

https://dspace.org/

The impact of independent power producers entering the South African electricity supply industry

Mokhethi, Keketso Elijah

2020
https://hdl.handle.net/10539/30846

Downloaded from a DSpace repository. https://dspace.org/

The impact of Independent Power Producers entering the South African electricity supply industry



Keketso Elijah Mokhethi

A thesis submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in fulfilment of the requirements for the degree of Doctor of Philosophy (PhD).

Johannesburg, 2020

ABSTRACT

For over a decade, South Africa has been experiencing electricity supply challenges which were mainly due to generation or distribution failures, as well as operational inefficiencies at Eskom; and this raised concerns about the power utility's ability to guarantee security and quality of supply. In order to address these challenges, several attempts were made in the past to introduce competition in the electricity supply industry, without any material success. The latest attempt has been to accelerate the introduction of Independent Power Producers (IPPs) through the Renewable Energy Independent Power Producer Programme.

This study investigated the impact of IPPs gaining access to the South African electricity supply industry which has been dominated by Eskom for a long time; and if the current market conditions are conducive for a competitive electricity market in the country. The study also identified some of the market barriers experienced by different IPPs. A qualitative methodology, premised on an interpretive paradigm, was employed for the collection of data. The study specifically focused on the South African context as a developing country. The sample included experienced individuals who are either currently working or have previously worked in the industry, thereby enhancing the richness of interviews conducted.

The study found that the cost of electricity using renewable technologies such as wind and solar PV (generated by IPPs) has reduced significantly and is therefore cheaper than current prices paid by customers which is mainly based on power generated by Eskom using coal, which contributes significantly to the levels of pollution in the country. However, customers are not benefiting from the reduced costs since IPPs sell their power directly to Eskom which on-sells to customers using tariffs that continue to escalate at above-inflation rates. Furthermore, the introduction of IPPs did not result in improved operational efficiencies. The study also found that market entry barriers were low with a few minor challenges. Another finding of the study is that the current electricity market structure is not conducive for competition to prevail and therefore a restructure of the South African electricity market should be considered. The study was original and makes contributions to the theory of public choice and the theory of economic regulation.

DECLARATION

I, Keketso Elijah Mokhethi, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in fulfilment of the requirements for the degree of Doctor of Philosophy at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.



Keketso Elijah Mokhethi

Signed at ……Midrand……

On the ……8th … day of …September……2020

DEDICATION

I dedicate this thesis to all members of my family who have departed from this world. If only I could give you a copy to read.

Papa: Elijah Mokhethi Sr.

Mama: Christina Matlakala Mokhethi

Abuti: Bogosi Prince Mokhethi

Abuti: Percy Sello Tladi

See you on the other side.

ACKNOWLEDGEMENTS

Most importantly, I would like to give thanks to God for my life, health and protection. Without him none of this would have been possible.

A special thank you to my departed parents and brothers for the love and support you have given me when you were still around.

I would also like to thank my brother, Mpho and my sister Selinah for the precious moments we share together.

This thesis would not have seen the light of day if it were not for Dr Renee Horne, my supervisor. She has always provided constructive criticism and guidance which have ensured that I complete this research. Her knowledge as an academic and an expert in her field has contributed immensely to this study. Thank you so much.

To those who agreed to take part in this research, thank you for making yourselves available to be interviewed. Your insights and experiences gave me data which was critical for the findings of the research. I really value your time and contributions.

TABLE OF CONTENTS

ABSTRACT ..... **ii**

DECLARATION ..... **iii**

DEDICATION ..... **iv**

ACKNOWLEDGEMENTS ..... **v**

TABLE OF CONTENTS ..... **vi**

TABLE OF FIGURES ..... **xii**

LIST OF TABLES ..... **xiv**

LIST OF ABBREVIATIONS ..... **xvi**

Terms and definitions ..... **xviii**

CHAPTER 1: INTRODUCTION **1**

1.1 Background 1

1.2 Motivation 5

1.3 Significance of the study 7

1.4 Problem statement 8

1.5 Research questions 10

1.6 Limitations and delimitations 11

1.7 Assumptions 12

1.8 Structure of the study 13

CHAPTER 2: LITERATURE REVIEW **14**

2.1 Introduction 14

2.2 Regulation of price in competitive markets 14

2.3 Natural monopoly 18
2.4 Liberalisation and regulation 20
2.4.1 Privatisation 20
2.5 Is private better than public ownership? 30
2.6 Restructuring vertically vs horizontally 35
2.7 A review of applicable theories 38
2.8 Empirical evidence of regulatory changes 42
2.8.1 Renewable energy support schemes globally 44
2.9 Electricity market structures in developed countries 46
2.9.1 The German electricity market 46
2.9.2 Electricity regulation in the UK 50
2.10 Competition in European electricity markets 52
2.10.1 The Nordic Power Pool 53
2.10.2 Electricity trading in Germany 56
2.11 Electricity market structures in emerging markets 57
2.11.1 China's electricity market structure 58
2.11.2 Independent Power Producers in Malaysia 60
2.11.3 Independent Power Producers in Brazil 61
2.12 Electricity markets in Africa 62
2.13 South Africa's electricity supply industry 64
2.14 Theoretical model 67
2.15 Conclusion 70

CHAPTER 3: RESEARCH METHODOLOGY 73

3.1 Introduction 73
3.2 Research paradigm and design 73
3.2.1 Unit of analysis 81
3.3 Population and sample 81
3.3.1 Population description 81
3.3.2 Sample – criteria for selection, size, sampling strategy 81
3.4 The research instrument 88
3.5 Data analysis method 88
3.6 Limitations of the study 92

3.7 Validity and reliability 92
3.7.1 External validity 92
3.7.2 Internal validity 93
3.7.3 Reliability 93

CHAPTER 4: PREVIOUS ATTEMPTS OF REFORM 95

4.1 Introduction 95
4.2 Reforming the South African ESI 95
4.2.1 Government's objectives for the ESI 95
4.2.2 Earlier attempts to reform the South African ESI 97
4.3 Government policy in the electricity sector 99
4.3.1 Policy decisions for the electricity distribution industry 99
4.3.2 Policy decisions for the electricity supply industry 100
4.4 Conclusion 103

CHAPTER 5: INTRODUCING IPPs THROUGH THE REIPPPP 104

5.1 Introduction 104
5.2 From REFIT to REIPPPP 106
5.3 Economic Development Goals vs Pricing 108
5.3.1 Requirements for economic development 108
5.4 Economic development: criticism and controversy 115
5.4.1 Job creation 115
5.4.2 Capacity building vs ownership and jobs 116
5.4.3 Production 116
5.4.4 Enterprise and socio-economic development 117
5.5 Success factors, weaknesses and risks 118
5.5.1 Factors associated with the management of the programme 119
5.6 Factors relating to the design of the program 121
5.6.1 Expediting roll-out of new generation 121
5.6.2 Size of the program 122
5.6.3 Potential project profitability 122
5.6.4 Discontinuation feed-in tariffs 123
5.6.5 Bid rounds 123
5.6.6 PPP regulations exemption 123
5.6.7 Requirements for economic development 124
5.6.8 Guarantees 124

5.6.9 Weaknesses relating to program design 125
5.6.10 Program design risks going forward 126
5.7 Private sector participation 128
5.7.1 Project sponsors 128
5.7.2 Funding 129
5.8 Cost of solar PV and wind power 132
5.9 Conclusion 134

CHAPTER 6: MARKET ENTRY BARRIERS 136

6.1 Introduction 136
6.2 Integrated Resource Plan 137
6.2.1 White Paper on the Energy Policy 138
6.2.2 Integrated Energy Plan 138
6.2.3 Renewable Energy White Paper, 2003 140
6.2.4 The Electricity Regulation Act 141
6.2.5 The National Energy Act 141
6.3 The Renewable Energy IPP Procurement Programme 142
6.3.1 Institutional setting 144
6.3.2 Request for proposal 148
6.3.3 General requirements, rules and provisions 148
6.3.4 Criteria to qualify 148
6.3.5 Environmental impact assessment 150
6.3.6 Technical criteria 152
6.3.7 Criteria for economic development 152
6.3.8 Criteria for pricing and costing 153
6.3.9 Financial structuring 153
6.3.10 Financial close requirements 155
6.3.11 Problems and delays encountered in the REIPPPP 156
5.3.12 Evaluation criteria 159
5.3.13 Final outcomes 159
6.4 Barriers to renewable energy technologies 164
6.5 Barriers to setting up a green power market in South Africa 166
6.5.1 Challenges of buying green power 167
6.5.2 Challenges of creating a green power market in South Africa 169
6.6 Conclusion 175

CHAPTER 7: COMPTETITION IN THE ELECTRICITY SUPPLY INDUSTRY 177

7.1 Introduction 177

7.2 Market power and generation 178

7.3 Transmission 180

7.4 Reform on the demand side 181

7.5 Institutional arrangements 182

7.6 Enforcing competition 183

7.7 Competition and pricing 184

7.8 Restructuring for competition 185

7.9 Restructuring options for the South African ESI 188

7.9.1 Integrated monopoly 189

7.9.2 Dominant supplier model 189

7.9.3 Subsidiary generation model 192

7.9.4 Divesting most of generation assets 192

7.9.5 Maximum separation of generators 193

7.10 Implications for competition and regulatory oversight 194

7.10.1 The roles of the Competition Commission and the NERSA 194

7.10.2 NERSA's role in a competitive environment 196

7.10.3 Regulating the transmission network 198

7.10.4 Regulation of distribution 199

7.10.5 Regulating benefits for the public 200

7.10.6 Security of supply 201

7.11 Electricity trading in South Africa 202

7.12 Conclusion 204

CHAPTER 8: CONCLUSION & RECOMMENDATIONS 205

8.1 Conclusion 205

8.1.1 Impact of IPPs 206

8.1.2 Market entry barriers 210

8.1.3 Competition in the ESI 212

8.2 Recommendations for further research 217

REFERENCES..... 220

APPENDIX A – Actual research instrument..... 232

APPENDIX B – HIGHLIGHTS OF THE REIPPPP AS AT JUNE 2017 (IPP-Office 2017) 234

TABLE OF FIGURES

Figure 1: Elements of the process of regulation (Steiner 2000) 26

Figure 2: Installed capacity in MW (Bayer 2015)..... 48

Figure 3: The Nord pool power market (Carlsson 1999) 54

Figure 4: Sub-markets of the electricity market in Germany (Gabriel 2014) 56

Figure 5: Progress of electricity market reforms in China (An et al. 2015)..... 58

Figure 6: Transfer of China's transmission assets in 2002 (IEA 2006)..... 59

Figure 7: The South African ESI (Eberhard 2001) 64

Figure 8: Theoretical model (Author's own work)..... 67

Figure 9: Number of respondents (Author's own work)..... 83

Figure 10: Race and gender of respondents (Author's own work) 84

Figure 11: Positions held by respondents (Author's own work)..... 85

Figure 12: Age of respondents (Author's own work) 86

Figure 13: Experience within the IPP sector of the ESI (Author's own work)..... 87

Figure 14: Experience in the ESI (Author's own work)..... 87

Figure 15: Shareholder participation: Bidding rounds 1-3 (Eberhard et al. 2014)..... 129

Figure 16: Debt financing in REIPPPP: Round 1-3 (Eberhard et al. 2014)..... 130

Figure 17: Initial providers of debt (DoE 2016) 130

Figure 18: Number of projects per debt provider (Eberhard and Naude 2017)..... 131

Figure 19: Cost of solar PV and wind from 2011 to 2015 (CSIR 2016) 132

Figure 20: Cost comparison of different electricity technologies (CSIR 2016)..... 133

Figure 21: Energy planning framework (DoE 2016) 139

Figure 22: The IEP and Sector Plans (DoE 2016) 140

Figure 23: Location of renewable energy power plants (Intelligence 2016)..... 142

Figure 24: Progress of the REIPPPP (Deloitte 2017)..... 143

Figure 25: The REIPPPP procurement programme (Ciglmayr 2013)..... 158

Figure 26: Lending cycle of renewable energy projects (Pegels 2010) 166

Figure 27: Monopoly and single-buyer models (Newbery and Eberhard 2008)..... 186

Figure 28: Wholesale competition vs retail competition (Newbery and Eberhard 2008) 187

LIST OF TABLES

Table 1: Complementary approaches on privatisation (Genoud and Varone 2002) 24

Table 2: Theoretical distribution of the function of regulation to the actors of the liberalised sector (Genoud and Varone 2002) 27

Table 3: The regulation framework (Genoud and Varone 2002) 28

Table 4: Germany at a glance (Bayer 2015) 47

Table 5: Installed capacity, consumption and peak demand (Bucksteeg et al. 2015)..... 48

Table 6: Market share of German electricity companies (Deloitte 2015) 49

Table 7: Profile of respondents (Author's own work)..... 82

Table 8: Thematic analysis phases (Braun and Clarke 2006) 89

Table 9: REFIT prices and REIPPPP prices (DoE 2016) 107

Table 10: Economic development objectives of the REIPPPP (Eberhard, Kolker and Leigland 2014) 110

Table 11: Scoring categories of the REIPPPP economic development (Eberhard et al. 2014)..... 112

Table 12: Requirements and results for local content scoring (DoE 2016)..... 113

Table 13: Economic development outcomes of Rounds 1-3 of the REIPPPP (DoE 2016) 115

Table 14: Companies involved in the four bidding rounds of the REIPPPP (Intelligence 2016)..... 144

Table 15: REIPPPP evaluation consultants (Eberhard et al. 2014)..... 146

Table 16: Allocation of generation capacity (Pieters et al. 2014)..... 149

Table 17: Financial parameters for REIPPPP projects (Pieters et al. 2014)..... 154

Table 18: Power procurement: Bid Window 1-4, as at September 2016 (Eberhard and Naude 2017) 160

Table 19: Bid Prices of the REIPPPP in 2011 (SA c/kW) (Eberhard et al. 2014)..... 184

LIST OF ABBREVIATIONS

ANC:	African National Congress
COSATU:	Congress of South African Trade Unions
DA:	Democratic Alliance
DoE:	Department of Energy
DPE:	Department of Public Enterprises
DSO:	Distribution System Operator
EEX:	European Energy Exchange
ESI:	Electricity Supply Industry
EU:	European Union
FIT:	Feed-in tariff
GW:	Gigawatt
HVDC:	High Voltage Direct Current
IEA:	International Energy Agency
IPP:	Independent Power Producer
IRP:	Integrated Resource Plan
ISMO:	Independent System and Market Operator
KenGen:	Kenya Electricity Generating Company
KLSE:	Kuala Lumpur Stock Exchange
MW:	Megawatt

NDP:	National Development Plan
NEB:	National Electricity Board
NGC:	National Grid Company
nTPA:	Negotiated Third Party Access
NERSA:	National Energy Regulator of South Africa
NETA:	New Electricity Trading Agreement
OTC:	Over-The-Counter
PPA:	Power Purchase Agreement
PPP:	Public-private partnership
PV:	Photovoltaic
REFIT:	Renewable energy feed-in tariff
REIPPPP:	Renewable Energy Independent Power Producer Procurement Programme
RPM:	Regulation Power Market
SADC:	Southern African Development Community
SAPP:	Southern African Power Pool
SEIFSA:	Steel and Engineering Industries of Southern Africa
SOE:	State-owned enterprise
TSO:	Transmission System Operator
UK:	United Kingdom

TERMS AND DEFINITIONS

Broad-Based Black Economic Empowerment – An initiative legislated by the government of South Africa in 2003 which aims to transform the economic landscape by increasing the number of black people who actively participate in the South African economy through management, ownership and control.

Contestable market – A market which is free to enter and does not cost to exit. Having the freedom to enter does not necessarily equate to ease of access or costing nothing. However, the new player will not be disadvantaged in as far as production methods or quality is concerned.

Distribution – The final stage of delivering electricity to individual consumers at low voltage (usually less than 132 kV).

Electricity Supply Industry – All stakeholders that participate in generating, transmitting, distributing, regulating as well as selling electrical power.

Generation – A process of producing electricity by a power utility at a power station using the appropriate technology e.g. coal and nuclear technologies.

Homo economicus – An economics concept that suggests human beings are always rational in whatever they do and will usually maximise their own interests.

Homo politicus – A political science concept that suggests humans are interested in and act in the public good.

Independent Power Producer – A privately owned company with the capacity and capability to produce and sell electricity to end-users for a profit.

Installed capacity – The maximum capacity that a generating unit or utility is designed to operate at.

Load shedding – A planned process of reducing electricity demand by curtailing supply to some areas or customers.

National Development Plan 2030 – A development strategy for South Africa which was developed by the National Planning Commission together with other South Africans from various parts of the country, which aims to achieve its goals by 2030.

Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) – A South African programme introduced by government which aims to buy renewable energy from Independent Power Producers through a multi-stage bidding process with the ultimate objective of ensuring security of power supply in the country.

Tacit collusion – A process whereby two or more companies act in a manner that will result in minimum response from another company.

Transmission – The process of evacuating high-voltage power (usually greater than 132 kV) from the generating unit to the distribution system or sometimes directly to the customer.

CHAPTER 1: INTRODUCTION

1.1 Background

The South African electricity supply industry (ESI) is monopolised by Eskom which is wholly owned by the government. Eskom is a vertically integrated power utility which is amongst the top seven utilities in the world with regards to sales and size. It supplies almost 93% of the power requirements in the country, which is equivalent to more than 50% of the power produced in the whole of Africa (Teljeur, Sheik, Kolobe and da Costa 2016). The power utility controls and owns the transmission network and distributes almost 60% of the power directly to its customers. The remaining power is delivered by approximately 240 municipalities. Most of these municipalities buy power in bulk from Eskom, with others having the capability of generating small quantities to be sold in the areas that they serve (Karekezi and Kimani 2002). Almost 2.8% of the power is generated by a few private generators for their own use. Eskom also buys almost 5% of its power requirements from some members of the Southern African Development Community (SADC) region (Deloitte 2017).

The National Energy Regulator of South Africa (NERSA) is responsible for the regulation of the electricity market in South Africa; and for many years the generation, distribution and transmission of electricity have been monopolised by Eskom (Hansen 2000). Since the early 2000's, there have been proposals for new structures and regulation for the separation of the elements of the electricity supply value chain i.e. from generation, transmission through to distribution, and to introduce competition in the market by introducing private companies (Eberhard 2001).

South Africa utilises different types of technologies to produce electricity with fifteen fossil power stations, all operated by Eskom, collectively generating base-load electricity of 40 268 MW (Dihwa 2017). Three coal-fired generators i.e. Camden Power Station, Grootvlei Power Station and Komati Power Station, which were mothballed around the 80s when South Africa had surplus capacity can generate up to 3 700 MW, collectively (Newbery and Eberhard 2008). The power stations were returned to service at a cost of R26 billion with the last generating unit being commissioned in

October 2013. Eskom also operates the only nuclear power station on the entire African continent which is located in the Western Cape province (Smith 2008). This base-load power station has 1 910 MW of installed capacity with an average output of 1 860 MW. Africa (2013) states that the government is planning to expand the country's nuclear capacity as part of the Integrated Resource Plan (IRP 2019) and the National Development Plan 2030 (NDP) which was promulgated in August 2012, however the decision around new nuclear capacity has since been put on hold until 2030.

According to Groenewald and Woudstra (2012), almost sixty per cent of the crucial Eskom base-load power stations are now operating beyond their recommended design life of thirty years. Technical assessments and guarantees are required before a power station can be operated beyond its design life (Azapagic 1999). As a result of Eskom's power stations operating beyond their recommended design life, there has been an increase in unplanned maintenance at some power stations which invariably contributed significantly to the infamous 'load-shedding' (Odhiambo 2009; Mokhethi 2010). Over the past decade, Eskom has managed to keep the lights on by managing a tight reserve margin of less than 8% which is more than half of the 19% reserve margin recommended by the NERSA (Webb 2015). This is also below Eskom's own reserve margin requirements of between 15% and 18%.

Large industrial customers are crucial to the economy of South Africa and this became more evident when load shedding started and these customers were asked by Eskom to reduce their electricity consumption by 10% (Odhiambo 2009). Some of these key customers entered into demand management agreements with Eskom where the power utility could reduce an agreed amount of supply to these entities at certain times (Boussougouth 2008). Eskom was, for a long time, the only company with operational licenses for generating and selling electricity. Municipalities and other key industrial customers were not allowed to build any new power stations (Newbery and Eberhard 2008). However, this is likely to change given the energy challenges facing South Africa (Bazilian, Nussbaumer, Rogner, Brew-Hammond, Foster, Pachauri et al. 2012).

As observed in other electricity industries around the world, regulatory reform has mostly resulted in a substantial escalation of incidents that are related to competition such as mergers and abuse of power that comes with a large market share (Bessemer,

Richet and Conil-Lacoste 2004). Anti-competitive conduct has been under a close watch of competition authorities and greatly discouraged in the power supply market. In Japan, for example, a warning was issued by the Japan Fair Trade Commission to a state-owned power company after investigations showed an intention by the company to substantially increase their cancellation penalty fee when consumers wanted to change from one supplier to another (Bhuiya, Chowdhury and Huq 2004). Similarly, a transmission company in Switzerland was found guilty of anti-competitive behaviour for declining to transmit electricity from a producer which was not part of its franchise area (Bajpai, Punna and Singh 2008). In Germany, several transmission companies have been investigated due to a suspected abuse of power that came as a result of market dominance (W.R. Bacon and J. Besant-Jones 2001).

Post-1994, there has been some progress made in terms of restructuring the South African ESI, albeit at a slow pace (Winkler 2005). Notable achievements during this period have to do with some of the government's policy objectives e.g. electrification and new infrastructure investments (35% of households could access electrical power in 1990 and this figure has increase to 85% in 2017). However, notwithstanding these achievements, there are other objectives that have been only partly achieved and some not achieved at all (Sewchurran and Davidson 2016). During the past decade, the country was faced with electricity supply challenges which were mainly due to generation or distribution failures and this raised concerns about Eskom's ability to guarantee security of supply (Herbst and Lalk 2015).

