulation formulations has been used in countries like the USA and European countries. Conducting an impact assessment before passing a regulation is believed to lead to better law making which is an important part of good governance (Kirkpatrick and Parker 2004). This viewpoint is supported by a 2010-study that showed that in countries where RIAs were implemented an increase in performance occurred. This implementation, however, requires a strong central oversight. The study concluded that without this kind of supervision, the RIA tends to be just a formality and the goals are not realized (Staroňová 2010). Both these studies looked at the benefits that RIAs could bring to developing countries. Their conclusions were similar and both of the studies placed an emphasis on ensuring that there is a capacity within agencies or governments to ensure that the assessment shows the intended benefits.

The South African government introduced the RIA so that any proposed regulation is thoroughly probed before passing in parliament. The government hopes to achieve the following key aspects via RIAs:

- To fully understand the problem that the regulation seeks to address.
- To clarify the objectives that the regulation should meet.
- To weigh up other options that can be used to solve the problem.
- To ensure that the cost of the regulation does not exceed its benefit (cost benefit analysis).

2.4 Clean Fuels II Best Practices

SAPIA supports the move towards cleaner fuels in South Africa but they are in favour of an integrated approach that does not only look at petroleum product

specifications but also at vehicle emissions and inspection and maintenance programmes. This approach is supported by a 1995-study that found that vehicle exhaust emissions were reduced in properly maintained cars. It is, therefore, important when formulating vehicle emissions policies to deal with individual vehicle (old versus new) maintenance rather than a regulation that treats all vehicles as equal(Washburn, Seet et al. 2001). In 2003, Gwilliam completed a study and also found that poorly maintained vehicles contribute significantly to the total car emissions. The researcher found that to impose clean fuels specifications in countries with an old and poorly maintained car fleet will probably be not cost-effective (Gwilliam 2003).

The state of California in the USA is in the forefront in driving a reduction in carbon emissions. Their policy is centred on a Low Carbon Fuel Standard (LCFS). Instead of just looking at the quality of fuel or emissions from refineries, the LCFS looks at the whole lifecycle of oil – from the drilling of oil, the refinement of oil to the point where oil is finally burnt in vehicle engines. Companies are then assigned a maximum level of greenhouse gas emissions per unit of fuel energy they produce. Companies can trade these permits amongst themselves so that each companies' maximum level is reduced (Sperling and Yeh 2009).

This LCFS-approach seems like the holistic policy that SAPIA is advocating but would probably require strong administration and monitoring to ensure compliance.

Other studies have shown that the improvement of fuels quality specifications by reducing the sulphur content, results in an unintended increase in energy use. This means that emissions go up at the source of production (refineries). This was illustrated in Brazil when the country was going through a specification change (Szklo and Schaeffer 2007). A similar European study's analysis came to the same conclusion when the costs of tightening the fuels quality specifications were evaluated (Concawe, 2005).

An alternative that does not need a high capital investment for upgrading refineries, is the use of light sulphur crude oil as feedstock (Yamaguchi, Fridley et al. 2002). This, however, is a short term solution and might be costly for refineries and is highly dependent on the design of refineries. This solution is also not plausible in South Africa as the price of petroleum products is regulated. Light crude tend to be more expensive, which will increase input costs for South African refineries, resulting in a shrink in profit margins.

The closest study with similar objectives to what the proposed Clean Fuels II Regulation aims to achieve was conducted in Asia by the Asian Development Bank. “A roadmap for clean fuels and vehicles in Asia” sought to provide information to decision-makers in the transition to clean fuels. The study covered Asian countries and made the following conclusions:

- Countries that had implemented clean fuels followed an integrated approach where fuel quality and vehicle emissions are regulated together.
- Clean fuels and the reduction of sulphur are essential in a clean air strategy.
- There is cost associated with improved petrol and diesel quality.
- In most countries where clean fuels are implemented, governments had incentivised the industries, mainly via a differentiated fuel tax (Asian Development Bank, 2008).

In summary, the SAPIA view of a holistic integrated approach is supported by research that indicates that fuel production specifications alone are not the solution to reduce greenhouse gas emissions. In 2006, South Africa introduced carbon tax when new vehicles are purchased. This was to promote engines with better fuel efficiencies. There has not been any progress on the implementation of inspection and maintenance programmes that will ensure that the cars on the road are within specified allowable exhaust gas emissions.

2.5 Uncertainty Of Cost Recovery Mechanisms

Investments in the expansion of refineries or upgrade projects usually require a lot of capital. Refiners tend to be hesitant in investing in drastic technological innovations especially when returns are uncertain. Environmental compliance projects are seen as a distraction from the core business of improving asset reliability, general improvements and capacity growth (Szklo and Schaeffer 2007).

Companies operating in counties where there is no clear or strong government direction regarding climate change direction, tend to be reactive when looking at environmental strategies. Climate change policies are stronger in Europe than in the USA as reflected in the policy stance of companies such as Shell versus ExxonMobil (Skjærseth and Skodvin 2001).

For refineries to be able to adhere to the Euro 5 specifications, they will need to upgrade their existing refineries and introduce other technologies which will allow for a cleaner fuel production. This upgrade, however; will require severe investment capital. This capital was estimated at $4.5 billion in 2011 (SAPIA, 2015). At that stage this was only just a 40% cost estimate. This figure will have to be adjusted for inflation plus the R/$ exchange rate to obtain 2015 estimates.

South African refineries have indicated they do not have the capital available for these upgrades or a viable business plan for them to do so. The government will have to subsidize them for these upgrades to be realized.

A comprehensive study that looked at the benefits of removing sulphur in diesel and petrol in developed countries found that even though costs and benefits vary amongst countries, the combination of regulations and incentives have proven to be effective in moving the industry forward. The study also agrees with SAPIA in that these proposed upgrades require severe capital investment (Blumberg, Walsh et al. 2003). Table 3 shows a summary of the countries evaluated in the study and also indicates whether the sulphur limit was achieved via regulations and incentives.

Table 3

Table 3: Developed Countries: Comparison Of Regulations

Country	Regulation	Date	Sulfur Limit (ppm)
U.S	Tier 2 – gasoline	2006	80 (30 ppm avg.)
	Heavy-duty – diesel	2006	15
	Off-road – diesel	Proposed – 2007 or 2010	15
EU	98/70/EC EURO4	2005	50
	Amendment to 98/70/EC	2009	10
	Incentives in Belgium, Denmark, Finland, Germany, Netherlands, Sweden, Switzerland, and the United Kingdom for early introduction of low & near-zero sulfur fuels		10 & 50
Japan	National regulations	2004	50
	Due to incentives low sulfur fuel is already available in Tokyo		50
Hong Kong	National incentive – diesel	2000	50
	Regulation – gasoline	2001	150
Australia	Regulation – gasoline	2005	150
	Regulation – diesel	2006	50

SOURCE: Blumberg & Walsh (2003)

The USA – through the Environmental Protection Agency (EPA) – dealt with emissions control by introducing emissions trading policies that allowed polluters to trade emissions credits. This policy was for point discharges such as manufacturing sites. These companies were allowed to trade for credits as long as the allowed emissions were not exceeded. This approach was seen as the most cost-effective way of achieving a reduction in air pollution. However, by the early 2000's research started emerging that suggested that the cost saving benefits were not enough and the trading of credits was limited. The trades were done bilaterally and a lot of inter-company trading took place to try to reduce trading costs(Spash 2010)

Incentives specifically related to refineries to help them to introduce cleaner fuels to the market have mostly evolved around differentiated price tax as was indicated in the Asian Development Bank study. Respective governments can lower the taxes paid on cleaner fuels and, therefore; a demand can be stimulated. The process can also involve governments paying an incentive for each litre of cleaner fuel produced. This kind of incentive can compensate refineries for the increased costs associated with producing cleaner fuel.