Power constraints experienced in South Africa have forced the government to accelerate the introduction of Independent Power Producers (IPPs) so that they can participate in the electricity supply industry which has always been monopolised by the state-owned utility, Eskom (Mokhethi 2010). The participation of privately-owned generation companies in the electricity market was ratified by the government in 2003. It was envisaged that ownership of the power generation component of the electricity value chain would be split between Eskom (70%) and IPPs (30%) (Boussougouth 2008). However, over a decade later; the contribution of IPPs in the generation of electricity has been minimal as over 93% of South African electricity is still being generated by Eskom (Pieters, Lotz and Brent 2014). In July 2016, Eskom took a decision not to sign any more IPP agreements but was forced to revise its decision

due to pressure from IPP companies and a statement by the president of the country in February 2017 where he categorically announced that IPP agreements will be signed (Eberhard and Naude 2017). This resulted in a statement by Eskom in March 2017 where the power utility proclaimed that it plans to shut down four of its coal-fired power stations to accommodate renewable IPPs. This would result in a total of 7 600 MW (from Hendrina, Kriel, Camden and Komati Power Stations) being removed from the grid. The decision, which was expected to be implemented over a few years is a significant one since it could expedite the industry reform process.

The supply of electricity by IPPs is a key focus in the five-point plan of the government of South African for the improvement of the country's electricity situation (Groenewald and Woudstra 2012). The Department of Energy (DoE) ran a competitive bidding process to procure renewable energy from qualifying IPPs. According to Herbst and Lalk (2015), about 4 000 MW from various renewable energy companies was secured in the first three bidding stages of the government's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP).

There has been elevated concerns from the UK public regarding some occurrences caused by the reform of their power sector (Jamasb and Pollitt 2000). The most notable being the disaster in California; the UK example (which illustrated the difficulty that comes with introducing enough competition to reduce issues such as market power which comes due to market dominance); and the introduction of the European Union (EU) directive, which showed that to successfully introduce competition in a market, it is not sufficient to reduce legal constraints. There is currently a significant amount of competition happening in the EU, however this cannot be attributed to the provisions of the EU Directive alone (Littlechild 2000). A popular example is the Nordic power pool where electricity trading has resulted in real competition in the market (Flatabo, Doorman, Grande, Randen and Wangensteen 2003).

From around the year 2000, South Africa has been considering to establish a state-owned independent market operator which will be responsible for buying electricity from private and public producers (Smith 2008). This model of an independent market operator is believed to be important in stimulating genuine competition between the various power generators (Boussougouth 2009). However, many in the African

National Congress (ANC), which is the ruling political party, have previously been reluctant to break up Eskom; particularly as the transmission business is the organisation's most lucrative (Newbery and Eberhard 2008).

In many liberalised electricity markets, the focus at the beginning is on restructuring the generation part of the industry and coming up with suitable and sustainable price mechanisms (Genoud and Varone 2002). The transmission and distribution parts of the industry tend to be impacted only to a lesser extent and this is mainly due to their monopolistic nature (Nepal and Jamasb 2012). As the introduction of competition takes place over time, there is an increase in the need to introduce changes in regulation that will create a conducive environment to move towards reducing monopolistic behaviour in the market. In the past, public interest and the natural monopoly which is inherent in companies owned by the state have been used to justify regulation of the market (Simmonds 2002).

Authors such as Littlechild (2000) and Van Witteloostuijn and Boone (2006), looked at market regulation as something that is important and necessary but not on a permanent basis. They believe that regulation must exist until competition amongst IPPs is realised. As indicated by Woo, Lloyd and Tishler (2003), the objective of changing regulation is to incentivise utilities in order to assist with improving their investments and operational efficiencies and to ensure that end-users are able to benefit from those efficiency gains.

1.2 Motivation

It is important that privately-owned companies i.e. IPPs play a significant role in addressing immediate and future energy requirements of South Africa (Estache and Wren-Lewis 2009). This will result in reduced burden on government in terms of funding, reduced amount of funds that Eskom has to borrow and usage of technologies which are not necessarily regarded as Eskom's core business which may be important for the future energy mix (Winkler 2005). The introduction of IPPs comes with other advantages which include contributing immensely to the energy mix in the market, development of new technical skills and capital injection through foreign direct investment (de Oliveira, Woodhouse, Losekaan and Araujo 2005). However, the real

impact of these IPPs entering an industry that has been monopolised for many years need to be thoroughly investigated and understood.

This is important particularly in South Africa because the REIPPPP, which has been hailed as one of the best in the world, has become under threat after Eskom announced that the state-owned company will no longer be procuring power from IPPs since the country seems to be in a state of excess power capacity due to additional electricity generated by the two new coal-fired power stations i.e. Medupi and Kusile Power Stations (Deloitte 2017). This decision by Eskom, even though it has been rescinded and subsequently resulted in the signing of 27 new power purchase agreements in April 2018, has caused uncertainty and this may negatively impact government policy and the National Development Plan (NDP) which envisages an increase in IPP participation in the future. This is a unique case in Sub-Saharan Africa i.e. a state-owned company going against government policy, hence, this research will be confined to the South African environment. Another reason that led to this research focusing on the South African context is the fact that Eskom's and the government's credit ratings have been downgraded to junk status by major credit rating agencies and this will negatively affect the ability of both the South African government and Eskom to borrow money i.e. it will be too expensive to borrow money, and this will have serious implications on the sustainability of Eskom as a company (Sewchurran and Davidson 2016). The high cost of debt will inevitably increase electricity prices and this will have implications on the dynamics of the South African electricity supply industry. This again puts South Africa in a unique position compared to the rest of Sub-Saharan Africa. Therefore, it is important that the impact of independent power producers be researched in the South African context.

Introducing IPPs in the country's electricity supply industry (ESI) is a significant change from the way the industry has been structured before and therefore the impact thereof needs to be understood i.e. how will the South African electricity value chain, including regulation be affected. The research aims to unpack this.

1.3 Significance of the study

Talks of privatising Eskom have been gaining momentum as a result of the utility's financial instability and its inability to guarantee power supply. This situation has initiated discussions on the future make up of Eskom and unavoidably, talks of private-sector participation and private ownership have resurfaced (Webb 2015).

The official political opposition party, the Democratic Alliance (DA) does not support Eskom being rescued by the government and also the party does not think that the power utility can afford to restore itself (Writer 2014). The DA is advocating for the privatisation of the state-owned company. However, despite Eskom's financial situation and the inability to guarantee supply, the ruling ANC had previously made it clear that it did not think privatising South Africa's power system is the right thing to do.

Eskom has always been considered as an important instrument to be used for government to meet its socio-economic objectives, therefore, those aligned to the ANC felt it would be a big mistake to sell it to private investors (Winkler 2005). This sentiment was also supported by the Congress of South African Trade Unions (COSATU), one of the biggest labour federations in the country. However, other stakeholders and energy analysts agreed with the DA in terms of partially privatising Eskom, saying private investors with equity in Eskom could help the power utility to secure the much needed funding (Newbery and Eberhard 2008).

This study therefore fills a gap by contributing new knowledge in the introduction of IPPs in South Africa, especially with the market having been monopolised by Eskom for such a long time. It demonstrates the difference between 2003, when the introduction of IPPs was first ratified by government and recent times when IPPs started to actively participate in the generation of electricity in South Africa. This will assist interested parties such as regulators to understand the impact of their past decisions and whether some of those decisions need to be revised going forward.

It is generally expected that transformation of the electricity market structure from the standpoint of generation will result in improved efficiencies, competition, reduced prices and the ultimate benefit to the customer. However, this has been the case in

most developed countries. Therefore, the new knowledge introduced by this study is important because it will indicate if these expectations are also true in the context of developing countries such as South Africa.

The study makes contributions to the theory of public choice and the theory of economic regulation. This is discussed in detail in Chapter 2.

1.4 Problem statement

Towards the end of 2007, following a long period of excess power capacity, South Africa entered a new undesirable dawn of load shedding, because of inadequate generating capacity. There were three main reasons for this occurrence, as stated by Webb (2015). Firstly, for a long time, the country had limited participation by private investors in the generation component of the industry. Secondly, the public sector itself did not invest early enough in the ESI so that the ever-growing demand of electricity can be met. Currently, Eskom is lacking behind with its capacity expansion programme and most projects are over budget (Odhiambo 2009). Thirdly, there has been a decline of plant availability at Eskom's existing power stations because of insufficient and inappropriate maintenance regime (Webb 2015). As a result, the electricity supply industry experienced challenges pertaining to supply that were, in more times than a few, insufficient and not reliable.

A delayed start to investing in new generating capacity, together with significant construction delays, caused an increasing gap between demand and supply, especially during peak periods and sometimes unplanned outages in the different power stations were higher than usual (Bazilian et al. 2012).

Where construction of new generation capacity has occurred, e.g. the construction of Medupi Power Station and Kusile Power Station, these projects were characterised by significant delays and spiralling costs (Sewchurran and Davidson 2016). The first unit of Medupi was commissioned approximately three years later in May 2015. Likewise, Kusile' commissioning was initially planned to take place 2014, however this only happened in 2017.

Before Medupi Power Station was commissioned, Eskom's total installed generation capacity improved by 166 MW to 44 281 MW between 2010 and 2015 (CSIR 2016). According to the original Integrated Resource Plan 2010-2030, Medupi Power Station was expected to contribute an additional 2 888 MW to the grid between 2010 and 2015, however, only 800 MW was commissioned. Additionally, the REIPPPP had procured 4 116 MW as at April 2015 (Sewchurran and Davidson 2016). Another issue that aggravated the shortage in power capacity is the fact that some of Eskom's power stations have become unreliable as a result of aging, which caused unplanned outages and contributed to load shedding (Mokhethi 2010). Below are the reasons for this:

- With diminishing reserve margins, which were at times nearing zero because of the stress the system is placed under, most of the power stations sometimes ran above optimal capacity, and baseload plants were being used for load-following (Baker 2011). For example, in 2013, the average available reserve margin during peak times was less than 3%, as compared to 15% which is considered to be ideal. This, together with postponed maintenance, contributed to the dire situation.

- Most power stations have been operating for over 30 years and need considerable maintenance more frequently (Nhamo and Mukonza 2016). This means that more time is required to conduct maintenance activities and unfortunately, generating units are normally unable to produce power during maintenance periods. Even power stations that were mothballed and now returned to service, need a significant amount of maintenance because of the absence of maintenance during the time when they were out of service (Teljeur et al. 2016). Therefore, this absence of spare capacity put strain on the system even further, which resulted in unplanned outages which, in turn, contributed to load shedding. The shortage of available generating units resulted in Eskom postponing most of the required maintenance which further caused an increase in unplanned outages (Herbst and Lalk 2015).

- Load shedding has impacted the South African economy negatively. The strain on the supply side negatively affected productivity in the manufacturing sector and other sectors of the economy, which in turn, affected output, especially in mining and manufacturing (Langenhoven 2015). As a result, growth forecasts have been revised downwards for the next few years.

An important challenge for the South African ESI is therefore to ensure security of power supply and improve plant availability. For this to materialise, Eskom's investment in new power stations needs to be managed more carefully so that any further delays as well as cost overruns can be avoided. It is also important to improve maintenance of existing generation fleet. Additionally, there needs to be a significant improvement in the available reserve margin (Mokhethi 2010).

Although the South African government has approved the participation of IPPs in the electricity supply industry and has undertaken various bid processes to select 'preferred bidders', limited studies have been conducted to fully comprehend how the decision will affect the industry, if there were any implementation challenges and what will be the implications for the future.

The purpose of this study is to establish the impact of Independent Power Producers gaining access to the South African electricity supply industry and to determine if the current market structure is conducive for a competitive electricity market to prevail. The study also aims to understand some of the market barriers experienced by the new market entrants.

1.5 Research questions

The following research questions are addressed in this study.

a) What is the impact of Independent Power Producers gaining access to the electricity supply industry?
b) What are the market entry barriers (challenges) encountered by the Independent Power Producers?
c) Do the current market conditions allow for competition to take place in the electricity supply industry?

1.6 Limitations and delimitations

The early 1980s represent an era of over-investment in power capacity in South Africa, especially by Eskom, which, when combined with low levels of electrification, resulted in low power usage in the early 1990s (Baker 2011). In spite of this, in the mid-1990s the country entered a new era where there was necessitated restructuring so as to mitigate the challenge of constrained supply of electricity, including:

- inadequate generating capacity;
- poor reliability of supply;
- accessibility of affordable energy, especially for poor communities; and
- operational inefficiencies.

Most of these challenges are still prevailing and are the main drivers behind the current thought of restructuring the ESI even further (Nhamo and Mukonza 2016).

The focus of the study is confined to IPPs operating within the South African context.

The study does not address other types of energy such as oil and gas but focuses strictly on electricity.

Qualitative methodology was utilised in this research and this could be a constraint for people who would like to look at the study using quantitative methods.

The study does not address any particular methodology and (or) technology used in the production of electricity e.g. coal, nuclear, hydro, solar and wind, instead the entire IPP-generated energy mix is considered.

Cross-border electricity trading amongst utilities that participate in the Southern African Power Pool (SAPP) is not the subject of this research even though South Africa procures some of its electricity from these entities.

1.7 Assumptions

This study is based on assumptions indicated below:

a. It is assumed that in the event that Eskom has too much control of the transmission system, this can be used by Eskom to sabotage IPPs, especially since Eskom had previously indicated that they will not be buying power from IPPs anymore.

b. There is an appropriate and functional regulatory environment, which is sensitive to the various electricity markets and economic conditions of South Africa.

c. The electricity supply industry has the necessary conditions that enable competition, with respect to;

    - the initial structure of competitive segments
    - market entry conditions
    - pricing and non-pricing requirements to gain access to network infrastructure for competing suppliers
    - there is a reliable and well-functioning transmission grid, otherwise the system may be exploited by generators to create market power which could discourage competition and entrance of new market players.

d. Independent Power Producers' actions are mostly (but not entirely) driven by the prospects of profit-making.

e. There are no capacity constraints in the transmission network and there is adequate supply of new generation capacity.

f. A set of complete markets supports competition in the electricity supply industry. Markets are considered to be complete when they exist for all power deliveries, all types of generating technologies, as well as all states of nature. Practically, this means future's markets must be established, including bilateral forward contracting and spot markets.

1.8 Structure of the study

The rest of this study is structured in the following manner. Chapter 2 evaluates existing theoretical and empirical literature that relates to the liberalisation and regulation of electricity market structures. It also considers and contrasts theories that are relevant to this study. Chapter 3 outlines the methodology applied in examining the objectives and research questions that are being addressed by the study. This is followed by Chapter 4 which discusses previous attempts to reforming the South African electricity supply industry. Chapter 5 then discussed the research findings relating to the first research question which focus on how IPPs were introduced to the South African electricity supply industry. Chapter 6 presents findings that addresses the second research question which focuses on market entry barriers encountered by IPPs. This is followed by Chapter 7 which discusses the findings that relate to the third research question that addresses the prospects of competition in the South African electricity supply industry under the current market conditions. Lastly, Chapter 8 makes conclusions based on the findings discussed in previous chapters while also making recommendations for further research.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to evaluate theoretical as well as empirical literature relating to the liberalisation and regulation of global electricty market structures. The conceptual foundations of the study are also discussed while considering and contrasting applicable theories. The chapter also addresses issues such as pricing and competition in existing international electricty markets that have already undergone the process of market liberalisation and restructuring.

2.2 Regulation of price in competitive markets

The deregulation of electricity came as a result of the need for efficient management practices and transformation of the electricity industry (Genoud and Varone 2002). Governments, and particularly, international financiers, understood deregulation to mean either an efficient or formal end of government control (Estache and Wren-Lewis 2009). Watts (2001) argues that the expected benefits of the deregulation of the ESI such as cost savings and productivity enhancement would likely outweigh the disadvantages which include high initial cost of capital and the difficulty in managing the transmission side of the value chain.

Governments across many sub-Saharan countries such as Kenya and the Democratic Republic of Congo; have been controlling their respective electricity supply industries until the mid-1990s when reform started in most of these countries. The electricity supply industry was always seen by Governments as strategic because the industry made sure there was access to reliable electricity which helped improve the lives of the general public (Turkson and Wohlgemuth 2001). This sentiment was supported by Karekezi and Kimani (2002), who argued that it made strategic sense because there were lots of inefficiencies in the Electricity Supply Industries of most sub-Saharan African countries. As discussed in Chapter 1, these inefficiencies can be addressed by changing regulation with the aim of incentivising power utilities to be more efficient while ensuring that consumers benefit from those efficiency gains. This study

considered the theory of economic regulation and the theory of public choice as the two dorminant theories in electricity market reforms.

According to Joskow and Noll (1981), one of the most scientifically resolved issues in economics is the fact that price and entry regulation in a market that is perfectly competitive result in economic inefficiencies. They further state that, under normal neoclassical assumptions about production technologies, human motivation, and frictionless markets; an externally imposed restriction on the participants in an otherwise perfectly competitive environment is likely to retain the efficiency of the market, just like it was before the restriction was imposed. The data obtained from literature on regulating competition confirm the theory in many key economic sectors that are regulated. According to economic research, price and entry regulation in agriculture, transportation, and oil and natural-gas production, results in economic inefficiencies (Djankov, La Porta, Lopez-de-Silanes and Shleifer 2002). Normally, this inefficiency is expressed in higher production costs, increased prices, as well as slow technological progress occurring without regulation. This is exactly where the South African ESI finds itself, as discussed in Chapter 1. In other cases, including in the regulation of petrochemicals, the inefficiency arises as a result of prices that are very low to clear markets, leading to inefficient use of commodities.

Around the 1960s, inefficiencies of regulating competition were normally estimated by comparing costs, equilibrium prices, as well as quantities in both unregulated and regulated conditions. The comparisons were based on direct observation when regulated and unregulated markets operated concurrently, or when there is easy intertemporal comparisons as a result of new changes in the nature of regulation (Joskow 2008).

Examination of finite element analysis (FEA) controls of petroleum in the United States (US) used a similar approach to developing regulation. The study found that there were large losses in efficiency as a result of regulation as compared to total transactions in regulated markets (Becker 1983). The study has to be taken seriously in current debates about public policy, especially because it was based on empirical information. One challenge with this comparative manner to study the impact of regulation is that,

in some cases, regulation has been in place for such a long time that the study may have questionable current quantitative value.

One characteristic of regulated competition is the fact that regulators tend to set prices on the basis of standard formulas for certain categories of service that apply to various companies and markets (Hansen 2000). Since regulators are sometimes deemed to be unwilling to take necessary steps to eliminate operational inefficiencies, the prices are normally set high so that significant changes in the cost of service provision can be realised between those companies and technologies that are economically viable (Shughart 2004). Therefore, one method of estimating the cost of regulation is by measuring the cost penalty relating to the protective price that is determined by regulators for those who are inefficient. The studies discussed above have been generally regarded as offering somewhat good quantitative estimates of the costs of regulating various competitive markets, however the common thing about the studies is that they all assume that the nature of a regulated market is homogeneous.

An important observation is the fact that the effectiveness of regulators is more pronounced when it comes to controlling prices as opposed to determining the quality of service being offered by a regulated company (Brunekreeft and Twelemann 2005). Consequently, in regulated markets, competition amongst companies is based on changing the quality of service. For example, in the aviation industry, most airlines compete based on the frequency of flights, choice of aircraft, and sometimes seat size, meals, a well as lounge facilities. Competing in aspects other than price results in too much emphasis on service quality, which leads to increased costs and prices.

Generally, factors such as cost and price in a regulated market with many players cannot be used to correctly measure inefficiencies that are caused by regulation since service quality tends to be lower in markets that are not regulated (Ngan 2010). It very critical to evaluate the combination of price and quality, and compare it with the best possible so that the cost of regulation can be estimated. Ideally, it should be relatively simple to estimate cost by comparing quality, price and cost outcomes in different markets (Sen and Jamasb 2012).

Economists generally agree in terms of the appropriate direction for public policy in many competitive markets, including electricity markets, however it still needs to be

understood why it is so difficult to totally reduce price and entry barriers (Joskow and Noll 1981). Many regulatory economists see changing regulation as a way of deregulating markets, and the slow response by public officials to this phenomenon is disappointing at results in scepticism about the impact of economic research on policy.

There are normally two challenges in the political debate whenever there are substantial reforms in regulatory policy (Hertog 2010). Firstly, there will always be losers and winners whenever there are significant changes in regulation that affect market structure, cost, price as well as quality. All things considered, economics research offers a strong case that the economic benefits to the winners will be more than the cost to losers. However, as observed by Bazilian et al. (2012), without some form of compensation, the losers will tend to resist a change in policy. If the winners are broadly dispersed and the losers are well organized, as it has been observed in South Africa recently when Numsa and Transform RSA approached the courts to interdict the signing of 27 new renewable energy IPPs due to the potential job losses in the coal sector, there will be an opportunity for losers to protest against the policy change. Whenever it is not clear who is likely to lose or win, and what will be the financial impact, it may be much easier for the losers to increase the extent of possible loss. The uncertainty that comes with the distribution of wins and losses is intensified by the inherent uncertainty associated with obtaining the result of deregulation by inferring instead of comparing.

The second challenge in the political debate whenever there are significant policy changes involves transitioning between unregulated and regulated states of the market (Hertog 2010). The higher the inefficiency as a result of prevailing regulation, the higher the chances of having short-term economic displacements, when the market is deregulated. These short-term displacements have the potential of aborting a regulatory change initiative before it even gets a chance of achieving a long-term equilibrium. Once more, not much research has been done by economists on the dynamic characteristics of transitioning towards a deregulated market (Sen and Jamasb 2012). Such research would make policymakers aware of the likelihood of important short-term market behaviour, and also contribute to policies that could make the transition seamless and more acceptable by politicians.

As much as further studies on regulation and deregulation and the manner of transitioning towards a deregulated market would contribute positively to the policy debate, the burden to prove regulatory reform cannot be the responsibility of academic economists (Ngan 2010). These economists can offer an analytical and empirical framework to be used to discuss the issues and assist in identifying possible winners and losers.

2.3 Natural monopoly

A market structure where there is only one supplier of electricty with no close substitutes; and where the supplier has significant power to dictate a price which is significantly higher than its marginal cost, is known as a monopoloy (Salvanes and Tjotta 1998). Natural monopoly on the other hand can come from global subadditivity of the cost function i.e. a scenario whereby the cost of producing all commodities together in a particular market is lesser than that of producing the same quantity of each commodity individually (James 2009). If such a market is made up of more than one company, the companies will either be reduced as a result of mergers or failures, or a lot more resources will continuously be used up during production. In the first case, competition will not last and in the second case competition will result in inefficiencies. Therefore, competition is not necessarily a feasible regulatory instrument when there is natural monopoly (Becker 1983). Hence, direct controls will be required in order to make sure there is acceptable performance i.e. controls over profitability, tariffs, extensions and discontinuations of service and equipment, even consent whether to participate in the business at all. These controls have been implemented mostly to electricity-producing companies as well as to institutions that are responsible for public transportation (Salvanes and Tjotta 1998).