The introduction of a concessionary duty for cleaner fuel in Hong Kong helped to offset a higher production price. Within two months after the introduction almost all diesel vehicles switched to the cleaner fuel (Hung 2006). The South African government pronounced that their Treasury Department will have to investigate options that involve differentiated price tax for the production of cleaner fuels. Other options suggested by the petroleum industry is an incentive linked to the capital required for projects to be launched. The government has not yet pronounced which approach it will follow regarding cost recovery mechanisms but for now it appears that the importance of options was understood.

The literature reviewed was mainly based on the experiences of European and North American industries who have indicated that in order to achieve sustainable air quality improvements, an integrated policy framework is required. This integrated policy framework should focus on all of the areas/sources where emissions are derived from fuels. Even though the indicated cost and benefits have differed, an approach followed by the South African government leading to regulation processes coupled with some form of an incentive for the industry seem to be the most effective route to follow.

2.5.1 *Research Proposition 1*

Based on the literature reviewed, the following research proposition arose:

The successful implementation of the proposed Clean Fuels II Regulation is dependent on the government providing cost recovery mechanisms to refineries.

2.6 Reduction In The Market Size

Environmental regulations have long been associated with a decrease in productivity. A study in the USA of 450 manufacturing plants in the 1970's showed that the impact was 0.44% points per year(Shadbegian and Gray 2005). This finding

was consistent with the point of view and research completed around that period. But as more models were developed to evaluate productivity and data gathering improved, literature started to question whether environmental costs were a true reflection of the reality.

This question is supported by an empirical study of the Porter hypothesis that sees environmental regulations as beneficial to polluting companies as they become innovative which leads to increased productivity or product value (Ambec and Barla 2006). The study found that the link between regulations and innovation was not supported by evidence.

In contrast to the above-mentioned finding, a study that looked at air quality regulations and the productivity of refineries in that region (Los Angeles Air Basin), showed that productivity actually went up during the period of increased regulations. The study concluded that abatement costs may overly state the true costs of environmental regulation (Berman and Bui 2001).

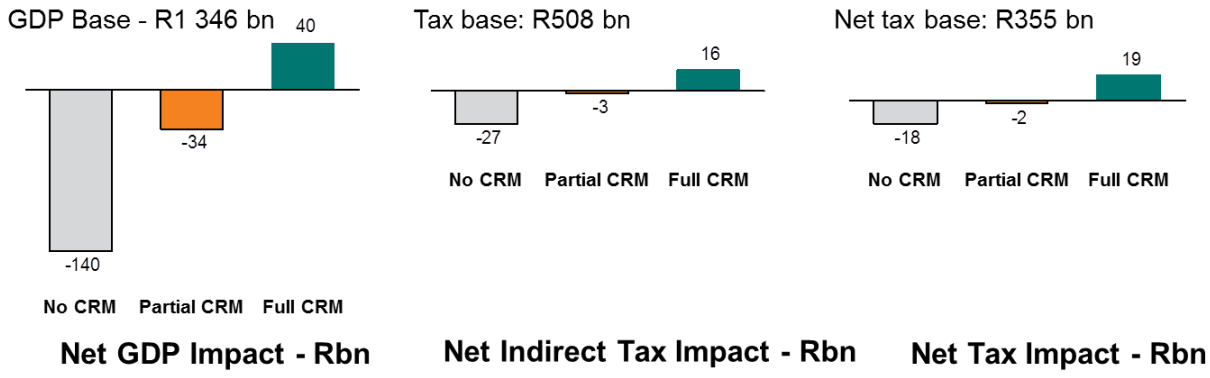
Literature on whether productivity changes can lead to refinery shutdowns after the implementation of environmental regulations is scarce. Literature does, however; state that other companies might respond to regulations by leaving that specific country where stringent regulations have been implemented and is referred to as the “pollution heaven effect”.

The findings of a more recent study by Brunnermeier and Levinson (2004) are in contrast with popular literature which found that environmental regulations have little effect on the location of companies. Their study used panel data rather than cross-sectional evidence. The results showed significant evidence suggesting that companies will flee to pollution heaven countries once stringent regulations are introduced (Brunnermeier and Levinson 2004).

Another study that looked at the relationship between abatement costs and trade flows, found that when data were corrected for heterogeneity and endogeneity, it became clear that environmental regulations have a significant impact on companies leaving pollution heavens (Levinson and Taylor 2008).

Literature indicating regulations as having a negative impact on productivity started in the early 1960's and this trend is supported by recent studies with a few leaning to the contrary. Recent studies have also corrected earlier studies on the pollution heaven effect to show that regulations can lead to companies leaving countries with stringent environmental regulations in place resulting in a market size reduction.

This finding seems to be supported by a study done by KPMG that was commissioned by SAPIA focusing on the proposed Clean Fuels II Regulation. The study indicated that if the South African government does not put incentives in place for necessary upgrades, some of the refineries might have to close. These shutdowns will result in 61300 job losses from a pool of 91000 employees in the industry (SAPIA, 2015). This is the only study currently available in South Africa that quantifies the impact of regulations apart from the discussion document issued by the South African government.



Source: SAPIA, May 2015

Figure 2: Highlights Of The KPMG Clean Fuels II Study

2.6.1 *Research Proposition 2*

The literature review gives rise to the following research proposition:

The proposed Clean Fuels II Regulation will result in a reduction of the South African petroleum industry market size.

2.7 Conclusion of Literature Review

The importance of protecting the environment is a duty that every South African should commit to. The South African government, however; should take the lead in formulating environmental protection policies to govern industries that are known to be the biggest contributors to greenhouse gas emissions. These policies should be clear to ensure that they are easily understood and that they achieve their stated goals.

The direction to follow in order to reach the final goal of clean air is a subject of contention. The road to clean air is through cleaner fuels, vehicle emissions reduction via better engines and the limitation of general emissions at manufacturing sites. The way to get all of the role-players moving in the right direction is through a principled-based regulation approach coupled with incentives for both the producers and the customers who buy cleaner fuel for their vehicles.

2.7.1 *Research Proposition 1*

A successful implementation of the proposed Clean Fuels II Regulation is dependent on the government providing cost recovery mechanisms to refineries.

2.7.2 Research Proposition 2:

The proposed Clean Fuels II Regulation will result in a reduction of the South African petroleum industry market size.