Natural monopoly does not ensure that there will always be a trajectory of break-even prices which will prevent market entry even when the natural monopoly is operating in an efficient manner. In other words, a break-even monopoly may sometimes need to charge prices that are higher than necessary for some services in order to recover the costs of serving some group of customers e.g. Eskom charging its large customers higher prices so that they can subsidise the poor. If companies enter a market by

responding to these price-cost margins, there will be a rise in the total costs of production and increased prices charged for other commodities (Joskow 2008).

In order to have an unsustainable natural monopoly, the economies of scale must have been significantly diminished to a point where any increase of production will result in an increase in the average cost (Posner 2007). This is exactly what happened around 2008 when South Africa experience load-shedding for the first time. Eskom had to use expensive diesel generators to increase production and this resulted in increased electricity prices.

Theoretical analysis can assume subadditivity; however, application of policy demands that regulators know if a monopoly is natural over the right commodity space (Armstrong and Sappington 2007). Should the monopoly be natural, a single regulated company can be more efficient and an exclusive franchise may seem sensible, assuming that the regulated monopolist will be efficient. However, Ngan (2010) indicates that there is no certainty in terms of the cost function, as it is the case in most instances when the issue occurs, the burden of barriers to entry may make it possible for the monopolist to produce products that would be supplied in a more efficient manner by separate companies.

This is particularly concerning in an environment where there is a greater potential for product and process innovation and a regulated company's profits are not perfectly regulated. Additionally, needing a potential market entrant to demonstrate that the monopolist has no cost function that shows strict global subadditivity; is something that could be difficult to achieve (Sen and Jamasb 2012). Another challenge with creating market entry barriers is that a protected monopolist such as Eskom has little or no incentive to operate efficiently e.g. Eskom is not that concerned about being operationally efficient because the company is almost always guaranteed to be bailed out by government whenever it is facing financial challenges, as it has been the case in recent times. Furthermore, introducing market entry barriers reduces the transition towards least-cost production as well as changes in technology that could be caused by a threat of market entry (Johnson 2015).

A company that is regarded as a natural monopoly is likely to be subjected to regulation in order to protect either its status of natural monopoly, the customers, or both. Price

regulation may be the best instrument to protect customers whereas entry regulation may be required to protect natural monopoly (De Alessi 1974). Many solutions have been suggested in literature to address the challenges of natural monopolies, including contestable market theory by Baumol, Panzar and Willig (1982) as well as franchise bidding as proposed by Demsetz (1968). Accordingly, there has been a lot of literature based on theories of regulation.

Cemil Ozbugday and Nillesen (2013) indicate that a customer-owned line company may not be that bothered by the challenge of natural monopoly because the customers eventually share the profits arising from the monopoly and can also align their objectives to thiose of the company. One can then ask, given the deficiencies of different kinds of regulation and related costs, whether customer-ownership could minimise concerns that come with a natural monopoly when there is no regulation i.e. are customer-owned natural monopolies as efficient as, or even more efficient, as compared to regulated natural monopolies that are not owned by customers?

According to Salvanes and Tjotta (1998), regulation must not be viewed as a phenomenon that stops power utilities from functioning inefficiently. Similarly, it cannot be said that efficiency happens because of a lack of regulation.

2.4 Liberalisation and regulation

One of the most important aspects of market liberalisation processes is public ownership. This applies to most sectors such as energy and postal services (Nhamo and Mukonza 2016). It is normally viewed as being inconsistent to the competitive nature of network industries as well as a possible threat to an optimum process of regulation. However, the arguments for privatising companies owned by the State are based on differentiating between public and private efficiency as well as on the description of public and private sector (James 2009).

2.4.1 Privatisation

Much has been written about privatisation; and literature ranges from theory-based to empirical discussions. The term “privatisation” normally indicates the relocation of a

task, either partly or wholly, from public to the private sector (Burton 1993). Privatisation includes many policies which are intended to limit the scope, minimise the functions as well as weaken the public sector's influence (R. Bacon and J. Besant-Jones 2001; Genoud and Varone 2002; Fiorio, Florio and Doronzo 2007). It means establishing a company which will be bound by the provisions of the Companies Act; and selling a minimum of 50% of the shares to private owners (Hunt and Morgan 1995b). Privatisation can be argued based on two categories i.e. macro and micro economic.

Traditional theorists

At a macro level, privatisation is thought of as a choice whereby a lot of confidence is placed on a private initiative instead of a public initiative. Therefore, as observed by Ostrom and Ostrom (1971), privatisation symbolises a different manner of looking at the needs of society as well as reconsidering the function of government in satisfying those needs i.e. more dependence on the private sector and lesser on the State to fulfil the people's needs.

According to De Alessi (1974), privatisation is justified by arguments of macro-economic efficiency as well as the attempt to structurally change the makeup of an economy. Becker (1983) indicates that many bases for privatisation depend on traditional neoclassical economics assumptions, including:

- Efficiency improvement
- Reduction of the need for public sector borrowing
- Reduction of government's role in company decision making
- Reduction of challenges relating to determination of public sector pay
- Increasing share ownership

On the other hand, theories around micro level economics describe the impact of the ownership type on management and operational efficiency. Most of the theories assert that by nature, public ownership is not efficient and it cannot achieve satisfactory levels

of allocative economic efficiency (McCrea 1974; Brewer 1978; Joskow and Noll 1981). In this sense, privatisation is a way of responding to the failures of public ownership and the weakness of the state as a corporate governance principal. Evered and Louis (1981) make the following observations:

- There are no sufficient incentives and pressure from the shareholder for public managers to achieve greater efficiencies
- State-owned enterprises (SOEs) are always bailed out by the state, and therefore are never subjected to financial bankruptcy.
- It is sometimes difficult to manage SOEs due to the many, unclear and at times, inconsistent objectives
- State-owned companies are sometimes captured by political as well as interest groups for the achievement of other objectives than optimal productivity. This has recently become evident in South Africa with the capturing of SOEs such as Eskom and Transnet.

Agency theories and transaction cost economics indicate that private companies tend to be more efficient than SOEs, under the condition of undistorted markets, because of the limited political meddling in private companies (McCrea 1974). It is important to always consider politics in such issues. Many studies have shown how politicians have been using macro and micro level arguments to justify privatisation so that political goals can be achieved. In this sense, privatisation is the result of practical, systemic as well as tactical considerations (De Alessi 1974; Brewer 1978; Becker 1983):

- Privatisation can assist in reducing national debt.
- Privatisation could be an indication of the will to limit public involvement according to a political initiative that encourages private participation as opposed to public participation.
- Privatisation can be viewed as a tactical move by politicians to attract votes and compensate supporters or interest groups that are interested in public divestiture.

Classical theorists

Theories on privatisation have been subjected to many debates – theoretically, methodologically and empirically (Eaton and Ware 1987). Most of arguments muddle the impact of several phenomena on an object (Baumol 1986; van Wegberg and van Witteloostuijn 1992). It is common to find, in both the political debate and scientific literature, assumptions that privatisation is the sensible result of liberalising a market that was previously monopolistic. However, as observed by Menninger (1984), it seemed logical to combine privatisation and deregulation, but he emphasised that it is actually not so apparent in practice.

Both privatisation and deregulation were not achieved in a clear-cut manner with the exception of some few cases (Fytche 1991; Burton 1993). In fact, this confusion is caused by the lack of an integrated approach which would take into account the impact of introducing competition in a monopolistic market which is dominated by public ownership e.g. the South African ESI (Webb 2015). Secondly, many studies tend to simplify reality by not differentiating the privatisation of assets from the privatisation of the legal order (Fytche 1991; Heath 1993).

Methodically, the first challenge is to answer questions such as; what does public property mean (Harris 1993)? This empirical question of differentiating between public and private entities has to do with the absence of solid hypotheses pertaining to the impact of property on the organisational aspect of companies (van Wegberg and van Witteloostuijn 1992). The second challenge involves the question of how public performance is defined and measured (Harris 1993; Nakashima and Niimura 1997). Should the productive or managerial efficiency of public and private operators, at an output level, be evaluated or should the evaluation focus on the general effectiveness of government policies or public service delivery, at an outcomes level? In as afar as policy analysis is concerned, these evaluation criteria must not be confused and that the latter is more essential than the former (Hunt and Morgan 1995a).

According to Wilson (1995), the advantages of private ownership still need to be confirmed. He indicates that many researchers have subjected SOEs as well as private companies to performance reviews which did not yield any straightforward proof of the advantages of private and public ownership over the other. Instead, the conditions in

which private companies operate, in terms of applicable regulation, levels of competitiveness and industry structure; has proved to be a significant aspect on productive efficiency (Fytche 1991). Furthermore, the modern liberalization programmes around the world have not led to systematic privatisation, with the exception of the UK and a few other countries (Heath 1993).

An intermediate approach (meso)

The comparative failure of macro and micro analyses supports the need for a new method of describing and explaining the occurance and the impact of privatisation. Genoud and Varone (2002) proposed that the 'meso' approach as outlined in Table 1 should be adopted. They emphasise the importance of not considering this 'meso' approach as another option to micro as well as macro methods but instead as a matching approach to the latter. There are two objectives in emphasising the significance of the atmosphere in which SOEs operate and in considering their specificities i.e. contribution to the development of a improved theoretical assumptions relating to privatisation, as well as having a deeper comprehension of the empirical changes that different markets undergo. This method tackles the issue of the process of regulation that comes after introducing market mechanisms into industries or sectors that have been historically monopolised (Genoud and Varone 2002).

Table 1: Complementary approaches on privatisation (Genoud and Varone 2002)

	Theoretical assumptions	*Unit of analysis*	*Question at stake*
Macro level	Public intervention in economical and social spheres is inefficient	Global public intervention in the economy and society	Reduction of public intervention by way of sales of assets or transfer of state functions to private sector
Meso level	Public ownership in liberalized contexts requires special institutional and policy design arrangements within a particular sector	Relations and strategies of actors taking part in the regulation process	Scope and coherence of the regulatory design
Micro level	Public ownership fails to furnish satisfactory incentives for efficient management	State Owned Enterprises (SOEs)	Sale of SOEs to the private sector or creation of joint stock companies

The design of regulation

What is interesting about the process of liberalising electrity markets is the fact that it needs a re-regulation process. Regulation is very important for the existence of an efficient and fair competition in a market such as the electricity industry (De Alessi 1974; Caudill, Im and Kaserman 1993; Hunt and Morgan 1995a). The public regulation of liberalised electricity industries brings together two objectives which could possibly be contradicting each other (Bessemer et al. 2004).

- In order to introduce and maintain competition in a market, there needs to be some economic regulation. This involves the setting-up of the legal environment that creates competition. It can be achieved by designing the 'rules of engagement' applicable to the market as well as penalties for those companies displaying anti-competitive behaviour; and making provision for third-party access to infrastructure owned by monopolistic companies.

- In an effort to rectify the impact of privatisation, there needs to be political and social regulation in place. This involves redistribution mechanisms coupled with offering public services obligations (PSO) in a market structure, as well as implementing applicable policies.

Most political and economic science methods have addressed questions relating to the characteristics, the impact as well as the basis for regulating markets, with each resulting in specific prescriptions such as the non-involvement of the government and a positive and pre-emptive externality that produces regulation (An, Weibin, Aiming and Wei 2015).

Elements of a regulation process

Figure 1 summarise different role players as well as the function of the regulation process. The aims and objectives of regulation are vast and different as articulated in various literature. The acceptance of regulation as a transitional event is mainly based on the impression that regulation is not permanent and focused on resolving any conflicting objectives that may exist when transitioning from a monopolised to a more competitive environment (Djankov et al. 2002). Many researchers argue that the

involvement of the state should over time reduce to lower levels. A different approach considers government involvement in electricity supply industries as important, including in the long term. In such an instance, regulation is conceptualised as an activity that involves continuous compromise between conflicting objectives. Similar to this approach, Table 2 shows functions of the process of regulation (Steiner 2000).

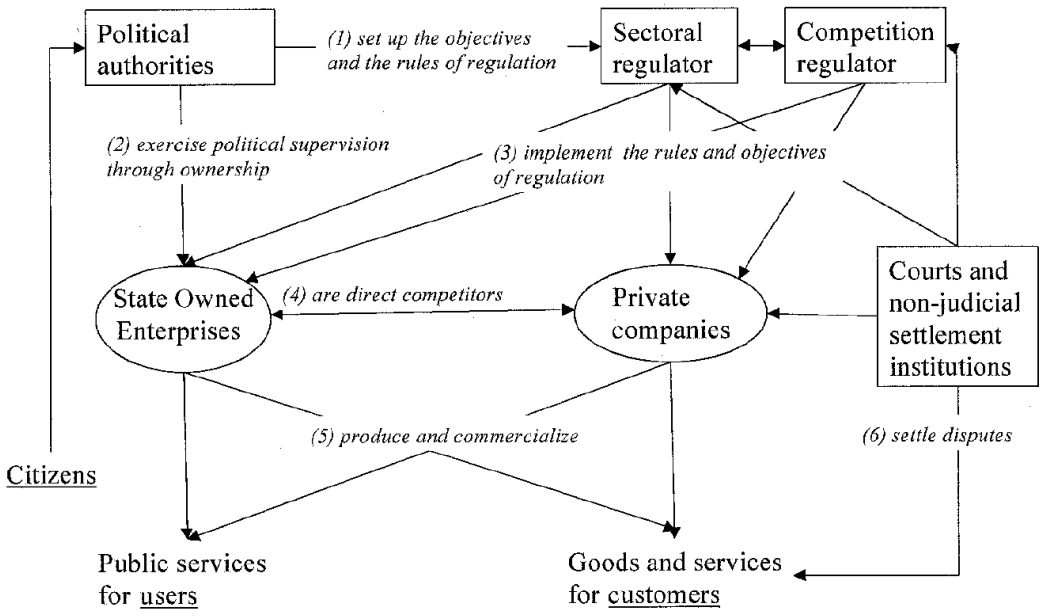


Figure 1: Elements of the process of regulation (Steiner 2000)

The nature as well as the goals of these functions differ and affect public accountability differently. Some tasks are of a technical nature, while others are judicial and economical. There are others which are almost entirely political e.g. creating a legal framework and implementing policies. The difference between the two categories shows once more the forms of regulation i.e. technical and economic regulation as well as political regulation.

Table 2: Theoretical distribution of the function of regulation to the actors of the liberalised sector (Genoud and Varone 2002)

Functions of regulation	*Responsible actors*	*Direct beneficiaries*
1. Sectoral legal framework setting	Public authorities	All actors
2. Procurement of universal service	Public authorities and sectoral regulator	Users
3. Competition and anti-trust regulation	Sectoral regulator, competition regulator, courts and non-judicial settlement institutions	Public and private operators, consumers and users
4. Infrastructure access	Sectoral regulator	Public and private operators
5. Implementation of public policies	Public authorities	Users and citizens
6. Evaluation of liberalization and regulation	Public authorities and evaluation units	All actors

Theoretical regulation framework

Genoud and Varone (2002) think of the regulation process as a repetitive game that features the interplay as well as balancing of the regulation functions (Table 2) during a certain matter by way of institutional arrangements showing how each function is distributed to specific actors. What comes out of the process of regulation is the outcome of the relations amongst various role players taking on particular roles and mobilising different resources (financial and legal) so that they can realise their own objectives (Hattori and Tsutsui 2004). The regulation game is characterised by endless tensions in between and a mix of the different sub-categories of regulation making up the regulatory framework as indicated in Table 3.

Economic regulation focuses on the performance as well as the efficiency of a market (Armstrong and Sappington 2007). Concerned about operational and procedural issues, this economic regulation brings together two different interventions. In terms of the sectoral intervation, the aim is about ensuring the presence of an effective competition including sufficient sanctions to deal with anticompetitive behaviour. This type of regulation is mostly focused on regulation of the market structure in general

and, more particularly, on mergers and acquisitions as well as market power (Jamasb and Pollitt 2005). However, due to the existence of large natural monopolies, such sectors e.g. electricity supply industry, the regulation process is also focused on economic and technical regulation of third-party access (Eberhad and Gratwick 2008). The theory of economic regulation is discussed further, later in this chapter.

Given that some segments of the sector maintain monopoly status, there is a need to regulate access in terms of price, volume and quality. This function of regulation is different from regulating competition as it is more concerned about regulating specific operators and not necessarily the whole market or sector. Furthermore, and contrary to Hansen (2000), Genoud and Varone (2002) consider that these functions are not the same because their goals, processes, resources, as well as their logic are quite different, even though they both aim to introduce and maintain some level of competition. Thus, economic regulation features two sub-categories of regulation i.e. competition regulation which seeks to provide competition and stability in the market, and a sectoral regulation aiming to enforce third-party access (Akumu, Oduor and Ngoo 2009). The findings of this research relating to market access are discussed in Chapter 6 and those relating to competition are discussed in Chapter 7.

Table 3: The regulation framework (Genoud and Varone 2002)

Public regulation of a liberalized sector	*Economic (1st order) regulation*	*Political (2nd order) regulation*
Sector level	Creation and supervision of a competitive market with public and/ or private operators	Procurement of public (universal) service and implementation of public policies
	⇒ ***Competition regulation***	⇒ ***Public service regulation***
Operators level	Enforcement of third-party access and supervision of free goods and services production	Management of public investments and public property
	⇒ ***Operators regulation***	⇒ ***Public property regulation***

Regulation as an institutional process

According to Okada, Asano, Yokoyama and Niimura (1999), regulation needs to be looked at as an institutional process. They indicate that the allocation of regulatory activities to certain actors as well as the institutional arrangements between them are to a large extent responsible for structuring the games played in the process of regulation. As a result, they are very likely to influence the consistency of the output of regulation, effectiveness as well as efficiency. In this perspective, the various matters relating to the process of regulation may be studied and clarified by means of this institutional framework. For example, one can scrutinise issues like accountability and independence of regulators, co-ordinating certain sector-specific regulation as well as general regulation of competition in the market, including the privatisation of SOEs. To demonstrate this statement, the question needs to be asked – does privatisation matter (Genoud and Varone 2002)?

Privatisation assumes a totally new way of doing things, going beyond the normal differentiation between micro and macro level aspects mentioned earlier (Hartzenberg 2006). In this instance, privatisation is less about micro and macro efficiency, howver it involves the evaluation of a specific regulatory framework with regards to effectiveness, efficiency and coherence. Deciding to privatise means there is an implied intention to improve the regulatory framework in the event that public property creates confusion, ineffectiveness or inefficiency into the regulatory process (Armstrong and Sappington 2007).

As it has been demonstrated by Genoud and Varone (2002) in their outline of the sub-games of regulation, it is clear that regulation is seen as a function and therefore poses a challenge to the regulatory process. Government's role as both the regulating authority and as the operator can threaten the existence of an efficient and fair regulation. Therefore, institutionally, privatisation is likely to create an improved solution for designing the regulatory system given that it minimises regulation. However, Posner (2007) indicates that there are other possible solutions, including the establishment of a regulatory framework designed to tackle a specific problem. In this instance, he highlights that decisions about institutional arrangements could be made and effected as part of the process of regulatory design to reduce issue like

incoherence. If issues like the political and legal environment are not conducive enough to create this kind of outcome, then privatisation of state-owned companies could be accepted and supported.

2.5 Is private better than public ownership?

Historically, power utilities have been owned and controlled by the state (Eaton and Ware 1987). The generation of electricity in most developing countries was for many years accepted as a service provided by governments and this has been the core of development strategies for many of these countries, as is the case in South Africa where the Government uses Eskom as a vehicle to achieve its social objectives (Eberhard 2001; Winkler 2005). Using electricity as a means of meeting social development as well as micro-economic objectives has been a preferred approach by many post-independence regimes. Ownership by government is believed to create the required environment for ensuring the achievement of developmental objectives (Malik, Cropper, Limonov and Singh 2015).

Power utilities, especially those that are owned by the state, have been expected to take on tasks that end up being costly, such as charging prices that are below the actual cost of production to some customer segments. Sometimes the power utilities also need to offer support, financially, using cross-subsidies to other segments of the economy just like the requirement to support the nuclear industry and coal mining in the United Kingdom (Lu, Chen, Hwang and Cheng 2008). These types of policies have caused a significatnt move away from allocating resources efficiently and the achievement of allocative and productive efficiencies.

When customers are charged prices that are below what it costs to produce and these prices are applicable to all customers and not only to those customers that need it more, normally the outcome is increased consumption and unnecessary wastages (Winkler 2005). Not only developing countries shared this notion, but also bilateral and multi-lateral institutions including many donor agencies. Infrastructure projects have been regarded a way of addressing inequality in society as well as a way of furthering development.

According to Karakezi and Kimani (2002), a lot has been written about various experiences of utilities (especially in developing countries) being managed by the state. There has been many disasters as a result of political interferences in the daily operations of SOEs and absent criteria of managerial accountability for performance evaluation. There is a general lack of service delivery, low levels of investments, inconsistent and quality of services provision, low productivity; and increased cost of debt for the public (Flatabo et al. 2003). Government regulation and private ownership may not necessarily be the solution. Regulatory deficiencies are closely associated with structural challenges (Bjørndal and Jörnsten 2007).

Transitioning from a wholly government-owned industry with some level of restructuring, such as separating the generation of power from distribution and transmission; and privatisation, can present a chance to realise and take advantage of some benefits that come with private ownership (Williams and Mayaki 1996). There have been strong theoretical arguments in the past that support privatisation of state-owned companies.

According to the principal and agency theory, publicly-owned companies are not exposed to financial markets and therefore are not susceptible to threats of takeovers, stringent budgets, competitive markets and they are also not prone to bankruptcy (Caudill et al. 1993). There is very weak monitoring by the shareholder. Private ownership is expected to adjust management's motivation towards being profitable and results in increased efficiency levels, particularly when operating in a competitive environment. A private company is highly unlikely to offer unprofitable or subsidised services (Hunt and Morgan 1995a). There is a huge incentive for private companies to provide quality services and in the manner required by customers. Generally, principals are known to be more open to taking risks than agents. Agency problems tend to be more serious when there is divergence in the interests of principals and agents. Therefore, ownership does matter, as argued by Nakashima and Niimura (1997).

The theory of property indicates that the failure by taxpayers to transfer individual rights, with the aim of capitalising on benefits, just like in a public company, minimises the incentives of individuals to reduce costs and increase returns (Eaton and Ware

1987). Introducing doubt in the company's decision-making process makes it challenging for individuals to have a direct effect on decisions made by management. As far as property rights are concerned, incentives are quite important, in that public ownership typically results in limited incentives that encourage behaviour which ends up with efficiency.

On the other hand, public choice theory emphasises more on the incentive structures applicable to public officials (Ostrom and Ostrom 1971). Political issues are more important and are therefore prioritised over the cost efficiency of a company. Politicians are more concerned with maximising votes mostly at the expense of social welfare. They also offer certain benefits with the aim of getting votes in return (Kirchner 2007). The public choice theory concludes that in most cases there is a conflict between political maximisation and cost efficiency; and cost efficiency tends to be replaced by political maximisation. This kind of practice has been observed for many years in South Africa where the electricity industry has been used to subsidise the coal industry and other manufacturing interests with the aim of securing votes of the unionised workers in thosee industries. As far back as 1970, policy formulation has been signifcantly impacted by the public choice theory (Engelen 2007).

De Alessi (1974) highlights that in the early 1970s there was a change in the demarcation line between private and public companies, with a lot of similarities. At that time, the state was the one that invaded traditional private company preserves. The demarcation barriers were further broken down by private companies invading areas, which historically were preserves of public companies. De Alessi (1974), however, supported the notion that says there are three criteria that determines whether a company is referred to as 'public' i.e. who are the shareholders, how are they funded and how easy can the government control them?

When it comes to public enterprises, ownership is not that critical, as far as economic performance is concerned. What is more important is the extent of government involvemet in managing the entity (Genoud and Varone 2002). The more government gets involved, the higher the probability of a reduced efficiency. In the case of private companies, ownership may also not be that vital. Some companies are privately owned, but in actual fact depend on government funds such as subsidies, grants and

interest free loans; and this has the potential to affect their commercial commitments (Mueller 2003).

There is also a lot of empirical research evidence that supports the view that privately-owned companies tend to exhibit efficient performance as compared to public companies and that transferring ownership from gvernment to the private sector results in enhanced efficiency. Nakashima and Niimura (1997), Hjalmarsson (2000) as well as Djankov et al. (2002) have showed empirical analysis supporting the assertion that privatisation results in better performance. Djankov et al. (2002) analysed the performances of twelve companies from Mexico, Malaysia, Chile and Britain after they were privatised to establish if privatisation resulted in improved efficiencies. Eleven out of twelve of these cases displayed some net welfare gains. Jamasb and Pollitt (2005) concluded that the pricing structure of public companies does not respond well to the cost of serving certain customers as compared to private companies. According to them, the inclination by SOE management to prioritise political support over profits will result in management using price as a tool for wealth redistribution.

Wilson (1995), in a more detailed study of 149 privated companies, compared performances of 61 companies (pre and post-privatisation) from 18 countries and 32 industries. The study revealed that real sales, opeartional efficiency, mean and median profitability; and employee performance show a significant increase as a result of privatisation. The study also concluded that there was an improvement in operational performance in both non-competitive and competitive markets; and that profit increases were not only due to price escalations. Involving private investors in a company's ownership structure and management has an impact on the overall performance of the company. Carlsson (1999) further highlights that the level of effectiveness of infrastructure development stems from the institutional environment and not necessarily from economic growth. He found some similarities in developing countries which included inefficiencies in operations; insufficient maintenance, too much reliance on government funding, inadequate response to environmental issues as well as minimum regard for the poor. Companies become exposed to competition pressures in financial markets as a result of privatisation. Littlechild (2000) argues that:

> *"Privatisation will generate benefits for consumers because privately owned companies have greater incentives to produce goods and services in the quantity and variety which consumers prefer. Resources tend to be used as consumers dictate, rather than according to the wishes of government".*

Public ownership makes it possible for other factors over and above cost efficiencies to influence management decisions. A study done by Harris (1993) where he analyses the gas industry also highlighted substantial increases in productivity levels soon after the gas industry in the UK was privatised in 1986.

There have been mixed results from empirical studies done on the performance of private and public companies in terms of power utilities. Jamasb and Pollitt (2000) found that private companies in the power distribution sector showed higher levels of efficiency as compared to municipalities; and that mixed companies i.e. public–private, dislayed efficiencies that were very close to that displayed by private companies. Turkson and Wohlgemuth (2001) found that when taking into account economies of scale in Sweden's power distribution sector, the distinction between various types of ownership were not that signifcant. Low levels of efficiency were mainly due to the lack of competition in the market. Eaton and Ware (1987) found no significant differences, while Hunt and Morgan (1995a) found that private companies tend to have higher levels of efficiency. The study conducted by Turkson and Wohlgemuth (2001) concluded that private companies are likely to be more efficient in terms of pricing as compared to power companies owned by the municipals.

One thing that causes tension when undergoing privatisation is the fact that the more an industry displays monopolistic characters at the time of divestiture, the likelier is the potential for monopolistic profits and the benefits of economic rent, the higher the attractiveness of the business will be to potential investors, and the higher the probability of the Treasury receiving divestiture revenue (Steiner 2000). The benefits of privatisation, which may result in lower divestiture prices, must thus be balanced against the long-term advantages to customers as well as financial benefits which are likely to come as a result of competition.

Increasingly, governments are starting to recognise that it is not always advisable for the state to be directly involved when dealing with market failure as this may results in significant negative costs (Djankov et al. 2002). Challenges emanate from adapting to conditions that are changing at a very fast pace, and different reconciliation as well as conflicting goals. It has also been proven that socio-economic goals can be attained while operating in a competitive industry or market (Karekezi and Kimani 2002).

2.6 Restructuring vertically vs horizontally

Vertical unbundling includes the formation of at least two organisations in various value chain stages e.g. separating transmission from distribution and generation (Tooraj and Pollitt 2005). The whole aim of unbundling is to separate appropriate costs and revenues; and limit the chances of cross-subsidisation together with greedy pricing practices between the monopoly and other participants in the market. Unbundling encourages competition and lessens the possibility of using market power against other competing entities (Jamasb and Pollitti 2005).

Vertical control and vertical integration may result in the creation of an anti-competitive environment which can outweigh the advantages of minimising externalities (Bazilian et al. 2012). This anti-competitive environment tends to be encouraged by an extension of market power i.e. a company with market power at some production phase can be able to improve its profitability by utilising that power to minimise the level of competitiveness at another production phase.

Generally, vertical control and vertical integration are unlikely to cause problems if there is sufficient horizontal competition at various production and supply chain phases because there would be limited market power to extend in the first place (Erdogdu 2013). However, even in an instance where market power is more pronounced at one point of the production phase, it is still challenging to defend any generic deduction against vertical control or integration because of the presence of possible substantial economic externalities when vertical control and vertical integration is weak between transmission and generation. The case for weakening the vertical links must be based on the notion that there is some significant offsetting advantages that can be realised from separation. Still, at first sight glance it may be challenging to sustain such

argument (Malik et al. 2015). The crux of market power in the electricity industry emanates from natural monopoly activities of distribution and transmission and distribution. If then, generation is separated from transmission, the market power will be left significantly in line.

When one company enjoys monopoly in an sector like electrcity transmission and is also participating in another competitive sector like generation, it can easily suppress competition by charging either excessive or unfair prices or even introducing bias interconnection standards (Hattori and Tsutsui 2004). Separation also minimises the requirements for regulation oversight and associated costs.

Whether vertical unbundling results in net benefits is dependent on the sacrificed scope and economies of scale, evaluated against the benefits that come with competition (Fiorio et al. 2007). One of the options includes accounting separation, which needs the vertically integrated company to account separately for the split operations, making single ownership of the vertical operations possible but needing a third party which is independent to manage the monopolistic company. Heavy regulatory controls are required for both accounting as well as operational unbundling, so that opportunistic behaviour can abe reduced (Pieters et al. 2014).

According to Bessemer et al. (2004), horizontal and vertical restructuring affect privatization differently. Vertically separating each phase into monopoly distribution, monopoly transmission and monopoly generation may result in increased effects of monopoly power while simultaneously resulting in significantly reduced economies of scale. A chain of monopolies that is not regulated will most likely sell at increased prices than integrated monopolies that are not regulated, thus it is important for unbundled vertical monopolies to be regulated.

Jamasb and Pollitt (2000) indicate that combining horizontal separation together with vertical separation, provides the possibility of introducing competition. They argue that management accountability and competition are more vital than privatisation, in terms of ecncouraging economic efficiency and this assertion was also reinforced by Evans, Guthrie and Videbeck (2008).

Horizontal unbundling is created by two or more companies from the same market. The most imporat objective is to minimise market power of the incumbent company and ultimately the barriers encountered by new market entrants (Joskow 2008). Horizontal unbindling also minimises the oversight responsibility by regulators. In cases where unbundling takes place on a geographical basis, a location monopoly is estblished just like water systems and electricity distribution, however, the possibility for yardstick competition is introduced between various companies. The optimum number of companies will be dependent to some extent on economies of scale in the relevant activity as well as the density and the size of the market (Carlsson 1999). The quantity of network connections significantly affects unit costs in distribution systems.

To explain the significance of density, Skytte (1999) states that:

> *"A change in the quantity of electricity supplied by a firm will have different impact on cost depending on whether the output is supplied to existing customers or to an increased number of customers. Significant reduction in ray average cost result from increasing output to existing customers, while no substantial savings occur when servicing an increased number of customers".*

Separation into various horizontal parts does not necessarily result in competition. However, a competitive framework comes with essential benefits over monopoly. The establishment of new institutions is necessary in order to ensure there is competition in a market (R. Bacon and J. Besant-Jones 2001). Around the 1990s, the electrcity market had new trading and market innovations. There was an emergence of a bulk electricity exchange market which provided for rivalry as well as incentives to companies to reduce costs and increase their share of the market. As far as the wholesale market is concerned, where different bids determine the price, plants that are not efficient may stay unused at certain levels of demand. Therefore, there is the motivation to minimise costs in order to grow market share. However, increasing the benefits from the generation side will need accurate pricing policies, which will consider consition in the transmission network as well as production costs at various peak periods (Shughart 2004).

Competition introduces efficiencies at two different levels i.e. in the short term and the long term. In the short term, the use of excess capacity will be gretater as a result of improved operations and maintenance of present plants, improved labour productivity, as well as better allocation of generating plant (Jamasb and Pollitt 2005). In the long-term, competition introduces improved investment decisions in terms of the quantity, speed and mix of new generating plant. However, introducing competition in the electricity market may result in anxiety in that reduced prices may result in stranded costs.

New policy frameworks are required in the electricty markets of developing countries because of the dynamics of international events as well as the fixing of economic challenges (Bask, Lundgren and Rudholm 2011). Economies where governments are in control of the pace and extent of economic progress will not exist anymore. There has been a lot of pressure, due to globalisation, to allow international competition and an increasing number of governments are starting to recognise that power utilities can no longer function with significantly higher prices than those confronting international competition (Savolainen and Svento 2012).

2.7 A review of applicable theories

Electricity market reforms can be thought of as introducing totally new regulation or modifying already existing regulation which in most cases happens as a result of a political decision (Erdogdu 2013). Kirchner (2007) indicates that political science and economic science were historically distinguished in terms of the sort of questions asked. He goes on to further state that the behaviour of homo politicus has been researched through political science whereas economics on the other hand has studied homo economicus in the market. Ostrom and Ostrom (1971) on the other hand say that political science has in most cases assumed that homo politicus is more concerned about the public interest and that economics supposes that all economic agents are only concerned about their private interests. The idea of “public choice” was characterised as using economics to political science i.e. economics methods are utilised for political studies (Mueller 2003). It can be used in many disciplines in as far as analytic tools of economics are concerned.

Buchanan and Tullock (1962) and later Estache and Wren-Lewis (2009) indicate that the theory of public choice does not assume that those who are responsible for policy development are just maximisers of public funds. Buchanan (1972) states that public choice assumes that people in general, chase after the same goals i.e. utility maximization and they use similar logic to ultimately choose whatever it is that results in highest or maximum personal benefit. The same sentiment was also expressed by Kirchner (2007) when he indicated that politicians usually do not deliver what they promise the voters instead they will say anything to be in a position of power in order to control resources for their own benefit. This suggestion of self-interest implies policymakers who make policies that favour business will tend to have stronger motivations, not to do things because they are in the interest of the public, but rather to look after interests that satisfy their own needs so that they can at the same time satisfy the demands of those interest groups that are politically connected.

The theory of public choice specifically underpins the first research question of this study, which is about understanding the impact of allowing IPPs to participate in the South African electricity supply industry. According to the theory of public choice, it should be expected that as IPPs are introduced in the South African electricity supply industry, politicians and those who are politically connected will tend to want a 'piece of the pie' by acquiring equity and sitting on boards of the various IPPs while using their political influence to implement regulations that will ensure that their profits are maximised (Ostrom and Ostrom 1971; Hantke-Domas 2003; Kirchner 2007). This behaviour may end up in undesired results e.g. misinformed regulation and government policy (Engelen 2007). The theory of public choice has quite extensive consequences, both for the way in which economists perform their work and for the way political systems are organised. According to Quiggin (1987), economists have mainly analysed government policies based on the principle of efficiency. In the event that current policies are thought to advocate for efficiency, they are considered to be relevant and justified, otherwise there is likely to be a call for alternate policies (Bethune 1997). A change of policy i.e. allowing participation of IPPs in the electricity market, is therefore expected to introduce efficiency in the system. In answering the first research question of this study, one should also be able to establish if this is indeed the case, particularly in the South African context.

According to Fike and Gwartney (2015), market prices are likely to direct self-interested individuals towards actions that encourage general welfare. However, the subject of economics points out the significance of the concept of market failure i.e. conditions where there is a clash between personal benefit and maximising value out of available resources. Market failure is categorised mainly by monopoly, externalities and public goods (Kirchner 2007).

It is important to note that there is government failure as much as there is market failure. Government failure becomes evident when there are reasons to expect that self-interested political decision-makers will lead to non-productive use of resources (Mueller 2003). Government failure is not only about poor policy implementation or economic inefficiency. It is systematic as is the case with market failure (Johnson 2015). It reflects an incentive structure that makes it possible for politicians to use resources inefficiently.

The theory of economic regulation as proposed by Stigler (1971) looked at market regulation mainly as a fight for accessing all the benefits that come with having a natural monopoly, among producers and consumers. He questioned the two popular concepts of regulation; one is the fact that regulation is for public benefit and the other being that rationality cannot be used to understand politics. Regulators are likely to care more about their own interests than those of customers. This, according to Erdogdu (2013), is caused by the fact that participants of the regulated industry are likely to be more knowledgeable in as far as regulatory processes are concerned, have more financial interest in the outcomes of economic regulation and because there is only a few of them, they are better organised and consequently are more influential on the regulatory agency. Therefore, one can deduce that the theory of regulation highlights that consumers are not as organised as other interest groups, hence they do not get the necessary attention.

The main characteristic of industrial regulation is ‘natural monopoly’. Economies of scale in the market is an important feature of natural monopoly (Armstrong and Sappington 2007). These economies of scale were understood to mean that with competition comes a great deal of inefficiency as well as unstable and unpredictable prices, thereby making it necessary for government to intervene. However, research

indicates that although a market is characterised by absolute natural monopoly in which competition is non-existent, under certain conditions competition may successfully allocate resources in an efficient manner without any regulation (Erdogdu 2011). Looking at it politically, what is more important about regulation is that it can be responsible for income redistribution as well as creating winners and losers, which will then result in the formation of various interest groups and alliances.

The theory of economic regulation underpins the second and third research questions of this study, which relate to market entry barriers and conducive conditions for competition, respectively. According to Joskow (2008) the theory of economic regulation highlights that the main objective of market reform has always been the creation of new institutional arrangements (such as privatisation) for the electricity supply industry. These institutional arrangements are expected to result in sustainable benefits to the public over a long period of time e.g. the consumers must get their share of benefits through prices that come as a result of improved efficiencies and service quality (Estache and Wren-Lewis 2009). According to the theory of economic regulation and to some extent the theory of public choice, introducing IPPs in the electricity supply industry is supposed to give customers the ability to choose their preferred supplier where customer choice can be based on price and (or) quality of supply. The different generators of electricity i.e. IPPs, are also expected to provide an improved variety of service offerings in order to match the needs of customers (Posner 2007).

Contemporary scholars compared the theory of public choice and the theory of economic regulation and concluded that the two theories are quite different in that the former focuses mostly on the general public and what they want while the latter is more concerned about regulators and their decisions; and how those decisions affect the public (Charmaz 2006; Armstrong and Sappington 2007; Posner 2007; Estache and Wren-Lewis 2009; James 2009; Hertog 2010). Notwithstanding these differences, the two theories are also similar in that they are both about individuals whose ultimate goal is maximisation of personal benefit i.e. the theory of public choice indicates that policymakers do not necessarily make decisions that are in the interest of the public and simultaneously the theory of economic regulation also indicates that regulators

are more inclined to satisfy their own needs rather than those of customers (Woodhouse 2005; Armstrong and Sappington 2007; Kirchner 2007; Hertog 2010).

In contestable markets, existing monopolists and oligopolists can behave in a manner that is preventing marketing entry (van Wegberg and van Witteloostuijn 1992). This phenomenon was observed in the South African electricity market in late 2016 when Eskom announced that it will no longer be procuring power from IPPs since Eskom was supposedly well capacitated in terms of producing sufficient electricity for the country. This was seen by many as Eskom's way of preventing further entry by IPPs into the market. Eskom was doing this knowing very well that the current survival of IPPs is dependent on Eskom being the off-taker of power generated by IPPs since customer choice is yet to be realised in South Africa. Due to some pressure from various interest groups, Eskom was forced to reconsider its decision resulting in the state utility announcing in early March 2017 that it plans to shut down some of its coal-fired power stations in order to make way for IPP participation. Contestable markets and perfect competition have something in common i.e. it is not necessary for companies to be small or many or independent when making decisions or produce the same products. In a nutshell, a perfectly competitive market is necessarily perfectly contestable, but not vice versa (Machaj 2013).

2.8 Empirical evidence of regulatory changes

The study looking at the impact of changes in regulation on electricity prices, which was conducted by Steiner (2000), found that reforms in the electricity market in most cases caused the price of electricity for industrial customers to reduce whereas the difference in price between residential and industrial customers increased. From this, it is apparent that industrial customers tend to enjoy a lot of benefits from the market restructuring. In the same study, she also found that reduced prices are not as a result of unbundling the generation part of the market and that there is rather a link between unbundling generation and lower industrial to residential price ratio, and lower reserve margins.

A similar study was done by Hattori and Tsutsui (2004) who used the same method as that used by Steiner (2000) with data collected from 1987 to 1999 instead of 1986 to

1996 as was the case with the latter. Their findings were twofold i.e. firstly they found that the price of electricity for industrial customers is almost certain to be reduced by market reforms while the difference in price between industrial and residential customers is likely to increase simultaneously. Secondly, they also found that unbundling of the generation part of the market did not necessarily result in lower electricity prices, but instead may have possibly caused an increase in electricity prices. Their study revealed that the effect of unbundling electricity generation on pricing for industrial customers is not that significant, as was the case with the study conducted by Steiner (2000). Besides, Hattori and Tsutsui (2004) also found that starting a wholesale electricity market (wholesaler) did not necessarily result in reduced prices of electricity but instead could have caused an increase in prices. Their study showed that the establishment of a wholesale electricity market caused higher prices that were statistically significant.

The belief that having a publicly owned entity can be an obstacle to other restructures and that it causes inefficiencies in terms of production was questioned by Fiorio et al. (2007). Their empirical findings did not support the notion that privatisation results in lower electricity prices or higher consumer satisfaction.

Additional studies such as Nagayama and Kashiwagi (2007) and Nagayama (2009) have looked at electricity market reforms. The research undertaken by Nagayama and Kashiwagi (2007) indicated how market reform affected electricity prices. The findings indicate that factors such as introducing IPPs into the electricity market, unbundling of the generating and transmitting elements of the market, forming a body to regulate the market, and the establishment of a wholesaler for the electricity industry had serious effects on prices of electricity, some of which were not in line with the results that were expected. These revelations indicated that neither the unbundling nor the establishment of a wholesaler on their own resulted in lower prices of electricity. Instead, electricity prices tended to increase. Nagayama and Kashiwagi (2007) argued, however, that unbundling of electricity generation and transmission may work to reduce prices if it is done in the presence of an independent regulator. They found that privatisation, entry of foreign IPPs into the electricity market and allowing competition reduces tariffs only in a few regions, and not necessarily in every region. The other study done by Nagayama (2009) focussed on understanding if the impacts

of electricity market reforms differ across regions as compared to between emerging and developed countries.

Electricity market reforms that have taken place around the world have resulted in the establishment of wholesale electricity markets which are characterised mostly by their oligopolistic nature (Nepal and Jamasb 2012). Some aspects of these markets, which include few participating IPPs, barriers to entry for new IPPs, formation of sub-markets as a result of congestion in the transmission system and the fact that electricity storage is a major challenge, have all contributed to existing market participants being able to increase their price bids beyond their actual marginal costs. Market participants may be aware that better profits are achievable if they behave in a collaborative manner (Nagayama 2009). The result of this is tacit collusion among non-cooperative players, which can end up in increased pricing and a distorted market structure (Liu and Hobbs 2013). Consequently, electricity prices tend to be higher than what is expected in a perfectly competitive market.

While an increase in price (which results in better profits) may lead to greater political support from regulated companies, it also leads to increased opposition from the consumers (Green and Porter 1984; R. Bacon and J. Besant-Jones 2001; Djankov et al. 2002; Fiorio et al. 2007). The opposite is true with lower prices. If lower prices tend to prevail, resulting in lower profits, the regulated companies will have to settle for less. As far as the regulator is concerned, the ideal tariff will be somewhere in the middle of competition and natural monopoly (Brunekreeft and Twelemann 2005).

2.8.1 Renewable energy support schemes globally

Since around 2009, over 70 countries had put in place targets for the implementation of their renewable energy policies, with at least 64 countries having specific support schemes in place (Ciglmayr 2013). The improved policy actions as well as the fears regarding the security of energy supply and global warming issues are reflected in private investments. Globally, feed-in tariffs are the most popular and arguably the more effective policy instruments used to support the development and implementation of renewable energy technologies. The scheme has been adopted by over 40 countries after being successfully applied in Germany (Bucksteeg, Trepper

and Weber 2015). The main objective of feed-in tariffs is to provide guaranteed fixed tariffs to power producers for the power generated from renewable energy sources over some time, which could be up to 20 years. This makes it attractive for long-term investment planning, especially because expected revenues are known and also guaranteed in advance. The tariffs normally differ in accordance with the type of renewable energy technology being supported. They are usually higher than the normal electricity price paid by customers and ideally make it possible for investors to cover their associated costs and earn a reasonable return on investment. The additional costs that come as a result of higher tariffs are passed on to consumers and charged per kilowatt-hour. In other schemes, tariffs are adjusted over a period of time to protect consumers from paying high prices unnecessarily and also to make provision for technology learning curves (Pieters et al. 2014). However, the predictability of these adjustment is important in order to maintain investment certainty.