CHAPTER 3. RESEARCH METHODOLOGY

Research methodology is a critical step in a research study as it outlines the processes to be used in conducting the research. An incorrect methodology might, therefore; result in incorrect conclusions.

This study made use of the qualitative approach (meaning the conclusions of the study will not be based on statistical data) to evaluate the two research propositions. Firstly, the successful implementation of the proposed regulation is dependent on the government's provision of subsidies. Secondly, the impact on the market size of the petroleum industry.

3.1 Research Methodology/Paradigm

The emphasis of qualitative research is on process and meanings. Techniques used in qualitative studies include in-depth and focus group interviews and participant observation. Samples are not meant to represent large populations. Rather, small, purposeful samples of articulate respondents are used because they can provide important information, not because they are representative of a larger group (Sale, Lohfeld et al. 2002).

This research study focused on the petroleum industry of South Africa, which is dominated by approximately seven role-players. The study also looked at the proposed government regulation and its potential impacts. Unfortunately, there are no hard data or evidence that can be used to evaluate the positive or negative impacts of this regulation due to the investigative nature of the study. A qualitative approach (which is more explanatory in nature) was deemed the most suitable for this study as most of the data used were from sources with a grounded knowledge of either regulations or the petroleum industry.

3.2 Research Design

A research design is a structure that guides the execution of a research method and the analysis of the subsequent data (Bryman, 2012). The research was displayed in the form of a case study focusing on the South African petroleum industry. Data were gathered primarily through interviews with industry experts. Reputable publications were also consulted.

The research was interpretative in nature seeking to understand the implementation of government regulations and their impacts. The data collected via the interviews were from the respondents who are involved in the petroleum industry. They were likely to be biased giving their views; for this reason it was important to adapt an interpretive view to understand these opinions from the respondents.

3.3 Population And Sample

3.3.1 *Population*

The population included all individuals who work or have worked within the petroleum industry and related industries. The population also included individuals who work for governmental departments responsible for policy formulation that affects the petroleum industry of South Africa.

3.3.2 *Sample and sampling method*

Sampling is important as it will determine the quality of data received and also shape the views regarding the whole industry. Typically, the sample comprised of individuals who are working in the petroleum industry for more than five years with additional years in management roles where they could have been involved in the Cleans Fuels II projects that the industry is currently evaluating. On the regulation side, the government's regulation documentation was studied.

The aim was to interview representatives from each of the six refineries in the petroleum industry, in the end, five participants were interviewed for this study. The ideal respondents were either Compliance Managers who look at regulations and/or Strategy Managers who deal with long term impacts of such regulations and who formulate strategies to take their respective companies forward.

Two sampling methods were used in conducting this research study:

- Self-selection – the respondents were given the chance to participate voluntarily in the study.

- Snowboarding – the respondents were asked to make recommendations of people they think will make an insightful contribution to the research.

This study followed a case study design, focusing on a specific sector. To obtain the most relevant data from the respondents, it is better to use a targeted approach when interviewing industry experts. However, the respondents must first be willing to participate in order to offer credible information. Voluntary participation would most likely also lead to the respondents suggesting other key people in the industry who can be beneficial to the study.

3.4 The Research Instrument

The researcher made use of face-to-face interviews with semi-structured questions. The interviews took place where it was geographically convenient. An interview guide was sent to the respondents via email when they were too far from Johannesburg to attend the interviews or telephonic interviews were conducted when a questionnaire was not suitable.

3.5 Data Analysis And Interpretation

A measure is considered a success when the scores manage to capture the ideas contained in that particular concept (Adcock 2001). To make the best use of the data collected during the research study, a structured and systemic framework (such as the directed content analysis) was adopted, which made the interpretation of and connection to theory easier.

3.6 Limitations Of The Study

The data were collected from industry experts who expressed their views on the way forward with regard to the specification changes of petroleum products. If the South African government decides to completely change the proposed regulation and adopts a different policy, the study will be transferable. The study assumed that the conditions of the industry as we know them today stayed the same.

3.7 Validity And Reliability

Validity is an important aspect that deals with the integrity of the conclusions derived from research. The following questions are dealt with: Does the research measure what it is intended to measure? Are the means of measurement accurate? (Golafshani 2003). In qualitative research, validity is more concerned with ensuring rigour by capturing data accurately and thereby ensuring that the analysis is unbiased and represents the respondents' views – thus improving internal validity.

Reliability looks at whether the results of a research study are repeatable. Golafshani describes reliability as "the extent to which results are consistent over time and are a true representation of the population being studied" (Golafshani 2003).

In research when statistical data are used, it is easy to determine repeatability as a study usually involves large quantities of data that are analysed by using set statistical methods. Qualitative research usually involves smaller quantities of data

and focuses on a specific sector of society. The measuring of validity and reliability in qualitative research is based on trustworthiness and authenticity (Bryman, 2012).

Trustworthiness can be categorized into credibility, transferability, dependability and confirmability. The sample of respondents used in this study was broad (in terms of the companies they worked for). The respondents have in-depth knowledge of the industry and the proposed regulation. This adds to the credibility and transferability of the research.

This viewpoint about qualitative research is supported by Golafshani (2003) and this approach was adopted for the research study.

3.7.1 *External validity*

External validity is concerned with whether a study can be generalized beyond its area of focus. As indicated above, reliability and validity are more relevant when conducting quantitative studies. It is better to focus on transferability when a qualitative study is done to ensure quality.

In contrast with this viewpoint, Morse and Barrett (2008) argue that validity and reliability are still relevant in qualitative research, as rigour is then ensured. A research study without rigour loses its significance. The authors further argue that to validate is to check, investigate, question and theorize and all these actions are relevant in qualitative research (Morse, Barrett et al. 2008).

This research study focused on the impact of the proposed Clean Fuels II Regulation in the form of a case study with regard to the implementation of the petroleum product specifications regulation. Rigour will be provided by investigating how this proposed regulation can be implemented and how implementation will change the market. The population included respondents from all the affected petroleum companies in South Africa.

3.7.2 *Internal validity*

Internal validity looks at the causality of a study's conclusion. There should be a match between what a researcher sees and theoretical ideas. In this particular study, internal validity will be measured by answering the following question: Can we be sure that the regulation will cause a decrease in market size? Or are government subsidies the key to the implementation of the proposed regulation?

Internal validity will be addressed in this study by looking at the credibility of the research. Credibility will be achieved through respondent validation and the drawing of correlations based on the literature presented in the study.

3.7.3 *Reliability*

Reliability looks at whether the results of a study are repeatable. This is a challenge for a qualitative study due to the small sample size and case study format. A qualitative research study should rather use dependability as a measure instead of reliability. Dependability is achieved by ensuring that data are accessible throughout the research process and kept safe. The conclusion of the research study should also be grounded in theory or reflected in data obtained in other studies – thereby achieving credibility (Bryman, 2012).

To enhance dependability, researchers should adhere to interview guidelines and ask the respondents the same questions and where possible in the same manner as well.