Some countries use quota models to support renewable energy technologies, e.g. the UK and Sweden. In the quota model, the amount of power that must be produced from renewable energy sources or the share of renewables in total capacity is fixed rather than fixing the tariff. The price is determined by the market (Bask et al. 2011). However, quota systems are not as effective as feed-in tariffs. According to Herbst and Lalk (2015), there is only one price for generators who produce renewable energy, as a result price is not differentiated according to the type of technology. Furthermore, the fact that the price is determined by the market makes the future price uncertain for investors. The fewer the market participants, the higher is the price fluctuations; resulting in additional risk which is priced higher by the private sector, acting as an unnecessary obstacle to potential investment (Savolainen and Svento 2012).

There are other support schemes such as tax incentives or subsidies for certain technologies e.g. solar photovoltaic technologies. Over and above increasing the revenues from renewable energies, the cost of competing fossil fuel technologies must be increased to increase the competitiveness of renewables (Bayer 2015).

2.9 Electricity market structures in developed countries

For a long time, the performances of industries with natural monopoly have been debated in terms of the impact of having different types of ownership, regulatory regime and market structure (Emmons-Iii 1997). Private ownership in these sectors has the potential to cause a loss through output restriction by the profit-maximising monopolist while on the other hand technical inefficiency of public ownership can minimise social welfare. Joskow (2008) said private ownership under government price regulation offers potential gains in allocative efficiency. However, he warns that there could be inefficiencies as a result of overinvestment in capital relative to labour, from rent-seeking behaviour, or from the direct costs of the regulatory process itself. Erdogdu (2011) added that alternatively, whether it is due to unsustainability of natural monopoly or it is imposed by government policy, duopolistic competition, might reduce technical efficiency and yet prove to be superior to private monopoly in as far as allocative efficiency is concerned.

2.9.1 The German electricity market

Electricity market reform in Germany started in 1998 and it was driven by the 1996 electricity directive of the European Union (EU). This resulted in a framework which was based mainly on three components (Brunekreeft and Twelemann 2005). Firstly, customer liberalisation was immediately introduced where all customers had the liberty to choose their preferred supplier; and this took almost a year to be fully implemented (Bucksteeg et al. 2015). The fact that customers can buy electricity from a supplier of their choice illustrates that the German electricity supply industry subscribes to traditional theory which, as described earlier in this chapter, states that privatisation is thought of as a social choice in which confidence is put in a private initiative instead of a public one. Traditional theory further states that privatisation symbolises a different manner of looking at the needs of society as well as reconsidering the function of government in satisfying those needs i.e. more dependence on the private sector and less on government to fulfil the needs of the people (Burton 1993).

Ostrom and Ostrom (1971) argue that the theory of public choice assumes that the individual is the basic unit of analysis, therefore the assumptions made about individual

behaviour are very important. They further indicate that individuals are assumed to be self-interested i.e. individuals have their own preferences which affect the decisions they make, and that those preferences may differ from individual to individual. This assertion was supported by Buchanan and Tollison (1984), Quiggin (1987) and Mueller (2003). This phenomenon was particularly evident in Germany after the electricity market was liberalised.

Secondly, the framework after the German market reform was about vertical integration which was allowed to happen and increased in popularity in the German ESI. Unbundling of the ESI was based on the country implementing only the minimum requirements of the EU, but these requirements proved to be meaningless because the controls put in place were ineffective (Fiorio et al. 2007). Thirdly, the Energy Act was not aligned to the rest of Europe because it made provision for negotiated Third Party Access (nTPA) on transmission networks (Jamasb and Pollitt 2005).

Germany's population was estimated at 80.43 million in 2011 with the average household electricity consumption of 3 369 kWh/year during the same period as illustrate in Table 4 (Bayer 2015). The power market in German is larger than any other one in Europe and it also has the biggest share of the market in terms of the amount of capacity of renewable energy that has been installed across the continent (Gabriel 2014). The country's installed capacity is shown in Table 5 below.

Table 4: Germany at a glance (Bayer 2015)

Population	**GDP**	**Average household electricity consumption**	**Gross electrcity consumption**
80 million	3.6 trillion Euro	3.4 MWh per annum	576 TWh

Germany is in fact the third largest country in the world in terms of installed renewables energy capacity, excluding hydro (Bayer 2015). In 2014, renewable energy was responsible for more than 25 percent of all power generation in Germany. This was followed by coal and lignite at 44 percent and nuclear power at 16 percent of total electricity generation in the same year (Deloitte 2015).

Table 5: Installed capacity, consumption and peak demand (Bucksteeg et al. 2015)

Installed capacity	203 GW (2015)
Consumption	597 TWh (2015)
Peak demand	91 GW (2015)

The approval of network charges (based on forecast and not actual results) is the responsibility of an authorised regulator and this is a requirement for regulated TPA (Brunekreeft and Twelemann 2005). However, the German legislator depended on a network access that was negotiated and the Cartel Office was responsible for monitoring any potential abuse. The Competition Act, from which the Cartel Office is empowered, was enforced by a policy, which states that the process of giving network access to third parties must be unbiased and should result in equitable charges (Gabriel 2014).

Figure 2 shows that in 2014, the capacity of electricity installed in the country was 192 GW of which 44 percent (83 GW) is renewable energy. Solar photovoltaics (PV) and wind power are responsible for a big portion of renewable energy. Other technologies including nuclear and natural gas form part of the total energy mix.

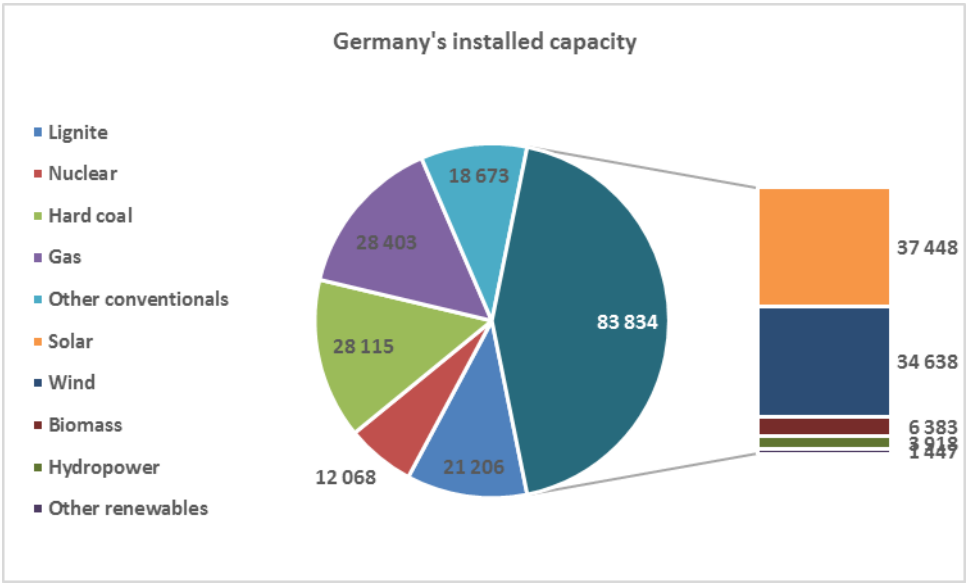


Figure 2: Installed capacity in MW (Bayer 2015)

There are four big players in the German power market i.e. Vattenfall, RWE, EnBW, and E.ON, as shown in Table 6 and most of the power distribution and generation is done by these IPPs (Bucksteeg et al. 2015). The evolution of a competitive market has been quite slow in the past; however, this has certainly changed as a steady increase has been observed in recent times. By 2013, over 20 percent of electricity consumers were being supplied by IPPs (Deloitte 2015). More renewables were being introduced in the market and this resulted in a change in the ownership profile of power generators. A sizable portion of conventional power generation is in the hands of the big four generating companies; however, they are responsible for just 5 percent of energy generated by renewable technologies (Brunekreeft and Twelemann 2005).

Table 6: Market share of German electricity companies (Deloitte 2015)

	Company	Market share	Number of providers
Generation Installed Capacity	EnBW, E.ON, RWE and Vattenfall	56%	> 1 000
Distribution System Operators		70%	+/- 890 DSOs, of which 700 are municipally owned *(Stadtwerke)*
Transmission System Operators	Amprion, TransnetBW, TenneT and 50Hertz	100%	4

According to Bayer (2015), Germany has the most complicated electricity distribution system as compared to other countries in Europe. 20 000 municipalities are being serviced by approximately 900 distribution system operators (DSOs). The four large DSOs operate a large part of the distribution system which is governed by concession agreements entered into with municipalities (Bucksteeg et al. 2015). Under the agreements, municipalities are able to rent out their distribution services for not more than twenty years.

The electricity market consists of a number of “sub-markets” that produce the pricing signal that will ultimately inform how generated power is produced and consumed (Fiorio et al. 2007). Balancing capacity is used by the TSOs to manage differences that could arise as a result of unexpected demand (Tooraj and Pollitt 2005).

2.9.2 Electricity regulation in the UK

A regulation that was independent and the introduction of competitive markets happened in accordance with the Electricity Act of 1989 which allowed for the UK government to relinquish its ownership of power generation to IPPs (Simmonds 2002). Consequently, a reformed ESI was established in England and Wales, in the early 90s. According to Simmonds (2002), the power pool of England and Wales was new and unique, as a result, lessons learnt from other countries could not be easily transferred and applied. Similar to the German ESI as discussed above, UK customers have the liberty select their preferred supplier, thereby indicating bias towards traditional theory.

Every day before the trading day i.e. day-ahead, different generators were required to submit their selling prices. Electricity demand was forecasted day-ahead by the National Grid Company (NGC) which on the same day calculated a generation schedule to match the forecasted demand on behalf of the pool participants, and determined pool prices (Bajpai et al. 2008). The NGC's other responsibility was to dispatch available generators on the trading day, based on the schedule prepared day-ahead. The day-ahead schedule can be changed depending on changes in the system such as generation failures, unavailable transmission systems and changes in demand (Littlechild 2000).

According to Green (1999), pool prices of electricity were very volatile. Most of the electricity produced was sold according to bilateral agreements which have been entered into with various suppliers – contracts for differences (CfDs) in order to hedge against pool price uncertainty. Simmonds (2002) identified the following problems with the pool over time, some of which are also highlighted by Woo, Lloyd and Tishler (2003):

- regardless of there being a significant number of new entrants in the power supply market, the majority of them were Closed-Cycle Gas Turbines which came with long-term bilateral agreements, consequently the price was set by a few companies;

- the absence of notable pressure from suppliers as well a minimum participation by consumers;

- complicated mechanism for submitting bids and price determination;
- easy manipulation of selling prices;
- poor relations between the gas industry and power markets;
- stringent directives and legislation which have been blamed for a slow reform.

Simmonds (2002) and Woo et al. (2003) agree that most challenges identified were not caused by the pool itself but by generation businesses dominating the industry. The new electricity trading arrangements (NETA) were enforced in the early 2000s, and are based on bilateral agreements between all stakeholders in the value chain (Littlechild 2000). The NETA wholesale market replaced the electricity pool. Most of the power under NETA is traded in forwards, futures and short-term markets in terms of pre-negotiated bilateral agreements (Hartzenberg 2006). Power Purchase Agreements are entered into and range from one day to months and even years ahead, making it possible for participants to secure cover at competitive prices (Bajpai et al. 2008).

Littlechild (2000) states that the most important characteristic of NETA is that, generating units can be automatically dispatched and are dependent on imbalanced prices if their available generating capacity does not match what was contracted. This is unlike the earlier electricity pool which was based on the power generation being dispatched by the NGC, centrally. There has been more emphasis on reliability of generators as a result of this.

Simmonds (2002: 27) further states that:

> "another key element of NETA is that the demand-side is fully incorporated into the new balancing arrangements. Suppliers and customers may offer load reductions to the balancing mechanism in direct competition with generators. This should encourage suppliers to try to understand their customer demand more fully in order manage their out of balance position and make them more responsive to customers' demand requirements. Large customers seem to be playing a more active role in the industry.".

A lot was achieved by the electricity industry during the last decade and this can be attributed to regulation (Bajpai et al. 2008). There has been better efficiency in the UK electricity market which has resulted in the generation and retail supply sectors being as competitive as anywhere in the world (Joskow 2008).

2.10 Competition in European electricity markets

Competition in electricity markets is being embraced and implemented at a fast rate in many countries across the world, particularly in Europe and many customers are in favour of taking part in the competitive markets (Bessemer et al. 2004). Therefore, the most important question for these customers, especially in the short-term, is how to embrace the electricity industry rather than whether to resist the industry at all. Many customers are more concerned about learning the inherent risks that come with competition as well as the openness and fairness of a competitive market (Jamasb and Pollitt 2005). There have been many debates either against or in favour of competition within the electricity industry. The collapse of the Californian market in the early 2000's has managed to over-shadow some success stories e.g. the fact that wholesale price in Britain has reduced by about 30% since 1999.

According to Bessemer et al. (2004), lower electricity prices are not necessarily a guaranteed outcome of competitive markets, which contradicts the findings of Nagayama (2009) who states that introducing competition will always result in reduced prices. However, this can be regarded as an outlier because Heath (1993), Beard, Kaserman and Mayo (2003) as well as Wise (2005); all agree with Bessemer et al. (2004) that competition can sometimes result in lower prices as much as it can result in increased prices in some cases.

Efficient competition on the other hand does ensure that electricity is supplied by those providers who are economically optimal (Heath 1993). However, it is important to ensure growth in demand is matched by generation capacity growth as failure to do so can result in an increase in prices in the short-term. A conclusion can therefore be made that markets are not the answer to all problems. Wise (2005) states that the opening of the market can result in unintended complications and risks for consumers,

which can be difficult and costly to manage. However, he stresses that this actually presents an opportunity and should be seen as such.

It is important for the market conditions to be conducive in order to have fair competition and this requires some market structural changes e.g. introducing independent grid operators, independent regulators as well as transparent information reporting (Hattori and Tsutsui 2004). A major challenge in the European market is to deal with market concentration and this could be achieved by increasing diversity amongst the different power suppliers. However, there is the reality that many countries are not supportive of the idea of unbundling the existing monopoly mainly because of political reasons (Bessemer et al. 2004).

Electricity prices tend to be more volatile in a competitive environment, however, the risk can be mitigated by using tools and processes similar to those used for oil and gas. Essentially, customers have two choices in terms of managing the risk. Firstly, customers can manage the risk themselves by developing their own capabilities for risk management (Sen and Jamasb 2012). Secondly, risk transfer which can be achieved by buying straight from a seller or entering into a “requirements deal” with a financial firm that can manage all the risk. In most cases, only industrial customers are likely to choose the second approach (Woolf and Halpern 2001). A hedging portfolio might be necessary for customers that choose this approach (Bessemer et al. 2004).

2.10.1 The Nordic Power Pool

Electricity trading has been happening for many years in the Scandinavian countries which boasts the most sophisticated international power trading pool globally (Carlsson 1999). The power trading regime has transformed significantly, changing from the previous model which was more of a cooperative model, under the Nordel agreement, to a model that is more competitive (Bask et al. 2011). Figure 3 shows the Nord pool power market which was formed by Norway and Sweden in 1996 and later joined by Finland in 1998 to also participate in the market. Other countries such a Denmark are now participants of the power pool.

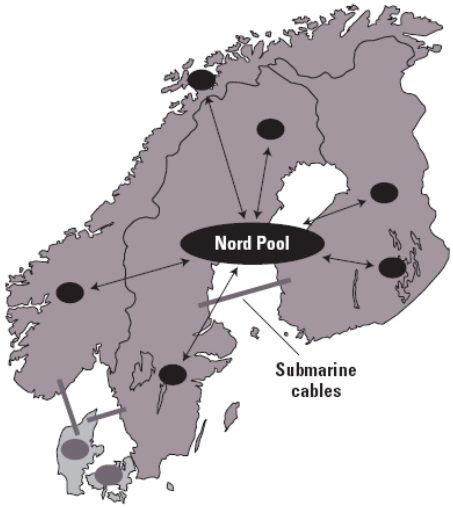


Figure 3: The Nord pool power market (Carlsson 1999)

Norway's electricity needs rely to a large extent on hydropower, while Denmark produces all of their power using coal-fired power plants (Bjørndal and Jörnsten 2007). Sweden on the other hand has an energy mix of approximately 50% hydropower and 50% nuclear power, and Finland has an energy mix of 25% hydropower, 45% coal and 30% nuclear power. Together, these countries use up approximately 360 TWh per annum, which beyond consumption in the U.K. market (Amundsen and Bergman 2012).

The formation of an international power pool is attributed to changes in the structure of the electricity market in Norway which began around 1991 (Amundsen and Bergman 2002). A competitive electricity market in Norway was established in 1991 by means of restructuring with the objectives of minimising electricity cost differences in the different regions, and this came with improved operational efficiency in the production and distribution of power, thus achieving more efficient development of the power sector (Skytte 1999). Nord pool as an exchange in collaboration with a few brokers has built a platform for trading electricity that has been used as a model for other deregulated electricity markets (Savolainen and Svento 2012).

The market first begins with bilateral contracting which is followed by the settlement of financial trades and then ends with the settlement of the spot market on a daily basis at mid-day (Flatabo et al. 2003). In the pre-operational phase, each generator is responsible for production scheduling and the responsibility of the market participants

is to bid for physical power regulation into the balancing market called the regulation power market (RPM), which operates on a real time basis under the management of the TSO (Amundsen and Bergman 2012). The aim of the balancing market is for it to be used in load balancing and for 'buy back' congestion management in the hour of trade (Savolainen and Svento 2012). This market is open for both generation and consumption. The Elspot and the balancing market are also known as physical markets. Elspot provides spot market trade in electricity agreements for the next-day physical delivery. Prices are determined through a double auction system for each hour in the day (Flatabo et al. 2003).

Pressure due to the competitive nature of the industry has resulted in the reform of the sector, including ownership by more than one member countries and the entry of foreign electricity entities (Carlsson 1999). In addition to the traditional electricity companies, other entities are also allowed to buy and sell on the market, this includes oil companies as well as power trading companies. Market access by third-parties is made possible by strict regulation of the network service (Bask et al. 2011). But the market is to a large extent supposed to take care of itself under the watchful eyes of the competition authorities (Hjalmarsson 2000).

The spot market is working well so far (Skytte 1999). Unlike the English and Welsh power pools, which allows only generating companies to bid for power, the Nordic power pool caters for both producers and consumers of electricity (Amundsen and Bergman 2002). Electricity producers in the Nordic power pool are not obliged to sell power to the pool. Therefore, the pool must make sure that it is very attractive so as to maintain current business and be attractive to new business.

The main challenge for a competitive market has been the fact that the cost of installing hourly metering has made it difficult for small consumers to change suppliers. Norway managed to deal with the challenge by implementing a system of customer load profiles that are pre-defined (Savolainen and Svento 2012). It is expected that Sweden will also opt to implement the load profile solution.

2.10.2 Electricity trading in Germany

In Germany, electricity trading happens on the exchange and over the counter (Bucksteeg et al. 2015). The German's European Energy Exchange (EEX) situated in the state of Saxony, and the EPEX SPOT are used as platforms to buy and sell standardised products through a transparent process. However, Gabriel (2014) mentions that there are some companies that still enter into power purchase agreements with electricity producers and this is referred to as over the counter trading (OTC).

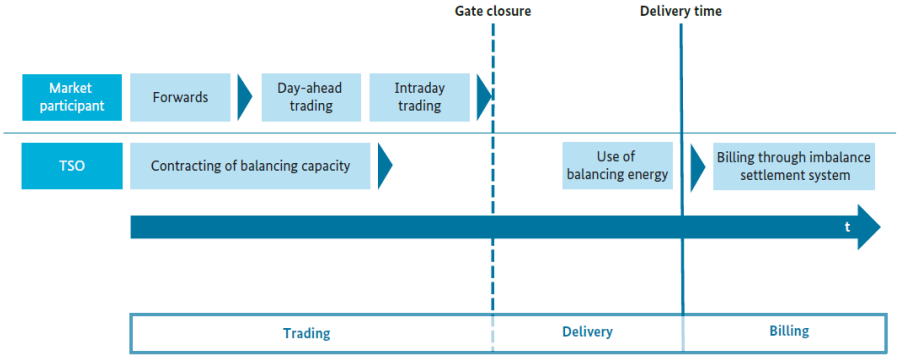


Figure 4: Sub-markets of the electricity market in Germany (Gabriel 2014)

As shown in Figure 4, three different markets exist in which trading happens i.e. forwards, day-ahead and intraday markets. As far as the forwards market is concerned, the buyer and the seller can enter into agreements for not more than six years (Brunekreeft and Twelemann 2005). Both the day-ahead and the intra-day are part of the spot market. On the day-ahead market, the power that needs to be delivered on next day is sold with market participants submitting their bids no later than noon on the previous day (Deloitte 2015). It is always better to estimate the actual supply and demand as it gets closer to the actual time the power needs to be delivered. In order to minimise shortfalls or over-supply and to ensure the available power is delivered in the most cost-effective way, buyers and sellers can trade on the intraday market after the day-ahead market is closed, on a short-term basis for periods ranging from 15 to 60 minutes blocks (Djankov et al. 2002). The intraday market closes 45 minutes prior to the power being delivered. Participants of the market are allowed to also participate in OTC trading up to 15 minutes before power gets delivered (Gabriel 2014).

The energy policy in Germany rests on three pillars namely; security of supply, economic viability and environmental compatibility (Fiorio et al. 2007). The whole intent is to produce energy under environmentally friendly conditions, while simultaneously ensuring security of supply in a manner that is not costly. The reform of the German ESI was informed by a policy document promulgated in 2010 which gives direction to the country's energy investment up to 2050 (the Federal Government's Energy Concept), and the need to move towards renewable energy.

Germany's obligations to the objectives of the Energy Concept were reemphasised on 8 April 2014 by the Federal Government (Bucksteeg et al. 2015). In changing the country's energy system, there will be more emphasis on the viability of Germany's economic in order to maintain the country's ability to compete and innovate as well as ensuring affordability for consumers. According to Bayer (2015), the transition to the renewable age has the potential to ultimately result in success in terms of the economy and the environment.

The restructuring of Germany's electricity supply industry is guided mostly by quantitative goals (Brunekreeft and Twelemann 2005). By 2020, the country aims to reduce greenhouse gas emissions by almost half, compared to 1990 levels, as well as achieving a 20 percent decrease in terms of the consumption of primary energy as compared to 2008 levels (Deloitte 2015). The objective is to have 40 to 45 percent of electricity generation coming from renewable energy by 2025 and this is planned to increase to 55 to 60 percent by 2035 (Valentic, Viskovic and Franki 2014). Additional goals to be achieved by 2050, set by the German Federal Government include about 90 percent reduction in carbon dioxide emissions compared to the levels of 1990, and consumption of primary energy consumption is expected to be reduced by half compared to 2008 levels.

2.11 Electricity market structures in emerging markets

To a large extent, the electricity supply industries in many emerging markets is still under the control of governments, even though some developing countries such as China and Brazil claim that their markets have been liberalised. On the other hand, most electricity markets in developed countries have moved away from total state

control to more competitive markets (Xu and Chen 2006). South Africa is still at the beginning of its market reform process with a few IPPs participating in the market. However, competition is still to be fully implemented as most of these IPPs sell their power directly to Eskom.

2.11.1 China's electricity market structure

China's installed generation capacity grew by almost 8% between 1984 and 2004 to 440 GW in 2004 (An et al. 2015). The country's capital expansion projects resulted in the generation capacity increasing by at least 12%. This increase included a significant expansion of hydroelectric power capacity; however coal-fired power stations grew the most during the same period (IEA 2006).

Historically, the power supply industry in China has always been under the control of the central government (Dong and Li 2006). Major sectorial reforms took place during the last two decades, as shown in Figure 5, which completely changed the electricity market structure. The market changes that happened, which involved separating the transmission network from the generation business, were mostly meant to prepare for competition between different power generating entities (Xu and Chen 2006). This was done by with the ultimate goal of achieving improved operational efficiency and reduced electricity prices. The market reform resulted in many generating entities which include five companies that were separated from the transmission network. The transmission network itself was also divided into different companies (Ngan 2010).

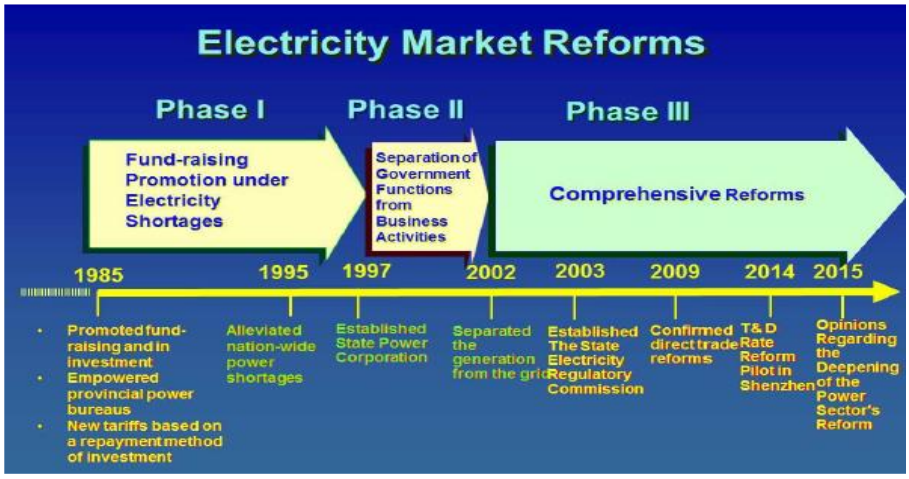


Figure 5: Progress of electricity market reforms in China (An et al. 2015)

The structural changes and changes in ownership of China's ESI started around the mid-1980s, in different phases (IEA 2006). Firstly, investment in the generation business was opened to entities such as provincial and local governments which were outside of the central government but the transmission network was left to remain wholly-owned by the central government (An et al. 2015). Other local and foreign private investors were also allowed to participate. These investors are now responsible for more than 50% of the total capacity available for generation. Collectively, these investors are sometimes referred to as IPPs; however this could be misleading since in China, most of these investor have strong links to the government i.e. they are owned by other government agents, therefore one cannot really say that they are independent (Dong and Li 2006). As a result, the Chinese electricity market seems to be more aligned to the classical theory which, as discussed earlier, indicates that modern liberalization programmes around the world have not really led to systematic privatisation (Wang, Li and Wu 2014).

The second phase of the electricity sector reform happened in 1997 where a majority of assets belonging to the Ministry of Power Industry were moved to a new entity called State Power Corporation (SPC) (Xu and Chen 2006). The assets transferred to the SPC included 90% of transmission and 46% of generation entities. The third phase of reform happened towards the end of 2002 when the SPC was unbundled and all of its assets transferred to ten newly formed state-owned enterprises (SOEs) as shown in Figure 6 below (IEA 2006).

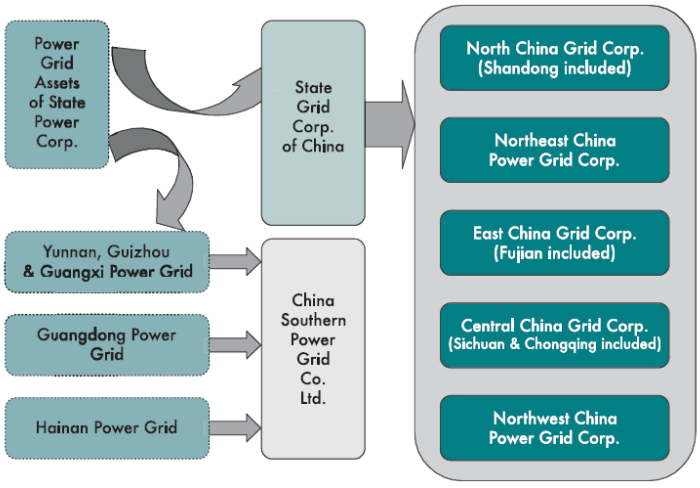


Figure 6: Transfer of China's transmission assets in 2002 (IEA 2006)

An agreement was reached post 2009 to introduce direct trade reforms in place of regional generation market liberalisation and this resulted in the establishment of two entities i.e. Power Construction Corporation of China and China Energy Engineering Corporation in 2011 (An et al. 2015).

2.11.2 Independent Power Producers in Malaysia

Almost half of Malaysia's electrical power is generated by Tenaga Nasional Berhad (Tenaga) through its subsidiaries (R. Bacon and J. Besant-Jones 2001). Tenaga, just like South Africa's Eskom, has for a long time monopolised the transmission and distribution networks in the ESI. Participation of IPPs in the country's generation is estimated at 40% (Rector 2005).

Malaysia was one of the first Asian countries to allow participation of privately-owned generation companies in the electricity market. Pursuant to the Electricity Supply Act of 1990, which also set out a framework for the introduction of IPPs, the national electricity utility, National Electricity Board (NEB), which is wholly owned by the government, was corporatized into Tenaga (R. Bacon and J. Besant-Jones 2001). The government then privatized Tenaga by selling about 22 % of the company's shares onto the Kuala Lumpur Stock Exchange (KLSE). Since 1992, the government has sold more of its interest in Tenaga but continues to be a majority and controlling shareholder. Tenaga is one of the two largest capitalized stocks on the KLSE (Erdogdu 2013).

Malaysia is a good example of a highly self-contained model of IPP program implementation. A big number of investors were domestic; debt financing for the projects came exclusively from domestic sources and was based in local currency; and fuel, the largest component of total project cost in the gas-fired thermal plants that Malaysian IPPs employed, came solely from domestic sources (Woo et al. 2003). These features made Malaysia's IPP sector less vulnerable to the shock of the Asian financial crisis than its neighbours, but by no means immune.

Malaysia's partially privatized but state controlled off-taker had high levels of debt with foreign currency denomination for which repayment obligations became hugely

onerous as a result of the currency devaluation that Malaysia experienced during the crisis (Woodhouse 2005). Additionally, the Asian financial crisis led to a contraction in the Malaysian economy, which resulted in a reduce demand for electricity and an increased overcapacity problem that was already causing financial strain on the government off-taker (Rector 2005).

2.11.3 Independent Power Producers in Brazil

State-owned companies control a big portion of the Brazilian power market, even though the operation of generation, transmission and distribution is done jointly by both the private sector and the state-owned companies (Nunez-Luna and Woodhouse 2005). Major suppliers to the Brazilian electricity market are companies offering outsourcing activities (Johnson 2000). The Brazilian electricity market consists mainly of privatised regional electricity companies which are vertically integrated from generation to supply. According to Johnson (2000), this therefore makes it difficult for new entrants to enter the market, even when the market is officially liberalised.

A big portion (80%) of the Brazilian electricity supplies is generated from hydropower. Most of these hydro-generators were built by state-owned companies over the years (de Oliveira et al. 2005). A few coal-fired power stations exist with coal reserves in the South, however the power they produce is mostly meant for isolated markets. Brazil is similar to South Africa in that, many citizens and households in both countries have access to basic electricity; however households in rural areas do not enjoy the same benefits (Joskow 2008).

In Brazil, the term IPP is used very broadly. Only a few companies are fully integrated and can be considered an “IPP” (R. Bacon and J. Besant-Jones 2001). Diversity in the IPP market in Brazil is driven by the unique characteristics of the fuel markets. The most important of these is between hydro and thermal generating technologies (de Oliveira et al. 2005). Investment in hydro plants entered a structured arrangement that has been largely predictable because of vast interests within Brazil keen in maintaining the integrity of the hydro system. These projects have faced problems in sitting and environmental permitting, but once operational they proved to be very stable (Watts 2001).

2.12 Electricity markets in Africa

The deregulation of electricity came as a result of the need for efficient management practices and transformation of the ESI in the different sub-Saharan countries (Eberhad and Gratwick 2008). Governments, and particularly, international financiers, understood deregulation to mean either an efficient or formal end of government control. Watts (2001) argues that the expected benefits of the deregulation of the ESI such as cost savings and productivity enhancement would likely outweigh the disadvantages which include high initial cost of capital and the difficulty in managing the transmission side of the value chain.

Governments across many sub-Saharan countries have been controlling their respective electricity supply industries until the mid-1990s when reform started in most of these countries. The ESI was always seen by Governments as strategic because the industry made sure there was access to reliable electricity which helped improve the lives of the general public (Turkson and Wohlgemuth 2001). This sentiment was supported by Karekezi and Kimani (2002) who argued that it made strategic sense because there were lots of inefficiencies in the power industries of most countries in sub-Saharan African. Karekezi and Kimani (2002) further state that the situation was caused mainly by a number of issues including low electricity tariffs, an appetite for large and costly power project investments and mismanagement of state entities. Consequently, only a few citizens of the sub-Saharan Africa had access to electricity.

In Kenya, before IPPs were introduced, the country depended a lot on funding from multilateral and bilateral agencies to finance power infrastructure (Eberhad and Gratwick 2005b). In the 1990s, however, the global donor trend supported private participation in infrastructure with concessionary funding channelled to health and social services. This move away from development finance for power projects was aggravated by a general aid embargo, imposed on Kenya throughout the early and mid-1990s. Thus, a platform of reform for opening up Kenya's electricity sector to private participation slowly emerged around 1995, making way for contracting the first set of IPPs in 1996 (Bazilian et al. 2012).

The generation of electricity was officially privatised in 1996 as part of a power sector reform effort. It then became government policy that all bids for power generators would be put out for competition, open to both public and private companies, i.e. KenGen would receive no preferential treatment (Bhuiya et al. 2004). The sector was then dominated by hydropower. All economically viable hydro sites had, however, been exploited and therefore diversification became necessary both for drought mitigation and to meet growing demand.

IPPs in Kenya were generally perceived as being expensive, i.e. more expensive than KenGen. Owners of the IPPs were seen as opportunists who made profit by taking advantage of Kenya's drought situation and poor investment climate (Boussougouth 2008).

In Egypt, the national power utility is responsible for building new generation plants. This decision by the government was influenced partly by the exposure to foreign denominated financing which caused PPA costs to double as the currency collapsed, and also because of the renewed availability of concessionary finance from development finance institutions (Eberhad and Gratwick 2005a). The original decision to open Egypt's market to IPPs was probably not welcomed immediately and was more due to agencies such as the World Bank. While there has been no serious attempt by Egypt to renegotiate these PPAs, or to expropriate IPP assets, the country has effectively shelved future IPP plans.

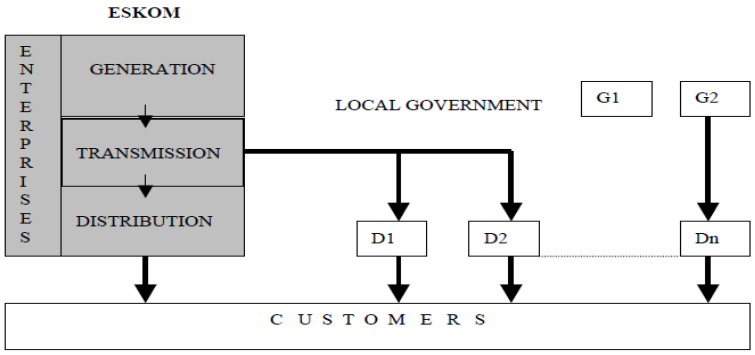
IPPs in Egypt now face new rules that require Power Purchase Agreements to be partly based on local currency. Initially, investors were willing to participate in the electricity market because they perceived a conducive environment for investment. They were also able to reduce risk through a Central Bank guarantee, an agreement with a single-buyer (EEHC) for two decades, which also helped allay any concerns that could have resulted with a regulatory environment that is still very 'young' (Eberhad and Gratwick 2005a).

It seems as though African countries such as the Democratic Republic of Congo, Kenya, Morocco, Ghana and Algeria, with the exception of countries like Egypt and Tunisia, subscribe to the German model which is based on traditional theory,

particularly the theory of public choice as discussed earlier in this chapter i.e. customers having the ability to choose their preferred supplier.

2.13 South Africa's electricity supply industry

A wholly state-owned power utility, Eskom has dominated the South African electricity supply industry for many years (Eberhard 2001). Figure 7 below shows that Eskom is a vertically integrated entity with tasked with the responsibility to produce, transmit and distribute power to its commercial, industrial and residential customers. 368 municipalities buy bulk electricity from Eskom in order to directly supply customers in their respective jurisdictions (Boussougouth 2009). There are a few industrial companies that have power generation capabilities for their own use (Bazilian et al. 2012).



Current structure of the SA ESI

*** Eskom Enterprises is a division of Eskom which undertakes technical support activities on a contracted basis.*
G1, G2…..different municipal generators. D1, D2……different municipal distributors

Figure 7: The South African ESI (Eberhard 2001)

Eskom also participates in the Southern African Power Pool (SAPP) where electricity trading happens mainly through pre-negotiated bilateral agreements between members of the pool (Mokhethi 2010). The SAPP is a power pool specifically for power utilities belonging to the countries that make up the Southern African Development Community (SADC). South Africa, through its power utility Eskom, sells electricity to its neighbouring countries including Namibia, Mozambique, Botswana and Swaziland (Bazilian et al. 2012). These sales represent almost 2% of Eskom's total sales. Eskom also buys electricity from other neighbouring countries including Cahora Bassa in

Mozambique where most of its purchased power is generated, thereby making Eskom a net importer of electricity (Boussougouth 2008).

Over-investment in power stations in the 1980s resulted in a number of these power stations being mothballed and therefor there was also no investment in new power stations (Newbery and Eberhard 2008). However, electricity shortages experienced since 2007 forced Eskom and the government of South Africa to bring the mothballed power stations back online and start one of the largest capital expansion programmes in the country (Odhiambo 2009). Electricity shortages also forced the government to rethink its policy by allowing private investors (IPPs) to start participating in the electricity supply industry thereby threatening Eskom's monopoly (Groenewald and Woudstra 2012).

Privatisation of the South African ESI can be based on lessons learnt from the United Kingdom (UK) where the Electricity Act of 1989 allowed for ownership to be transferred from companies owned by the state to privately-owned companies. Simmonds (2002) indicates that the power pool of England and Wales which was formed in the early 90s was unique and therefore, there was not enough countries with experience to learn from, when it was formed. South Africa finds itself in a similar situation i.e. although there are currently lots of countries to learn from in Europe and other continents, there is limited experience in Africa (particularly in the SADC region) to learn from. As a result, it becomes important that whatever South Africa implements and however it is implemented, it must be done efficiently and effectively in order for other African countries to learn from that experience. Both the theory of public choice and the theory of economic regulation can apply in the South African context and this will be tested as part of this study.

The experience of the Nordic Power Pool is more relevant to South Africa and its participation in the SAPP with other SADC countries, especially when it comes to cross-border electricity trading which the SAPP has not been successful in adopting (Mokhethi 2010).

South Africa finds itself in a similar situation that China was in the early 2000s where the transmission business was divided into different entities (Ngan 2010). The concept of IPPs in China could be misleading, according to Dong and Li (2006). This is due to

most of these IPPs having strong links to the government as they are owned by other government agents. They argue that for this reason, IPPs in China cannot really be considered as independent. Depending on what the ultimate decision is, South Africa can potentially end up in the same situation especially because there have been talks in the past of forming a system market operator which will be largely owned by a government entity (Smith 2008). The theory or economic regulation highlights that this can lead to abuse where regulators will only support decision that are to their benefit and not necessarily in the interest of the public.

The liberalisation of the South African ESI can be successfully implemented if it follows the German example which was started in 1998 where the ultimate framework was based on customer liberalisation, vertical integration and negotiated access by third parties to the transmission network (Brunekreeft and Twelemann 2005). Customer liberalisation meant that all end-users of electricity have the option of selecting which company to buy from based on variables such as pricing, reliability and quality of supply. Vertical integration should not pose any difficulty in the South African context as Eskom is already vertically integrated. Negotiated access by third parties on the other hand may not be the route to be followed by South Africa as it has the potential of being abused by different players for their own interest as explained by the theory of public choice. The theory indicates that policymakers do not always make decisions that are in the public interest (Buchanan 1972). This is also supported by the theory of economic regulation which indicates that regulators are most likely to satisfy their own needs rather than those of customers (Stigler 1971). The corruption that is currently happening in South Africa (both in the private and public sectors) adds to the disapproval of the negotiated third-party access model which was successfully implemented in Germany, but not implemented by other European countries. The suggested thinking i.e. customer liberalisation, vertical integration and not following the negotiated third-party access model; will be tested in this study.

In August 2016, Eskom shocked the South African ESI including IPP investors when it announced that due to the current over-supply of electricity, which is credited to the coming on-line of two coal power stations i.e. Medupi and Kusile, the country will no longer need IPPs. This was seen by many as an anti-competitive behaviour by Eskom and also against government policy which is in support of IPPs. A few weeks after

Eskom's announcement, Eskom's stance was cemented by the power utility's refusal to sign an agreement with an IPP called Redstone, regardless of the agreement being approved by government. This agreement forms part of the Department of Energy's REIPPPP programme which has attracted more than R200 billion in private investment since 2011. The decision by Eskom resulted in uncertainty in the market which increased talks of a need to restructure the ESI so that Eskom is not both player and referee.

2.14 Theoretical model

According to Dubin (1978) and Whetten (1989) the process of developing a theory must have covered at least four important aspects, which are described below. Firstly, the process of developing a theory must address the concepts, variables and constructs which need to be considered when attempting to explain the subject of study. In the case of this particular study, as illustrated in Figure 8, this refers to Eskom as the main player currently, NERSA as the regulator and the South African government as the sole shareholder of Eskom. In order to ensure that the right factors have been included, comprehensiveness (consideration of all relevant factors) and parsimony (removal of factors that are considered to be of little value) are used as the two criteria for judgement.

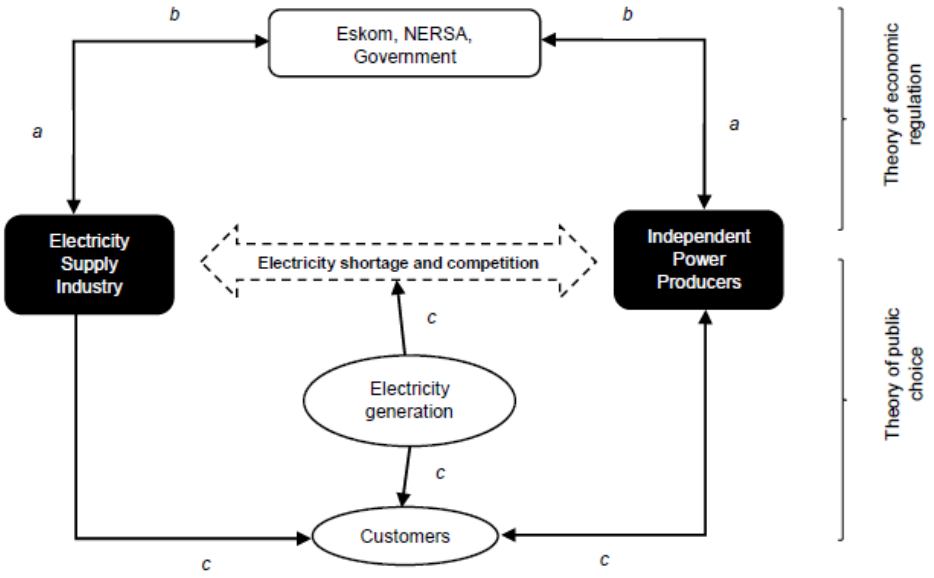


Figure 8: Theoretical model (Author's own work)

Secondly, the process needs to look at the relationship between the different factors and this is represented by arrows that connect the various aspects of the diagram. The relationships in Figure 8 can be summarised by highlighting the fact that Eskom, NERSA and Government are the main players in the industry and are responsible for electricity supply, regulation and policy; respectively. The two lines labelled (a) show that Eskom, NERSA and Government have a say in how the ESI operates and also in the future direction of the industry, including any market structure reforms. The other two lines labelled (b) show that the industry and new entrants (Independent Power Producers) can also influence policy-making and future capital investments based on the current and future demand projections; as well as other self-serving interests. This is where the theory of economic regulation becomes applicable because according to the theory, regulators are likely to care more about their own interests than those of customers. This, according to Erdogdu (2013), is caused by the fact that participants of the regulated industry are likely to be more knowledgeable in as far as regulatory processes are concerned, have more financial interest in the outcomes of economic regulation and because there is only a few of them, they are better organised and consequently are more influential on the regulatory agency.