CHAPTER 4. PRESENTATION OF RESULTS

4.1 Introduction

The results of the data collected are presented in this chapter. The results are from the semi-structured interviews that were conducted with five respondents. These five respondents represent five of the six refineries that will be impacted by the Clean Fuels II Regulation. The results are presented in line with the two research propositions of the study.

4.2 Results Pertaining To Proposition 1

A successful implementation of the proposed Clean Fuels II Regulation is dependent on the government providing cost recovery mechanisms to refineries.

The proposition arose from reviewing literature based on countries that have undergone similar product specification changes. The South African refineries have been vocal in requesting subsidies in order to implement the required changes.

The respondents were firstly asked to demonstrate their understanding of the proposed regulation, its importance and perceived benefits. Secondly, the respondents shared their views on cost recovery mechanisms.

4.2.1 Understanding The Proposed Regulation

All of the respondents understood that the Clean Fuels II Regulation is necessary to improve air quality in South Africa by reducing harmful components in the exhaust fumes of vehicles. The regulation will also help to standardize the quality of fuel sold in South Africa.

All five of the respondents felt that the petroleum industry needed the petroleum products specification regulation. The regulation will provide customers

with product quality assurance. The regulation will also protect the environment and the population at large.

The majority of respondents, except two, did not see any benefit for the petroleum industry when this regulation is approved. This viewpoint is underpinned by the fact that South African petroleum product prices are regulated and there is no incentive to invest in changes if refineries cannot increase prices to recoup the money spent. In contrast with this viewpoint is the risk of de-regulation which might catch South African refineries unprepared and lead to cheaper, cleaner imports of finished products. The regulation will also present an opportunity for refiners to modernize their refineries.

The biggest benefactors, therefore; from this regulation are the general public and car manufacturers.

The tables below first highlight a question that was posed to the respondents, followed by a theme that developed from the answers of that particular question. Lastly, the answers from respondents for the main question are listed in each table.

The first section of the interview guide, Appendix B, dealt with the respondents understanding of the proposed regulation.

Table 4: Why is the government planning on implementing the regulation?

The regulation will decrease the emissions from vehicles and, therefore; the health of South African citizens will be improved.
• To decrease emissions from vehicles, to advance the car manufacturing industry to manufacture Euro 5 compatible cars which can then be exported, and to promote investment and modernization of the refining industry in South Africa. • The government should be held accountable to protect the environment and the health of its people. Also, the global standardization of fuel quality is

important to improve the availability of fuel and to make it easier to import fit-for-purpose fuels. • Car manufactures are experiencing pressure to design cars that use clean fuels in order to reduce toxic emissions. The world is increasingly making use of renewable energy and is moving away from fossil fuels. Government, therefore; has to at least promote the use of cleaner fuels (derived from fossils fuels) as a minimum regulation instead of allowing the environment to get polluted while other countries are investing to reduce emissions. • It is to improve the health of South African citizens. By improving the overall health of South Africans, the government can increase the life expectancy of the population.

Table 5: Is the regulation necessary for the petroleum industry?

The petroleum specification regulation will standardize the quality of fuel sold – thereby giving customers an assurance of the product. Companies are interested in profits not in protecting the environment.
• YES. It is necessary to assure consumers that they are purchasing fuel that is compatible with their cars. The car manufacturing industry needs to know what type of engines they have to produce for the local market. Both consumers and car manufacturers need to know that the proposed regulation will be fixed for a significant period of time. However, refineries always have the choice to make fuels compatible with the local market or for export. • YES. Absolutely … it's inconceivable to have a free for all on product specifications. • YES. The petroleum industry will always aim to profit and it is not in their interest to invest in cleaner fuels, especially in a regulated South African market. It is mainly the car manufacturing industry that is aiming for an

improvement in fuel quality because cleaner fuels improve the performance of engines and reduce exhaust emissions.

- YES. The necessity for changes in the product specification regulations should be viewed from the stakeholders' perspective, which comprises the technical and economic benefits to the refiners, car manufacturers, and the social and environmental impacts. Based on this viewpoint, it is necessary that the fuel specification is changed. It will have long term benefits for the environment and the health of citizens and possibly some positive impact on the car manufacturers versus associated costs for the refiners.
- YES, because the petroleum industry, like any other, is driven by generating profits. Investors invest in projects that have an acceptable rate of return. Otherwise they can take their investments somewhere else. If Government does not step in to protect its citizen from harmful environmental conditions, then no one will. So Government must ensure that this is also a business imperative, not just about profits.

Table 6: What are the benefits for the oil companies regarding the proposed regulation?

The regulation presents an opportunity for refineries to invest their assets and to improve profitability and to modernize operations. To realize these benefits, the industry will have to be deregulated.
• YES, it will force the modernisation of refineries, but this will come at a cost that will require a change in the regulated prices in order to be remunerated. • NO, not explicitly. Also, it is not about a homogenous petroleum industry benefitting – but rather about the individuals' impact on competitors in the market. With cost recovery those companies that have underinvested would benefit from a higher subsidy. Typically this would mean that the Engen and

Calref refineries would obtain greater subsidies. • There is an opportunity to invest in commercial projects to improve profitability if the government will fund investment in cleaner fuels. There is a risk for the petroleum industry if deregulation takes place as imported cleaner fuels would be readily available. So, investment in cleaner fuels production will have to come anyway. • NO. The government will have to invest money to ensure that the refineries produce the required fuels quality. At the current fuel pricing structure, the refineries will not receive any benefits. • NO, as long as there is not compensation of some sort.

Table 7: Who will benefit the most from the implementation of the regulation?

The biggest beneficiaries of the regulation will be the public through improved air quality. The car manufactures will also gain as they can streamline their operations and produce better fuel efficient engines.
• South African consumers will be able to access new vehicle technologies with more efficient engines at a very small incremental cost to fuel. … The South African car manufacturing industry. … The engineering companies in South Africa who will be employed to construct the new refinery facilities. … The refinery employees whose job security will increase when the refineries are modernized. • Consumers, the motor industry perhaps and the environment are likely to be the beneficiaries. Consumers will have access to a higher grade product but this will come at an increase in the price. So one may argue their cost/benefit position is neutral. Original Equipment Manufacturers (OEMs) will be able to market their new vehicle technologies and it will also assist them in landing global production deals. Overall emissions will fall – for example, CO2

emissions will increase at refineries but decrease from tailpipes.

- The auto mobile industry – the production of high performance engines and consumers will pay and the public will have access to improved air quality.
- The proposed changes should have a stakeholder focus: refiners, motorists, car manufactures, and the public. Motorists, car manufacturers and the public will benefit from these changes.
- The citizens of South Africa.

4.2.2 *Understanding* The Cost Recovery Mechanisms

Four of the five respondents saw cost recovery mechanisms as the only option to ensure that the proposed regulation is implemented. This is because the South Africa petroleum market is currently regulated.

The themes that were identified from the responses of the respondents are as follows:

- The South African market must be deregulated so as to allow for a cheaper and quicker implementation of the proposed regulation.
- Under a regulated market, a fuel levy increase is the best approach to incentivize refineries.
- Refineries will not consider upgrading at their own discretion.