Thirdly, the question of the underlying dynamics be it economical, psychological, or even social, that explain the choice of selected factors and the relationships that exist, must be addressed. In the diagram above, the lines labelled (c) deal with the demand side. Sufficient electricity must be generated in order to meet the demand by customers. This demand relates to both the demand for a quality supply of electricity and the demand for a choice of supplier where customers can choose to select their preferred supplier at any given time. Here, the theory of public choice becomes applicable.

This, according to Dubin (1978), is “the theoretical glue that welds the model together”. The model is similar to the Nordic Power Pool which was established in 1996 when competition was introduced in the Scandinavian countries as discussed earlier in this chapter. Lastly, the process of building a theory must also look at putting limitations on the proposition generated from a theoretical model. This clearly describes the scope of the theory in terms of what will be covered and will not be covered, thereby setting the boundaries for generalisability.

Theoretically – According to the theory of public choice, a change of policy such as allowing participation of IPPs in the electricity market, will introduce efficiency in the system. (Ostrom and Ostrom 1971; Hantke-Domas 2003; Kirchner 2007). This study has shown that, this has not been the case in South Africa. What the theory of public choice did not highlight is the condition required for the statement to hold i.e. there needs not be a restructure of the market before introducing IPPs for the statement to hold.

Furthermore, the theory of economic regulation and to some extent the theory of public choice, indicate that the introduction of IPPs in the electricity supply industry is supposed to give customers the ability to choose their preferred supplier where customer choice can be based on price and (or) quality of supply (Posner 2007).

In the case of South Africa, IPPs were introduced without restructuring the electricity market with Eskom remaining the major supplier or electricity. IPPs were introduced through the REIPPPP which forces all IPPs to supply their power directly to Eskom which will be sold by Eskom to the end-user, without the benefits of reduced prices as a result of operational efficiency that comes with IPPs. The introduction of IPPs has neither improved the efficiency in the market nor has it resulted in customers having a choice of who supplies them with electricity. In fact, the efficiency seems to have deteriorated even further, even though this further deterioration may not necessarily be attributed to the introduction of IPPs. The theory of public choice does not take into account the fact that IPPs could be introduced without restructuring the market first (as is the case in South Africa); and in this instance, efficiencies may not necessarily improve. In this regard, the study makes a significant contribution to the theory of public choice and the theory of economic regulation.

Empirically – The study makes a further contribution towards the theory of economic regulation, which according to Posner (2007) is all about regulators and the decisions they make; and how those decisions affect the public. The contribution to the theory is founded on empirical evidence of this study as well as practices of various experts in the South African ESI. The introduction of IPPs in developed countries has resulted in the creation of a competitive market which in turn caused a significant reduction in electricity prices as market participants had to improve their efficiencies (Geerli, Chen

and Yokoyama 1999). This phenomenon was not observed in South Africa, which is a developing country. There has not been any competition in the South African ESI since the introduction of IPPs, except during the bidding stages of the REIPPPP where the different bidders were selected based on different prices offered (as one of the selection criteria) for the power they will supply. Additionally, average electricity prices in South Africa have increased by almost 374% between 2007 and 2018; and have been increasing each year, which contradicts the reduction which was observed in developed countries. Therefore, this study shows that the impact of introducing IPPs on electricity prices in developed countries is different from observations made in developing countries such as South Africa. This knowledge will be generalizable to other developing countries, particular where IPPs are introduced prior to restructuring the electricity market.

Methodologically – The IPPs interviewed for this study are all operating for the first time in the South African market and had limited understanding of the country and its political landscape, which has a direct influence in the manner in which IPPs are introduced and how they will ultimately conduct business in the South African ESI. Therefore, the researcher was possibly one of the first to interview these IPPs for the purposes of establishing their impact in the electricity supply industry and also understanding some of the barriers they encountered in the process; in the context of a developing country.

In addition to the gap analysis, the study will make valuable contribution with reference to establishing whether the electricity market in South Africa is ready for competition to take place among different producers of electricity and establish what it will take for the market to get to a point where customers can choose their preferred supplier of electricity as it is the case in some parts of Europe e.g. Germany. This will contribute new knowledge towards the theory of public choice and its applicability to developing countries.

2.15 Conclusion

When it comes to power sector reforms, empirical testing is more important and relevant than theoretical debate. Power sector reform is sometimes triggered by the

general liberalisation of the economy of a country. Studies done in the past as well as applicable economic theories show that market reforms have an impact on the prices of electricity. As a result, the introduction of IPPs in the South African electricity supply industry is expected to result in reduced prices.

The fact that politicians and those that are politically connected can inform the policy direction of a country and influence regulation means that, although there might be competition in a market, the market rules of engagement may not necessarily favour everyone. Those who are not politically connected are likely to be treated unfairly and may end up exiting the market as a result. The exit of some businesses (IPPs) will mean that there will only be a few players in the market who will make sure that they maximise profits, even to a point of colluding. To deal with this, an independent body such as the Competition Commission may be required to ensure that all players in the market are treated fairly and have an equal chance of success. In South Africa, the electricity market is regulated by the NERSA which does not have the authority required to address uncompetitive behaviour. Therefore, this could be addressed by the existing Competition Commission, however its mandate may need to be amended to accommodate the dealing with uncompetitive behaviour in the electricity market.

The ability to transmit electricity from the generating source to the end-user can prove to be a challenge especially if the transmission network is congested. This was also true in some areas in South Africa, especially those that are far from the generating source, however this has now been alleviated to a large extend by recent investments in new transmission networks. Existing research towards this phenomenon is limited and maybe not be well-understood in existing literature. Such an effect, however, is vital to understanding the behaviour of most electricity suppliers, particularly in a wholesale electricity market.

Many countries in Africa seem to be adopting the German model of market reform, however there are some countries such as Egypt which do not necessarily subscribe to this model, especially because there is no clear policy direction in terms of the future of the electricity supply industry. There seem to be a strong case for South Africa to adopt the German model in the electricity market.

Electricity supply industries in many emerging markets are still owned by the respective governments as compared to most developed countries where competition has been introduced by privately-owned companies. South Africa is still at the beginning of its market reform process with a few IPPs participating in the market. However, a competitive market is still to be realised as most of these IPPs sell their power directly to Eskom and not to the end-users.

There is clearly a need for a total reform of the South African ESI to avoid uncompetitive behaviour which has been exhibited by Eskom. IPPs will play a pivotal role in restructuring the electricity market with customer choice and reduced prices becoming the order of the day.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter outlines the methodology applied to examine the objectives and research questions that are being addressed by this study. It discusses the paradigms supporting the method of analysis. The relevant literature around the methodology is discussed as well as the research design and research instrument which was utilised. The population, sampling methods, the gathering of data and the approach to data analysis are also explained. Issues such as validity and reliability of the study are also addressed.

3.2 Research paradigm and design

This study analysed the impact of IPPs entering the South African ESI and thus required interviewing various stakeholders so as to obtain a deeper understanding of issues and views on the changes taking place in the industry. Angen (2000) states that findings or knowledge claims are usually made during the research process itself i.e. findings are made as discussions happen whereby contradictory interpretations are exchanged between the population sample. Additionally, he states that issues such as morals and pragmatism need to be seriously considered when evaluating interpretive science and therefore it was important, during the data collection stage of this study, for the researcher to have an exchange of interpretations with the respondents. This made the interpretivist paradigm more suitable for this study. Therefore, qualitative methods were utilised so that suitable and accurate data can be collected to address the questions in this research. This type of method considered different and diverse aspects including the design of the research. Pratt (2009) highlights that the various types of qualitative methodologies are very similar in terms of their research objectives which attempt to understand the depth of the object being researched. He also mentions that qualitative research can be quite subjective as compared to the quantitative methodology and in most cases, are often open-ended and of an exploratory nature.

Positivism, interpretivism, constructivism, critical theory and realism are all examples of research paradigms. They can be categorised in different perspectives i.e. epistemology, ontology and methodology (Lin 1998). Epistemology is more about the relations between the researcher and the facts; ontology on the other hand looks at the facts that are being researched, while methodology is all about the practices and processes employed when conducting research (Lee 1991). In most cases, a researcher has to deal with two epistemological/ontological views i.e. objective and subjective views, which are bound to inform the type of research paradigm (Krauss 2005). The subjective view makes an assumption that data collection is socially constructive and the results are swayed by what the researcher thinks. The research method is to a large extent qualitative (Johnson and Duberley 2000). The objective viewpoint on the other hand acknowledges the likelihood of neutrality, which makes an assumption that data collection can be conducted objectively without being influenced by the researcher's viewpoint (Evered and Louis 1981). The objective viewpoint is mostly quantitative in nature where scientific methods and procedures are used to understand and illustrate the relations between different variables in order to establish laws that can predict and explain the research question (Ponterotto 2005, Lee 1991).

The usual comparison of qualitative research and quantitative research can lead to neglecting crucial things like the fact that qualitative research in its nature involves many varied approaches (Lin 1998). Qualitative research can be positivist i.e. it can document events that overwhelmingly result in one set of results instead of another. The positivist approach maintains that scientific standards of verification can be used to come up with an explanation of an event and what led to it happening (Lee 1991).

According to Hunt and Morgan (1995a), the positivist approach emphasises that scientific knowledge is based on facts while its ontology regards the reality as separate from social construction. If the research study involves a stable and constant reality, then the researcher can assume an 'objectivist' perspective i.e. a realist ontology is anchored on believing in an objective, real world and isolated epistemological viewpoint based on believing that the statements and perceptions of individuals are either true or false, right or wrong. This belief is based on knowledge being hard and real.

Positivist thinking is associated with a wide range of practices and theories, including Comtean-type positivism, behaviourism, cognitive science, logical positivism (non-realism) and empiricism (Lee 1991). Even though positivistic paradigm has for some time influenced research, it has faced some challenges and criticism from other alternative paradigms i.e. constructivism as well as critical theory, mainly because of its limited subjectivity when it comes to the interpretation of social reality. According to its critics, objectivity has to be substituted by subjectivity when conducting a scientific research. Both constructivism and critical theory present alternative theoretical and methodological ways of doing research (Roth and Mehta 2002).

Realism represents the conventional positivist perspective. However, according to an adapted objectivist tradition called postpositivism, even though the reason of a research exists outside and independent of the human mind, it cannot be realised entirely accurately by human observations i.e. it is almost not possible to be completely objective, but it is still pursued as a manner to regulate the search for knowledge by humans. This is referred to as the critical realist ontology, as advocated by Easton (2002). Therefore, the positivist focus on quantitative studies has been taken over to some degree by an interest in using qualitative techniques to obtain information outside of readily measured variables (Dubin 1978).

Simultaneously, qualitative work can also be interpretivist i.e. it can attempt to understand the meaning of some concepts such as “poverty” or “race”, to try and reveal the conscious and unconscious justifications some individuals may have for what they do or believe (Roth and Mehta 2002).

The interpretivist approach, according to O'donoghue (2006), does not pursue an objective truth in order to undo displays of subjective understanding. He says instead, it assumes that all available types of the truth are created by the observers’ views and the way they understand their world i.e. reality is made up of subjective observations of the external world by people. Therefore, interpretive researchers may embrace an inter-subjective epistemology and the ontological idea that reality is socially constructed.

Lin (1998) argues that interpretivists tend to be anti-foundationalists, who advocate that there is more than one way or approach to acquiring knowledge. On the other

hand, (Lee 1991) argues that the interpretive approach has no right or wrong theories. Instead, the theories have to be judged according to how ‘interesting’ they are to the person conducting the study and to other people who are involved in similar areas. They obtain their constructs from the field by thoroughly examining the phenomenon of interest. According to Angen (2000), interpretive researchers make the assumption that knowledge and meaning are subject to interpretation, hence all objective knowledge is dependent on thinking and reasoning humans. Additionally, Roth and Mehta (2002) state that the basis of interpretive researchers is that people gain access to reality (whether given or socially constructed) through social phenomena such as consciousness, language and shared meanings. Interpretive paradigm is based on observations and interpretations, hence observations are a collection of information about events, while interpretations make meaning of that information by drawing inferences or by evaluating the match between the observed information and some abstract pattern (Easton 2002). It tries to understand things through the meanings assigned by people to those things (O'donoghue 2006).

Roth and Mehta (2002) note that the interpretivist paradigm emphasises the importance of putting analysis in context. The interpretive paradigm has a lot to do with having an understanding of the world experiences of individuals, which are usually subjective experiences. They use meaning (as opposed to measurement) oriented methods e.g. interviewing or participant observation, that depend on the relation between the researcher and subjects, which happens to be subjective. An interpretive study does not necessarily predefine dependent and independent variables, instead it focuses on the whole complexity of human sense making as the event unfolds (Whetten 1989).

There are three ways in which theory may be used in interpretive case studies i.e. theory as a guide on how data is designed and collected; theory as an iterative process of collecting and analysing data; and theory as an outcome of a case study (Lee 1991). This study has made use of theory as an iterative process of collecting and analysing data.

According to Roth and Mehta (2002), interpretivism is not just a single paradigm, but a large family of different paradigms. Hermeneutics and phenomenology are the

philosophical bases of interpretive research (Dubin 1978). Hermeneutics can be regarded as either an underlying philosophy as well as a specific approach to data analysis. As a philosophical approach to human understanding, it gives the philosophical basis for interpretive researchers. As an approach to data analysis, hermeneutics suggests a manner of understanding the meaning or making sense of textual data which may not be clear (Miles and Huberman 1994).

The most important basis of hermeneutics is that all understanding by humans is realised through iteration between consideration of the interdependent meaning of parts and the whole that they form. Modern hermeneutics involves not only written text, but also everything else in the interpretative process that involve verbal and nonverbal ways of communicating as well as prior issues that affect communication, like presuppositions as well as pre-understandings (Healy and Perry 2000). The relationship between parts and the whole is circular because the movement of understanding is continually from the whole to the part and back to the whole (McCarthy 2007). It aims to understand humans in a social context. This is important to this study since it also links with some aspects of the theory of public choice and the theory of economic regulation which were discussed in Chapter 2 i.e. the theory of public choice indicates that policymakers do not necessarily make decisions that are in the interest of the public and simultaneously the theory of economic regulation also indicates that regulators are more inclined to satisfy their own needs rather than those of customers.

As indicated above, the other philosophical base of interpretive research is phenomenology, which can be described as the study of “phenomena” i.e. the way things appear, or the appearance of things based on our experience, or the manner in which things are experienced by human beings; therefore, the meanings things have in our experience (Dubin 1978). Phenomenology tries to establish conditions for objectively studying topics that would generally be considered to be subjective.

(Lin 1998) argues that a phenomenological study explains the meaning of the lived experiences for human beings about an idea or the phenomenon. This means obtaining deep information as well as views using qualitative research techniques like interviews and observations, expressing this information and views from the standpoint

of the research participants; and therefore, challenging structural or normative assumptions.

This study analysed the impact of IPPs entering the South African ESI and thus required interviewing various stakeholders so as to obtain a deeper understanding of issues and views on the changes taking place in the industry. Angen (2000) states that findings or knowledge claims are usually made during the research process itself i.e. findings are made as discussions happen whereby contradictory interpretations are exchanged between the population sample. Additionally, he states that issues such as morals and pragmatism need to be seriously considered when evaluating interpretive science and therefore it was important, during the data collection stage of this study, for the researcher to have an exchange of interpretations with the respondents. This made the interpretivist paradigm more suitable for this study. Therefore, qualitative methods were utilised so that suitable and accurate data can be collected to address the questions in this research. This type of method considered different and diverse aspects including the design of the research. Pratt (2009) highlights that the various types of qualitative methodologies are very similar in terms of their research objectives which attempt to understand the depth of the object being researched. He also mentions that qualitative research can be quite subjective as compared to the quantitative methodology and in most cases, are often open-ended and of an exploratory nature.

It was critical for the research instrument (questionnaire) used in this study to be open-ended because it allowed the respondents to elaborate further and clarify any statements that needed clarification. For example, the first question reads as follows; *"Describe the relationship between IPPs, Eskom and the municipalities as suppliers of electricity"*. A lot of time was spent on this question as it was important to understand the various dynamics. One of the responses was that Eskom will be the off-taker of the power produced by IPPs and will on-sell the power to its customers. This answer prompted the respondent to, while answering the question, start addressing other aspects relating to pricing e.g. whether the IPP pricing will be incorporated in the pricing charged by Eskom (for the benefit of customers), what is the view of the regulator and municipalities regarding this arrangement? etc. Some of these aspects were not explicitly asked in the questionnaire, but the design of the questionnaire i.e.

it being open-ended made it also possible to obtain insight around these issues. This clearly demonstrates the value of having open-ended questions.

Qualitative research has its own advantages. In most instances, it involves reconstructing certain occurrences where interviewees are asked to recall how certain events actually happened as compared to the present situation (Wolverton 2009). This was suitable for this study as interviewees were asked about historical events that led to the decision by the government of South African to allow private companies to participate in the electricity market. A lot of detail was required so as to have a deeper understanding of issues, considerations and decisions that were made. The choice of qualitative research is supported by Pratt (2009) who indicates that the method is strong for the attention to detail, the capability to embrace different behaviours whether verbal or not, uncover meanings, and reveal the subtlety as well as the complexity of cases.

The findings of this study will become available to be tested by other researchers in terms of its applicability. According to Miles and Huberman (1994), although sometimes it might be only one case study, it has the potential of contributing to knowledge on some topic which can then be reinterpreted. Actions can be contextualised in certain situations and certain times. Qualitative research also comes with the benefit of having time to think. Empirical data is used to create the theory and this results in correlation between data and the created theory (Wolverton 2009).

Like any other method, qualitative research has some limitations. Trying to have a deeper understanding of a topic has the potential to lead to either 'going native' or 'macro blindness' i.e. the person conducting the research can attempt to explain what is being observed, without being aware to other situations taking place from outside (Miles and Huberman 1994). Qualitative research can be a lengthy process as it involves some aspects that are beyond the researcher’s control e.g. unavailability of people who are being interviewed (McCarthy 2007).

(Lin 1998) states that at times, qualitative methodologies have been criticised for being too generalised; and therefore, tending to be subjective, which in most cases results in biasness without any precision. In most cases the bias manifests in the presentation of accounts which can be rhetoric. Researchers sometimes try to influence the reader

to think in line with the author's argument and this is achieved by using rhetorical means e.g. metaphors and 'big' words (Roth and Mehta 2002). However, validity and rigour can be determined using procedures which are explained later in this research.

To thoroughly understand the impact of Independent Power Producers in the South African ESI, a methodology was required which allowed respondents to give an account of their deeper understanding of the topic. Therefore, a qualitative approach was deemed to be best suited for this task. In-depth interviews and questionnaires are the essences of any qualitative research and are used in the process of collecting data, in analysing the data and also in the data interpretation step (Golafshani 2003). As previously indicated, all interviews were done using pre-determined open-ended questions which provided an opportunity for respondents to elaborate in order to clarify issues. The research was also done with the assumption that all the interviewees will respond honestly.

The research design is sometimes regarded as the actual structure of the study (Wolverton 2009). It ensures that the important parts of study are aligned. The choice of a research design is mostly determined by the research question and how it is framed. Some things will inevitably be sacrificed when choosing a certain design i.e. focusing on a particular part of a problem will result in other parts being excluded (Johnson and Duberley 2000).

As indicated previously, an interpretive approach was used for the research design which ensured that data was collected efficiently. This, according to McCarthy (2007), comes with some advantages, including the fact that the individuals who are being interviewed are familiar with the structure of the interview process and that the respondents have the ability to deal with complicated issues, hence only senior members of each organisation who work or have previously worked closely to regulation issues that led to the decision to allow IPPs to take part in the ESI, were interviewed. There are also disadvantages which include the researcher's own effect to the interview, the assurance of confidentiality to respondents and the chance that questions could be interpreted differently (Krauss 2005).

3.2.1 Unit of analysis

In this study, the unit of analysis is the Independent Power Producers in the South African electricity supply industry, even though Eskom as the major player in the industry was also examined with the aim of understanding the various market dynamics. Sub-units of analysis include the National Energy Regulator of South Africa (NERSA) as well as the national Department of Energy which is responsible for policy-making.

3.3 Population and sample

3.3.1 Population description

The population of this study is the electricity regulator (NERSA), the Department of Energy (particularly the IPP Office), the Department of Public Enterprise, Eskom, the various IPPs, industry experts and independent energy analysts.

3.3.2 Sample – criteria for selection, size, sampling strategy

The sample is individuals who are presently working or have in the past worked in the South African Electricity Supply Industry comprising senior Eskom managers, representative of government responsible for policy within the Department of Energy, senior managers working at the various IPPs, as well as senior members of the NERSA. Other stakeholders who are considered to be experts in the energy sector as well as energy analysts also formed part of the sample. Sample selection was largely based on their knowledge and experience in the electricity industry and most importantly their close involvement on regulatory issues pertaining to the ESI. Due to their knowledge and experience, the sample was able to provide the necessary insights pertaining to this study.

Table 7 shows the profile of respondents who were interviewed. This includes senior managers at the NERSA which is responsible for energy regulation in the country, the Department of Energy which determines the policy direction and the Department of Public Enterprises which is Eskom's shareholder. Senior Managers at Eskom

responsible for generation, transmission, distribution, pricing and regulation were also interviewed. Respondents also included senior managers at various IPPs, industry experts from consulting companies and universities, as well as independent energy analysts.

Table 7: Profile of respondents (Author's own work)

ORGANISATIONS	DESCRIPTION OF RESPONDENTS	NUMBER SAMPLED
NERSA	Senior Managers*	2
Department of Energy (IPP Office)	Senior Managers*	2
Department of Public Enterprise	Senior Managers*	2
Eskom	Senior Managers*	5
Independent Power Producers	Senior Managers*	5
Consulting companies	Industry experts	2
Media companies	Independent energy analysts	2
TOTAL		**20**

**Senior manager are individuals with authority to make decisions on behalf of their organisations and can also inform the strategies of their respective organisations. This includes executives.*

a. Number of respondents

According to Marshall (1996) and supported by Daly and Lumley (2002), for qualitative research, a suitable and proper sample size is one that sufficiently addresses the research questions. For simple questions or even detailed research, single figures might sufficient; whereas for questions that are complex, larger samples and various

sampling methods might be required. In reality, the number of required subjects typically becomes evident as the research proceeds, as new classification, themes or responses stop developing from the data i.e. data saturation. This clearly needs a flexible research design and a repetitive, cyclical approach to the process of sampling, collecting data and interpreting it. This is different from quantitative research and can make it difficult to predict the sample size.