The responses to the cost recovery questions are tabled below.

Table 8: Are subsidies the right approach to ensure implementation?

In a regulated market, cost recovery mechanisms are the best approach to ensure the implementation of CFII.
• No, a market led approach will be best for consumers (cheapest), but this must be coupled with the deregulation of fuel prices, and will inevitably lead to some refineries closing, and an increased reliance on imports. With no deregulation some adjustment will need to be made to fuel prices to remunerate refinery investments. • This is a secondary question … the key question is whether the market price should be regulated or not. Another key question is whether the country benefits from a local refining sector or should it let the market decide and be ambivalent to local production versus imports … probably a topic for a separate thesis! • Under regulated markets, one has to ensure proper cost recovery and adequate remuneration of investments otherwise the supply chain will essentially be under-remunerated and consequently fail. • Yes, as this is a regulated market and no means for the petroleum industry to recover their investment costs. • Subsidies should never be an option for refiners to afford Clean Fuels II. The South African government is under tremendous pressure to alleviate poverty through the creation of sustainable industries, and to also ensure availability of reliable (and possible cheap) energy to boost the economy. Refiners should have budgeted for this long before Government proposed these changes. Most of the South African refinery owners are international oil companies, and they should have prepared themselves for these changes when these regulations were being implemented in other international refineries. There are only three possible payers for the changes: Government, motorists or refiners, and the most suited payer is refiners.

Table 9: Will refineries voluntarily comply with the proposed regulation if subsidies are offered?

Refineries are likely to change slowly in a market driven by demand unless it is forced by regulations.
• Refineries will delay as long as possible and then decide whether they can afford to invest or reduce production and eventually close. Without an adjustment to the fuel prices, there is no incentive for refineries other than the ultimate threat of going out of business because ultimately they will not be able to produce the fuel specifications required by regulations. • Without cost recovery, the driver for CF II will either be regulatory led – imposing changes – or market led … or supply led … It's unlikely that conventional refineries will follow Sasol and make the investment to produce CF II … but not impossible. • No, unless the fuel price increase will make it profitable to invest in clean fuels. Refiners will comply if Government implements Clean Fuels II. There are a number of alternative energy sources that are being proposed to drive the growth other than crude oil derived fuels for a number of reasons: 1. A desire to monetize existing stranded gas reserves. 2. A global demand for cleaner and alternative fuels. 3. Vast discoveries of natural gas as an alternative clean fuel. 4. Cars fuelled with alternative energy (hydrogen, gas, electricity and synthetic based fuels – which is very clean relative to crude). • The emergence of cleaner alternative energy source (for exampe gas) and a move to "zero emissions" (for example hydrogen plus power, especially from renewable energy) or cleaner fuels (such as GTL fuels) will leave the government with no option but to move to cleaner fuels. • No they would not. The driver would have to be compensation for investment that refineries would have to make.

Table 10: Which subsidy approach will ensure the quickest adoption of the regulation?

Fuel price increases via a Clean Fuels levy is the best way to ensure the quickest adoption.
• Cents per litre fuel price increase / incentive redirected to refineries. • A direct cost recovery will ensure the greatest motivation to refineries to upgrade. This means that investors will recover exactly what they spend on upgrading to CFII. Rules will ensure they do not over-recover. • Tax incentives will work for some refiners but will require the investment to be made upfront so this will increase the prospect of a closure decision. • Direct injection of capital through a government loan or share deal will not work at all. • Fuel levy (an increase in pump prices that gives full recovery of the capital injection). • I am not sure what subsidy mechanism was used in Europe, for example, when Clean Fuels (Euro 5) was introduced. The circumstances and wealth of the different countries are not the same. The South African government have more pressing issues than to subsidize international oil refineries. They should ensure that they can afford clean fuels from their local or global revenues or supplement their volumes by imports. The only reasonable subsidy would be to provide some financial support for the development of new refineries. • Differential tax that would change consumer behaviour by increasing the levy on dirty fuels, they ring-fence that for the investment in cleaner fuels.

Table 11: Why did refineries not request subsidies when the previous regulation, Clean Fuels I was approved?

Clean Fuels I dealt only with petrol, not diesel. To comply, there were other alternatives not requiring capital investments.
• Higher investment level and investment complexity. Also not possible this time to import components (for example, reformate) as an alternative to investments. There is no way to blend low sulphur products and, therefore; investments are necessary. • There was no subsidy approach. However, effects of lead on health were well-documented and the petroleum industry had a moral obligation to produce unleaded petrol. There was also sufficient pressure from the automobile industry to make unleaded fuel available to reduce exhaust emissions. • The proposed fuel regulation is not only aimed at reducing the quantity of toxic metals, but also the reducing of toxic gases from the fuels in order to deliver more clean and easy to burn fuels. The type of cleaner fuels being earmarked for Clean Fuels II are used in densely populated European countries because of the cleanliness. • The environment was different then. There were far less cars on higher Octane grades like ULP95. Since then the increase in ULP95r has been phenomenal – putting enormous strain on refinery resources for Octane. The previous regulation focused on one product, namely gasoline. Now gasoline and gasoil are targeted.

Table 12: How have other countries approached this regulation?

Most countries have undergone product specification regulations. This was achieved by allowing prices to rise.
• Yes, all of Europe, the USA and Australia. I am not familiar with the details of the implementation of the regulation in these countries, but they are all non-regulated markets and so will have introduced the new specifications and allowed prices to adjust through the market and some refineries will have decided it is not economically viable to invest and will have closed. • There is quite a bit on this in the SAPIA CFII documentation … but absolutely other countries have done this … that is why CFII is often referred to as Euro 5! • Many countries outside of Africa have been through product specification regulations. There was no subsidy, but producers were able to recover capital costs by increasing pump prices. • I know Europe (for example, Germany), but I am not sure of the process. • Kenya and China. They approached it by progressively changing the specifications. Kenya went to a maximum of 3% benzene. Some, like China, regulated only on major cities affected by pollution.

Table 13: What is the most cost-effective approach?

Adding a fuel levy on the price of petroleum fuels.
• Add a c/litre increase to the price of Euro 5 fuel and pay it to the refineries. Alternatively, deregulate the market. • Include a levy in the price to generate funds to a governmental controlled pot.

Refineries submit their upgrade plans which are scrutinized by independent experts. Payments made in accordance with finalized investment plans.

- Fuel levy (increase pump prices to refund the refinery upgrades proportionally).
- Like I said: there are only three potential payers: Government, the public or refiners. The public is already stretched and cannot be expected to pay. What will be their benefits (from a social point of view)? Subsidizing new refineries will address some of the poverty and employment challenges, and that is what Government should focus on. In South Africa, the refiners must pay, either through the use of their equity or loans.
- Fuel levy increases.

4.2.3 *Summary* Of Results

Below are some of the themes listed that emerged from the discussion regarding cost recovery mechanisms:

- In a regulated market, cost recovery mechanisms are the best approach to ensure the implementation of CFII.
- Refineries are likely to be slow in making changes when the drive is a market demand, unless it is forced by regulation.
- Fuel price increases via a clean fuels levy will ensure the quickest adoption.
- Most countries have already undergone product specification regulations. This was achieved by allowing prices to rise.

4.3 Results Pertaining To Proposition 2

The proposed Clean Fuels II Regulation will result in a reduction of the South African petroleum industry market size.

4.3.1 *Understanding the impact on market share*

Previous studies on the implementation of environmental regulations have suggested that implementation normally results in a reduced market size due to companies leaving those countries or due to a reduction in productivity. The South African petroleum industry has also stated that if the CFII regulation is implemented without subsidies, it will result in refineries shutting down. There are, however; contradictory views with regard to the statement of the petroleum industry.

The findings from the effects the proposed regulation might have on the market size are tabled below:

Table 14: What are the risks to the industry if the proposed regulation is implemented?

If implemented with no incentives, some refineries will have to close.
• Yes, if there is no adjustments to fuel prices, then some refineries will likely close and there will be more fuel imports to South Africa. • Yes – as indicated – CFII will see a significant change in the market and likely new entrants. • Yes. Some refineries may have to close down if there is no subsidy as the cost of refinery upgrades will not be affordable. • There is a likelihood that some of the refineries will operate at low through-put or change their product slates, thereby necessitating increased white product imports. The net impact will not be that severe as we are already importing white products (the same with crude feedstock).

• The risk for refiners is that their margins will reduce due to reduced throughput for the same fixed costs. This will either necessitate refinery closures, a reduction in staff or investments in production of high value products to keep high margins.

Table 15: What are the reasons for refinery closures?

When there are no incentives available to refineries to continue operations, they will not be able to recoup their capital investments.
• Yes, when there are no incentives for refineries to invest, there is no way they would be remunerated for their multi-billion rand investments. • Absolutely – international experience shows that refinery closures are almost a given. South African refineries are small and a refinery like Enref is likely to close anyway. • Yes. Some refineries may have to close down if there is no subsidies as the cost of refinery upgrades will not be affordable. • Yes, refineries will shut down, because the refineries will have to operate at lower profits due to reduced throughput (because of limited internal capacity to produce according to new fuel specifications) or interest payments required on loans to ensure fuel quality according to Clean Fuels II specifications. Depending on the extent of the reduction, some refineries might find it not economical to operate any longer especially when considering how much “life” they still have (most of them are already old, and such investments would be better for new refineries than to upgrade old refineries). • Yes. Import terminals are much cheaper and easier to operate and have a low pollution impact.

Table 16: Production impacts

The total volume produced will reduce due to the implementation of the regulation.
• They will likely decrease as the new specs will enable new engine technologies which are more efficient and will, therefore, require less fuel. • Indirect effect only through improved vehicle efficiency and, therefore; slower growth in demand. • Product volumes will reduce. • The volumes are likely to reduce or the split changed (assuming no further investments for Clean Fuels II purposes) due to: 1. Reduced throughput due to lack of hydrogen and sulphur capacity to meet the new product specifications. 2. Diversification to high value chemicals as a way to improve refinery margins. • No, it will not affect volumes.

Table 17: Financial impacts

The proposed regulation will result in a negative financial impact on refineries.
• Without any increase in fuel prices, there will be a huge negative impact on the financial performance of petroleum companies. With an increase in fuel prices, the best that can be expected is that the companies' financial performance remains as it is. • With Cost Recovery (CR) – refineries will probably see an improved performance as they switch to higher grade products … without CR … Most (if

not all) will be cash negative for say five to ten years.

- With no government subsidy, the petroleum companies (especially those primarily based on crude derived fuels) will have reduced profits due to lower processed volumes or loan payments on investments to enable similar throughputs. These reductions can be reduced by investing in high value chemicals derivatives or products, but such investments will be capital intensive and, therefore; the current profits will not be maintained.
- Significantly. In 2009's estimates it would have cost the economy US$4 billion.

Table 18: Competition impacts

The industry competition will be impacted on but whether positively or negatively, is inconclusive.
• Yes. If the regulation is introduced, then the industry will be more competitive globally. If there is a further procrastination on the way forward, then this will negatively impact competitiveness. • Yes, as previously indicated. • Yes, operating costs will increase significantly. • The constraints of the refiners' competitiveness are internal, and not market related. There is an under supply of white products in South Africa (hence the import) and, therefore; necessary measures by the respective refiners are required to ensure that there are not constraints. At worst, the new regulation will result in the importing of more white products (unless new refineries are built and imports are reduced – then competitiveness could be an issue). • No. It would make them compete with international players.

Table 19: Is the timing of the proposed CFII Regulation right for South Africa?

The timing of when CFII must be implemented is inconclusive.
• No. I think it is too big a step that is not needed yet. There should be a less stringent and cheaper (lower investment) improvement in specifications – for example, 50 ppm diesel as an interim measure with no changes in density and no change in petrol. • It should have been done already … it is now not likely before 2023. • Yes, it is a basic human right to breathe clean air. • There will never be a more perfect time than now (and possibly in the next five years). Delays will continue as long as Government is considering subsidizing refiners, which is providing refiners with ammunition to keep delaying the implementation. Zero emissions cars (electrical cars) and LNG buses (City of Tshwane) are being introduced while fossil fuel cars are still operating on low quality fuel. These interventions are not synchronized. • Not yet. If this could be pushed to the next five to ten 10 years. Too expensive for the economy now.

4.3.2 *Summary of results*

All of the respondents agreed that the regulation, if implemented with no incentives, will result in refinery closures. The respondents were, however; divided on whether the proposed regulation should be implemented now or pushed back for another couple of years. A summary is listed below on the impact the regulation will have on the petroleum industry:

- If the proposed regulation is implemented with no incentives, some refineries will have to close down.
- If there are no incentives for refineries available to continue operations, they will not be able to recoup their capital investments.

- The proposed regulation will result in a reduction with regard to the total volume produced.
- The proposed regulation will result in a negative financial impact for refineries.
- The respondents were divided on the effect the proposed regulation will have on the industry's competition.
- The respondents were also divided on when the proposed CFII Regulation should be implemented.

CHAPTER 5. DISCUSSION OF THE RESULTS

5.1 Introduction

In this chapter the research results that were presented in the previous chapter will now be discussed. A direct content analysis approach was used, as this type of approach helps to validate, expand or offer contradictory views on already existing research or theory (Hsieh and Shannon 2005).

The chapter begins by discussing the importance of the proposed regulation followed by a discussion focusing on subsidies and market size effects.

5.2 The Importance Of The Clean Fuels II Regulation

All of the respondents were of the opinion that the proposed regulation is a necessity that will ensure that the quality of air in South Africa improves. By improving the quality of fuel used by motor vehicles, the amount of greenhouse gases emitted via car exhausts will be reduced. The respondents also believed that the industry was not likely to move towards cleaner fuels on their own and, therefore; a government regulation was required to drive the change.

The findings highlight the proposed regulation as a must in order to protect the environment and the health of South African citizens. As Goldstein and Carruth mentioned, the government must take a precautionary approach in regulation legislation to protect the environment (Goldstein and Carruth 2003).

The protection of the citizens of South Africa is one of the most important objectives of the government, meaning that the benefits of the proposed regulation will be greater than the perceived costs. This view is supported by a study done by Khanna (2001) who also concluded that benefits should exceed costs before a regulation is implemented.

The respondents also saw the proposed regulation as a way of providing assurance of the quality of fuel that is sold in South Africa. They saw the proposed regulation as a benefit to the public and not the petroleum industry. The proposed regulation will be a financial burden to the petroleum industry that must be carried if they want to continue operating in South Africa.

The car manufacturers were also cited as the biggest beneficiaries should the proposed regulation be implemented, as they will be able to standardize their South African operations to those in developed countries. Cleaner fuels will allow the introduction of new engine technologies that are more fuel efficient with improved performances.

The regulated petroleum product prices were cited as the reason for the industry not benefiting from this proposed regulation. One respondent highlighted the following: “They will have to invest money to ensure that the refineries produce the required fuel quality. At the current fuels structure, the refineries will not have any benefits”.

These findings with regard to the importance of the proposed regulation are consistent with current research findings and SAPIA who also supports the implementation of this type of regulation.

5.3 The Importance Of Subsidies In The Implementation of The Clean Fuels II Regulation

The majority of respondents agreed that cost recovery mechanisms are essential in ensuring the implementation of this proposed regulation within the current regulated pricing environment in South Africa. One of the respondents even went further to say that maybe the government should be looking at deregulating the prices of petroleum products in South Africa.

Deregulation will allow a market led approach that will allow imports of cleaner products entering the market, which will be sold at market prices. Refineries will then

be forced to produce cleaner fuels due to a market demand. This market-based or incentive-based approach was advocated by Hahn (2000) as opposed to a “command and control”-approach.

The market led approach is also viewed as a cheaper option that will ensure the implementation of the proposed regulation as the government does not have incentives to offer refineries, they will have to invest on their own due to market pressures/demands.

The South African market is, however; still regulated and under these conditions cost recovery mechanisms are needed. Most of the respondents saw the introduction of a fuel levy in fuel prices as the best approach in raising the capital required for these upgrades. This capital will then be passed down to refineries. Other alternatives such as taxation incentives will require huge capital investments by refineries and might result in closures when refineries do not have access to enough capital.

This line of thought is supported by Blumberg and Walsh (2003) who concluded in their study that these kinds of upgrades – in order to comply with this type of regulation – require huge amounts of capital and they suggested that a regulation combined with incentives is required for effective implementation.

The South African government has not stated which incentive scheme will be followed for the implementation of the proposed Clean Fuels II Regulation. Research reveals that most of the countries that have gone through this process did so via differentiated pricing for cleaner fuels. Either a concessionary duty or lower taxes on fuel were implemented and demand was, therefore; stimulated. The respondents of this study were of the opinion that adding a fuel levy (cents/litre) will be the most effective way to ensure implementation, as a price increase could be used by refineries for upgrades.

Refineries in European countries used their own capital for the necessary upgrades and they were compensated via tax credits or concessionary duties. The

respondents of this study, except one, suggested that the government should first raise the capital for refineries before upgrades are done.

One of the respondents who opposed providing existing refineries with incentives, suggested that the money could be better used in building new refineries. These refineries will be able to produce fuels that meet the required quality whilst also creating jobs for the unemployed citizens in South Africa.

The findings from the interviews are consistent with research and support the proposition that a successful implementation of the proposed Clean Fuels II Regulation is dependent on the government providing cost recovery mechanisms to refineries.

5.4 The Effect Of The Regulation On The Petroleum Industry Market Size

All of the respondents agreed that if the proposed regulation is implemented without incentives, the result will be the closing down of refineries. The cost of upgrading will be too high for refineries as their margins will be greatly reduced.

The respondents are of the opinion that should refineries decide against upgrades, they will have to reduce the amount of volumes produced and they will suffer financially. A cheaper alternative will be to switch to import terminals. Finished products will already meet the required specifications. Szklo and Schaeffer (2007) also support this view, stating that environmental regulations put pressure on the profitability of refineries, leaving refineries with no other option than to find solutions to comply.

The effect that the proposed regulation will have on market size was found to be negative – either through closures or a reduction in the volumes of petroleum products produced locally. The respondents mentioned that a volume reduction would either be direct due to being unable to produce the required fuels or indirectly as the new proposed specifications will enable more fuel efficient engines to enter the market.

Research by Brunnermeier and Levinson (2004) showed that companies flee countries where stringent environmental regulations are in place. A study conducted by KPMG on behalf of the petroleum industry also concluded that refineries will have to close if they are not compensated for upgrades.

The respondents were in agreement that the proposed regulation will result in a negative financial impact on the petroleum industry. The respondents differed on the effects on the industry's competitiveness and some of the respondents concluded that the proposed regulation will result in the local industry being more competitive globally. This will occur when refineries have upgraded their operations to meet the standards of developed countries. A portion of the respondents felt that the proposed regulation will result in high operating costs, thus reducing competitiveness.

Even though the respondents did not agree on what the impact will be on the industry's competitiveness after the proposed regulation was implemented, they all agreed that the regulation will result in a smaller market size either via closures or reduced productivity. Their agreement supports the proposition that the proposed regulation will result in a reduction of the South African market size.

5.5 Conclusion

If the proposed regulation is implemented without cost recovery mechanisms, it will result in refinery closures, thus reducing the market size.

The respondents also agreed that the government needs to provide incentives to refineries or alternatively deregulate petroleum products prices for the successful implementation of the regulation.

CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The chapter summarizes the findings and conclusions of the research study. Similarities to or differences in literature are highlighted. Finally, recommendations and suggestions are made for future research.

6.2 Conclusions Of The Study

The findings from the interviews that were conducted are consistent with current research regarding the importance of the proposed CFII regulation. All of the respondents saw the tightening of the petroleum product specification regulation as necessary in order for the government to protect the environment and its citizens.

In a 2011-study, Skjaerseth and Skodvin also concluded that companies operating in countries where weak or no government regulations are in place tend to be reactive when it comes to the implementation of environmental strategies. Regulations then become necessary tools to drive the right behaviours.

The importance of the proposed Cleans Fuels II Regulation was, therefore; established and supported by both research literature and the findings of this study.

The major difference was regarding the benefits that the petroleum industry might derive from the implementation of such a regulation. The interview findings were ambivalent in this regard. Ambec and Barla (2006) made use of a Porter hypothesis to suggest that companies subjected to environmental regulations benefit by becoming innovative – leading to increased productivity and product value. Their study, however; concluded that they could not establish a link between regulations and innovation.

Some of the respondents envisioned an opportunity for refineries to modernize their operations and thus increase their profitability. This notion is supported by Berman and Bui (2001) who found that productivity actually increased during periods of regulations and that the environmental costs are often exaggerated.

This research study was, therefore; inconclusive on whether the petroleum industry of South Africa stands to benefit from this proposed regulation.

6.2.1 *Conclusions* To Proposition 1

A successful implementation of the proposed Clean Fuels II Regulation is dependent on the government providing cost recovery mechanisms to the refineries.

The findings from the study indicated that the best way forward for the implementation of the proposed regulation is for the government to provide cost recovery mechanisms to the petroleum industry for the capital investments needed to perform the necessary upgrades.

The reasoning behind this conclusion is that, with the current petroleum product price regulation in place, there is no incentive or benefit available for refineries to invest in these upgrades. If the prices of fuel products are not allowed to increase, then refineries will not be able to recoup the capital invested.

The study also found that a fuel levy introduction to fuel prices will ensure a quick adoption and implementation of the proposed regulation. The levy raised can be ring-fenced and then proportionally distributed to the refineries.

Consequently, the proposition that a successful implementation of the proposed Clean Fuels II Regulation is dependent on the government providing cost recovery mechanisms is **accepted**.

6.2.2 *Conclusions* To Proposition 2

The proposed Clean Fuels II Regulation will result in a reduction of the South African petroleum industry's market size.

All the respondents agreed that if the proposed regulation is implemented without incentives, the implementation will result in refinery closures. These closures will be driven by the negative financial impact on the cost of upgrades – causing a dwindling profit margin. A sensible solution for most of the affected refineries will be to close rather than to invest in upgrades.

The market size might also be reduced by a reduction in volumes. As refineries will try to comply with the regulation, they will also try to lower their throughput to produce the required quality product using the same existing equipment and technology. These actions will ultimately lead to a reduction in productivity caused by the implementation of environmental regulations – supported by a number of studies such as the study conducted by Shadbegian and Gray in 1987.

The findings from the study, therefore; **accept** the proposition that states that the proposed regulation will result in a reduction of the South African petroleum industry's market size.

6.3 Recommendations

The fight against global warming has intensified in the past couple of years with countries implementing policies that will ensure that the amount of greenhouse gasses emitted is reduced. The significance of the proposed fuel specifications regulation in South Africa is, therefore; understood and accepted by all role-players as the next step towards cleaner air.

The government, however; needs to ensure that a delicate balance between imposing this environmental regulation and the sustainability of the petroleum industry – a major contributor to the economy – is maintained.

It is, therefore; recommended that the government should pronounce the implementation of this proposed regulation timeously. It is very important to allow time for businesses to plan accordingly and if this implementation is done correctly, the petroleum industry will have enough time available to decide on a response with regard to compliance strategies. The incentive approach via fuel levies is recommended that will subsidize affected refineries. The levy will remove the burden from the government of having to obtain the necessary funds by lending or reallocating from other commitments. The levy is also seen as an easier and more direct approach of raising the required capital for upgrades.

The petroleum industry also has a role to play in the move towards cleaner fuels in South Africa. The industry needs to make a contribution as the proposed implementation of this regulation is an initiative aimed at improving the environment in which they operate. As responsible corporate citizens they too have an obligation to protect our environment. The South African government cannot be the sole contributor to the required capital. The government cannot subsidize private companies whilst other important priorities such as fighting unemployment, developing infrastructure and improving the quality of education in the country need attention.

The recommended approach should, therefore, be that the government contribute 50% of the required capital to refineries.

6.4 Suggestions For Further Research

This study focused on the petroleum industry and how the proposed regulation can be implemented to reduce impacts such as a reduction in market size.

However, there are other relevant role-players that the study discovered such as car manufactures who will also benefit from the implementation of this proposed regulation. An improvement in fuel quality will not help if South African vehicles are old and when these vehicles do not have the technology required to reduce harmful emissions.

A study is recommended to investigate if the current available vehicles in South Africa are complementary to the intended goals of the proposed regulation. Vehicle inefficiencies can result in an increase of harmful exhaust gases even when cleaner fuels are used.

Another study should look at the benefits of deregulating the price of petroleum products in South Africa. Suggestions were made during the interviews that the cheapest way of implementing the proposed Clean Fuels II Regulation is by deregulating fuel prices. This will lead to a market led demand and refineries will have no choice but to either produce cleaner fuels or import cleaner fuels from other countries. In this scenario neither the government nor the public will have to pay or provide incentives for necessary upgrades in order to acquire cleaner fuel.

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APPENDIX A: Euro 5 Specifications

Parameter[1]	Unit	Euro II Spec	RSA (CF1) Spec	Euro IV Spec	Euro V Spec	RSA (CF2) Spec
Petrol						
Sulphur	mg/kg	500	500	50	10	10
Aromatics	Vol %	50	50	35	35	35
Benzene	Vol %	5	5	1	1	1
RVP	kPa	45 - 75	45 - 75	45 - 60	45 - 60	45 - 65[2]
Olefins	Vol%	No max	No max	18	18	18
Diesel						
Sulphur	mg/kg	500	500 / 50[3]	50	10	10
Polycyclic Aromatic Hydrocarbons (PAH)	% m/m	11	No max	11	11	11
Cetane Number	none	45	45	51	51	51
Distillation						
T90, max.	°C	N/A	362	N/A	N/A	N/A
T95, max.	°C	360	N/A	360	360	360

Table 1: Fuel Specifications in terms of European Emissions standards and Proposed South African Fuel Specifications

Notes: (1) Unless otherwise stated all figures indicate maximum allowable levels.

(2) Vapour pressure shall be 65kpa maximum with a 5 kPa waiver allowed when ethanol is used.

(3) * = niche grade specification

(4) "Euro" refers to European Emissions Standard

POSITION PAPER FOR PUBLIC COMMENT

APPENDIX B: Interview Guide

Understanding the proposed regulation

What is your understanding of the proposed Clean Fuels II Regulation?

Why do you think the government wants to implement this regulation, will the implementation be effective?

Do you think environmental regulations are necessary for the petroleum industry? Please support your answer.

Is there any benefit for the petroleum industry in this proposed regulation?

Who do you think will benefit the most from the implementation of this regulation?

Understanding cost recovery mechanisms

Do you think subsidies (cost recovery mechanisms) are the right approach to ensure the implementation of Clean Fuels II?

Can refineries comply to the proposed regulation without government subsidy? What would be the driver towards clean fuels?

Which subsidy approach do you think will ensure the quickest adoption of the regulation?

How does this proposed regulation differ from Clean Fuels I when lead was banned from petroleum products?

Do you know of any other country that has been through similar product specification regulations? What approach was adopted in that country?

In your opinion, what is the most cost-effective mechanism for subsidizing the refinery upgrades?

Understanding the impact on market size

Are there any risks for the petroleum industry involved by the proposed regulation?

If the regulation is implemented by the Department of Energy, are there any threats of refinery closures? What will be reason for closures?

How will the tightening of petrol and diesel specifications affect product volumes?

How will the proposed regulation impact the financial performance of petroleum companies?

Will the industry's competiveness be impacted by the implementation of this regulation?

Understanding the timing of the implementation

Do you think the South Africa market is ready for clean fuels? Why?

Additional comments

Please add additional comments that you think will benefit this research that was not covered by the questions above.