The interviews were conducted as planned in terms of the sample size i.e. all of the 20 sampled participants were available and willing to take part in the study. This response rate is important as it ensured that the responses are representative of the electricity sector population, particularly in a specialised area such as the IPP segment of electricity generation in South Africa.

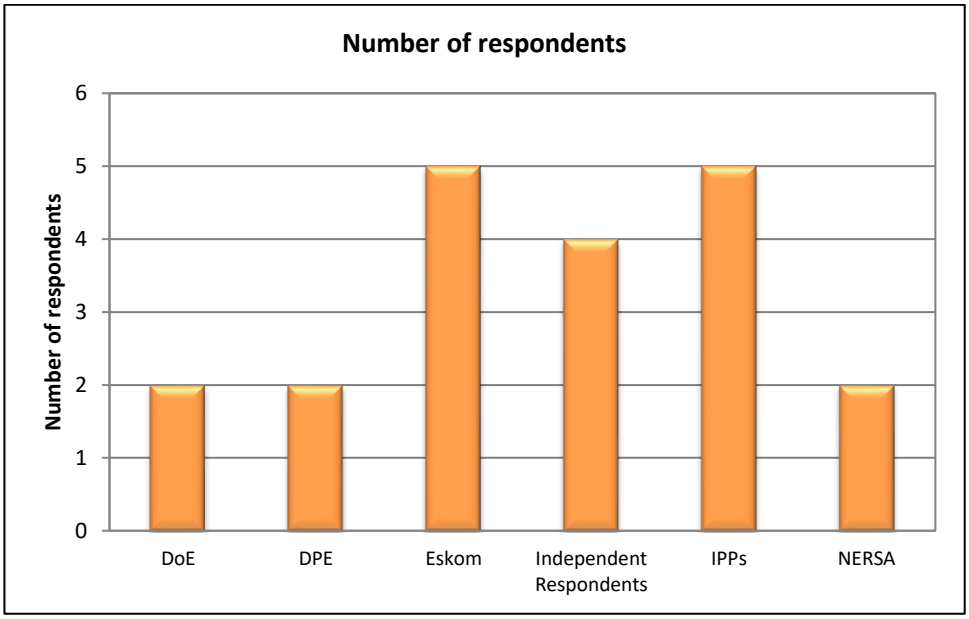


Figure 9: Number of respondents (Author's own work)

The respondents comprise of individuals who are directly involved in the ESI and particularly with IPPs in one way or the other. As presented in Figure 9, the highest number of respondents are from Eskom with 5 participants. Eskom is a big player in the introduction of IPPs in the country as it is the off-taker of the power generated by IPPs. The other higher number of respondents comes from the IPPs which also had 5 participants. The IPPs are responsible to produce the power and make sure the IPP

sector is viable. The third highest number of respondents is 4 independent respondents which is made up of 2 industry experts and 2 energy analysts. Industry experts have extensive and valuable experience particularly in the IPP sector whereas energy analysts have a 'bird's eye-view' of the South African energy industry which includes but not limited to IPPs.

The DoE, DPE and NERSA had 2 respondents each. The DoE is responsible for determining the policy direction of the country and the IPP Office reports directly to the DoE. The DPE is the sole shareholder of Eskom and other state-owned enterprises whereas the NERSA is the regulator of the energy industry in the country.

b. Race and gender of respondents

South Africa as a country has transformation objectives for each sector of the economy, as a result it is important to analyse the transformation elements such as race and gender as most government tenders including the awarding of IPP contracts takes these into consideration.

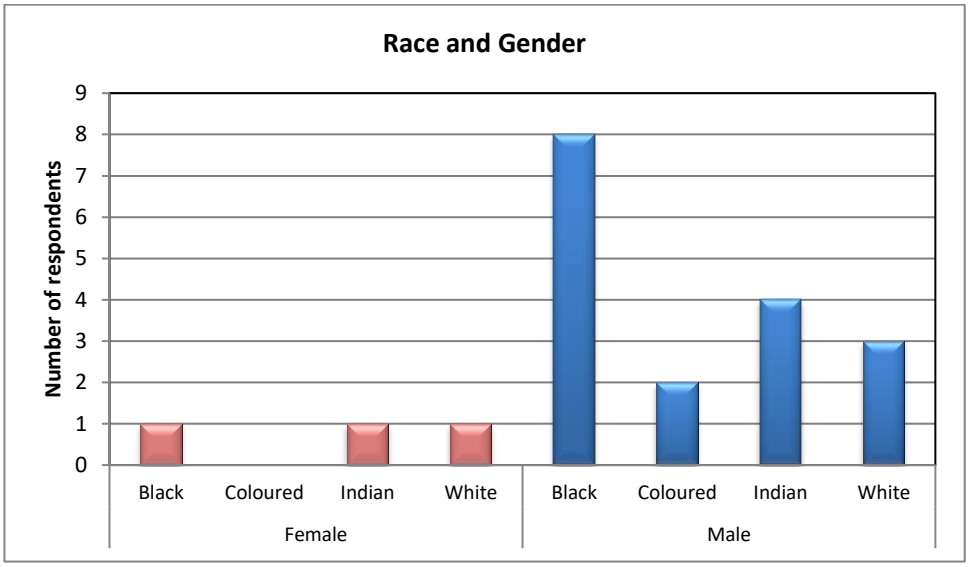


Figure 10: Race and gender of respondents (Author's own work)

The make-up of participants of the study is quite varied in terms of both race and gender. Figure 10 shows that 9 of the participants are Black, which represents 45% of the sample. This is made up of 1 female and 8 males. The second highest race in the sample is Indian with 5 participants of which 1 is female and 4 are male, representing 25% of the sample. 20% of the sample is White with 1 female and 3 males. Coloureds make up the remaining 10% with 2 males and no females.

c. Experience in the ESI

As presented in Figure 11, different participants occupied different positions in their respective companies. Out of the 20 participants interviewed, 3 are Chief Executive Officers, 4 are General Managers and 3 are Senior Managers. There were 5 interviews conducted with individuals from the Government. 1 Programme Manager and 4 Independent Respondents were also interviewed. The 4 Independent Respondents include 2 Industry Experts and 2 Energy Analysts.

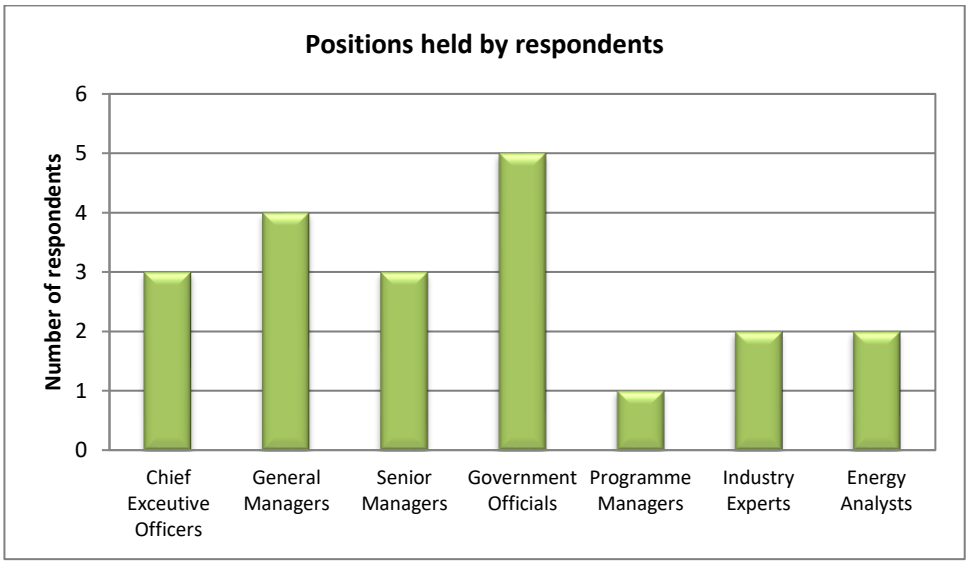


Figure 11: Positions held by respondents (Author's own work)

d. Age of respondents

Figure 12 shows a breakdown of the different age groups among the respondents. The biggest age group which makes up 25% of the sample is between 40 and 45 years. This is followed by the 35 to 40 years age group representing 20% of the sample. The 45 to 50 years and the 50 to 55 years age groups represent 15% of the sample, each. The 25 to 30 years and 55 to 60 years age groups make up 10% of the sample, each. The oldest group which is between 60 and 65 years makes up the remaining 5%.

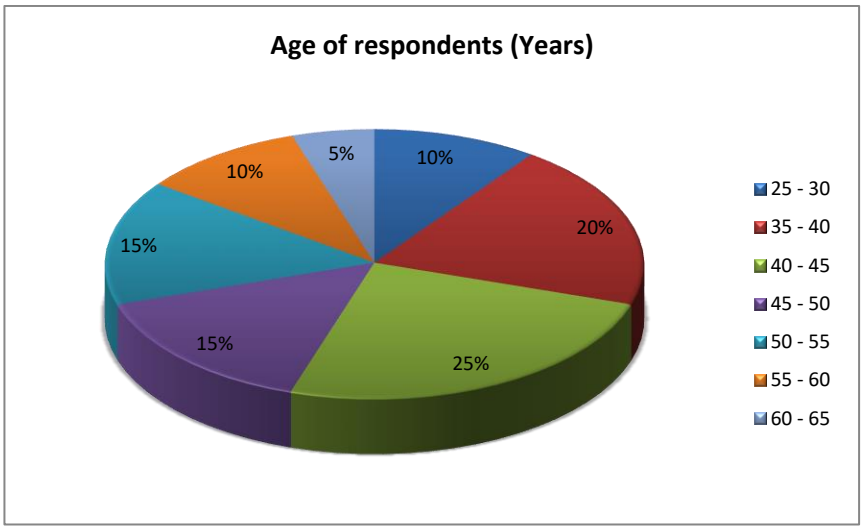


Figure 12: Age of respondents (Author's own work)

e. Experience within the IPP sector

In order to ensure that the responses are credible, it is important to interview individuals with the relevant experience. Figure 13 shows that the total number of respondents with experience in the IPP sector is 13 which represents 65% of all respondents. 35% of the entire sample has 1 to 3 years' experience in the IPP sector, 15% have worked in the IPP sector for between 4 and 6 years, 10% have 7 to 9 years working experience in the sector and only 5% has worked in the sector for 10 to 12 years.

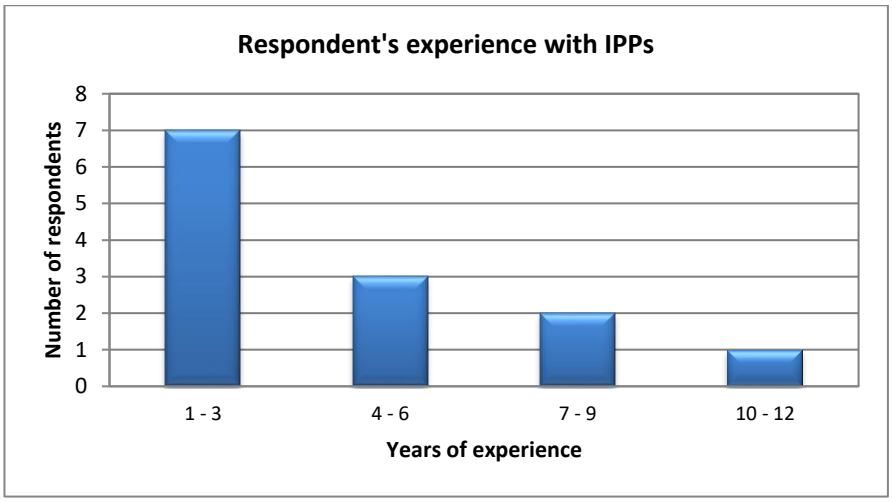


Figure 13: Experience within the IPP sector of the ESI (Author's own work)

f. Experience in the ESI

Figure 14 shows that 7 of the respondents have worked in the electricity supply industry for 1 to 3 years. This represents 35% of the sample. This is followed by 4 who have 4 to 6 years and 3 who have 7 to 9 years' experience in the ESI. There were 2 participants who had experience of 10 to 15 years and another 2 with 16 to 18 years' experience. The remaining 2 participants, who represent 10% of the sample have been working in the ESI for more than 18 years. Therefore, the sample is made up of individuals with the relevant experience in the electricity industry.

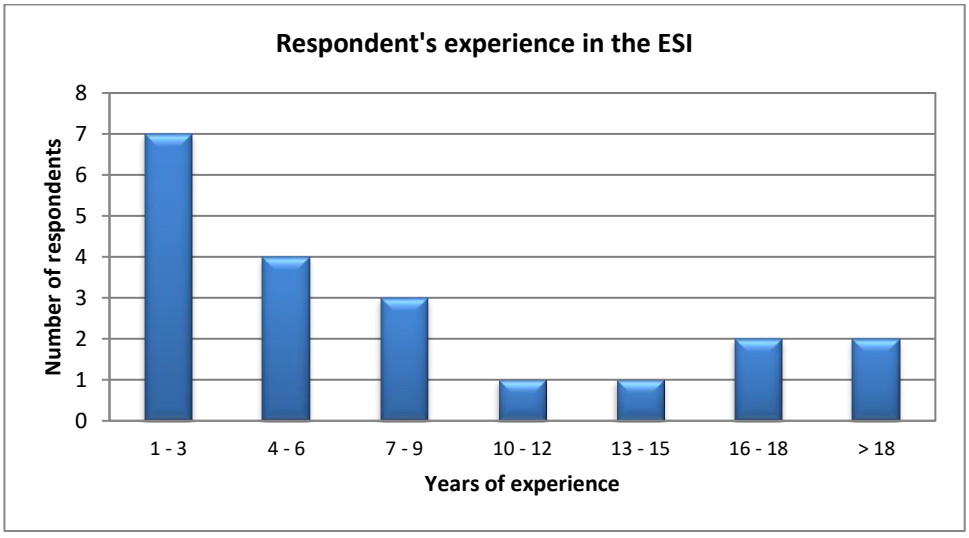


Figure 14: Experience in the ESI (Author's own work)

3.4 The research instrument

Interviews were semi-structured whereby pre-determined set of open-ended questions were used which provided the opportunity to further explore certain themes or responses. However, semi-structured interviews can be time consuming, as cautioned by Angen (2000). The research instrument ensured that interviewees were able to provide their opinion. Interviews are important in that they ensure respondents are given an opportunity to respond in a manner that is comfortable (Smith 2009). Most questions on the research instrument were open-ended, thereby allowing respondents to be detailed when answering the questions. This is critical to this particular study as it ensured that the respondents were able to provide historical information and an account of prior decisions that led to the ultimate decision of allowing IPP participation in the ESI. The historical information was quite important as provided some light as to why it has taken South African government so long to act on a decision that was made more than a decade ago.

A semi-structured interview has some advantages as it ensures that the researcher can have a deeper understanding of issues and is able to explain issues when necessary. One of the disadvantages is that in most cases respondents are concerned about their disclosure and also there is a possibility that they may not be comfortable with sharing sensitive information (Smith 2009).

Some respondents were asked questions that are not necessarily in the questionnaire for them to elaborate and clarify certain aspects. As recommended by McCarthy (2007), every effort was made to ask all questions in the questionnaire using the same wording for each respondent. However, selected respondents were re-contacted in order to verify the conclusions.

3.5 Data analysis method

The data obtained from various interviews were taken through a process of thematic analysis using a framework advocated by Braun and Clarke (2006) and Grounded Theory as advocated by Charmaz (2006). In order to interpret the data, a Computer Aided Qualitative Data Analysis Software (CAQDAS) called Atlas.ti was used to reveal

and analyse unstructured data e.g. text and multimedia. The software provides tools that assists the researcher to code and interpret findings in primary data material to visualise the complex relationships between them. Atlas.ti consolidates many documents and tracks all notes, comments and codes in all fields that need to be studied and analysed. The fields analysed can be made up of text, images, audio and video. The software also provides analytical and visualisation tools that assist in opening new interpretative views on the data being analysed.

According to Braun and Clarke (2006), there are six different phases of conducting analysis, as shown in Table 8, which have been used in this research.

Table 8: Thematic analysis phases (Braun and Clarke 2006)

#	PHASE	PROCESS DESCRIPTIION	RESULT
1	Familiarising yourself with your data	Gaining intimate knowledge of the data by reading and rereading the data, while noting occurring patterns.	Detailed notes with preliminary codes
2	Generating initial codes	Creating initial codes by noting where and how patterns occur i.e. reduction of data by collapsing it into various categories. This phase also involves making inferences on the meaning of the created codes.	Codes that address the research question(s).
3	Searching for themes	Combining codes into different themes and describing the meaning of each theme.	List of themes to be analysed further
4	Reviewing themes	Looking at how the data and the predominant theoretical perspective are supported by the themes.	A thematic map showing how themes tell a correct story regarding the data.
5	Defining and naming themes	Defining each theme, naming it and determining what is interesting about the themes.	Knowing how the themes assist in understanding the data
6	Producing reports	Deciding which themes contribute to understanding the data in relation to the research questions and literature.	Description of the results

The interview data were loaded onto Atlas.ti where the processing of data was automated, making it easier to analyse. In order to ensure anonymity as well as confidentiality, each record of data was assigned a fictitious name. During the first phase, which involved familiarising oneself with the data, each transcript was read a few times to understand the prominent issues emanating from preliminary codes, and how they relate to each other, while simultaneously noting occurring patterns, particularly those that address the research questions. For example, one of the occurring patterns at this stage was the fact that most respondents expressed the need to fast-track the introduction of IPPs in the South African ESI and significantly reduce Eskom's dominance in the process.

Memo writing presents an on-going dialogue for the researcher which assists in clarifying what is going on in the field and what can be deduced from the data. It encourages the researcher to examine the data and identify codes in the data which will make it easier for comparison (Jennifer and Eimear 2006). Basically, memo writing is a process that allows the researcher to reflect on the data so as to remember, question, analyse and create meaning out of that data (Charmaz 2006). It is important to question the data as it can trigger new thinking of the different categories.

In this study, memo writing assisted with recording the emerging thought process for reconsideration later in the process. It also assisted with clarifying and identifying relationships with other concepts e.g. an emerging thought process at this stage was that most respondents, except four, were in support of the unbundling of Eskom's generation business into different generating private companies or IPPs. This information was used later in the process to relate it to the question of market entry barriers which is discussed at length in Chapter 6.

The next stage in thematic analysis involves generating initial codes i.e. the generation of list of issues that have a recurring pattern and code them using the Atlas.ti software. The data was read repeatedly, reflected upon and then followed by the identification of key issues that addressed the research questions. As suggested by Charmaz (2006), initial codes were created by 'tearing the interview apart' i.e. reviewing each word and each line, followed by assigning a word to each code. The process of coding evolves through an inductive analysis and is non-linear, but a more cyclical process

whereby codes emerge as the research process progresses. This meant going back and forth between different phases as required, until final themes emerge. This process of generating codes can be regarded as both data complication and data reduction (Braun and Clarke 2006). The complication of data is used to interrogate the data further by creating new questions and interpreting the data.

Searching for themes makes it possible to start analysing potential codes. This phase is critical as it looks at how different codes come together to create over-reaching themes in the data. At this point, there was a list of themes which was used to focus on broader patterns in the data as well as combine code data with other emerging themes. Relations between codes and themes; and also between various levels of existing themes, started forming. It is critical to address what is missing from the data as it is to deal with what is contained in the data. As many potential themes emerged in this phase, it was very important to avoid destroying or discarding those themes that may be considered to be insignificant as they may turn out to be important later as the process of analysing the data continues.

The next phase of reviewing themes involved searching for data that agree or do not agree with the proposed theory. This made it possible to further expand on and revise themes as and when they emerge. At this point, it was important to have some potential themes because this is where initial themes can be reworked. Some existing themes collapsed into each other while others had to be reduced into smaller parts.

Defining and naming existing themes is an important phase as it assisted with analysing the data with each theme. Identifying the essence of themes assisted in understanding how each theme impacted the whole picture of the data. Analysis during this phase involved determining which parts of the data would eventually be captured, what is interesting about the themes and also why are the themes interesting. The analysis was concluded when a point of saturation was reached i.e. analysis of additional interviews did not yield any new information. As much as data for this study was obtained from 20 respondents, a point of saturation was reached after analysing data from 17 respondents.

After reviewing final themes, the last phase is producing a report. It was important to determine the themes that meaningfully contributed to addressing research questions

which were later refined as to be final themes (Braun and Clarke 2006). Once the data analysis process was concluded, the emergent themes were analysed and the relationships between them were used to construct a narrative and a theoretical inference (Lacey and Luff 2001). The whole intent of this phase is to write the thematic analysis in such a way that it conveys the complex story extracted from the data, in a way that gives comfort to the reader about its validity.

3.6 Limitations of the study

The respondents identified for this study are amongst the few knowledgeable individuals on the subject. As a result, the sample size may be perceived by some to be small. Due to unforeseen circumstances, some interviews were postponed to a later date which was outside the data collection period. To mitigate this risk, other suitable respondents were identified to take part in the study. Efforts were made to ensure that only respondents with the necessary knowledge and experience were identified.

The fact that the study is qualitative could be a limitation to individuals who would like to evaluate the South African electricity supply industry in a quantitative manner.

The focus of the study is confined to IPPs operating within the South African context.

The study does not address other types of energy such as oil and gas, but focuses strictly on electricity.

3.7 Validity and reliability

3.7.1 External validity

Validity aims to establish if the research is actually measuring whatever that is supposed to be measured or if the findings of the study are true (Golafshani 2003). Neuendorf (2002) defines external validity as the ability to generalise findings to other groups and not only to the population in question.

The method of triangulation is a validity procedure used by researchers to establish if there is any convergence amongst the many different information sources to form

themes in a research (Golafshani 2003). Initially, it was meant to be used when analysing quantitative data. It was meant to improve the validity of a study by searching for the extent of convergence in the findings by using various methodologies and measurement techniques (Norwich 2007). In terms of analysing qualitative data, it was meant to search for convergence in the results that were obtained from different and systematic uses of methods and theories.

The study is relevant to other developing countries which are either undergoing electricity sector reforms or are intending to do so in the future. The study ensures external validity through learning from prior experiences of other countries and the literature that cover electricity supply industries in different countries (O'donoghue 2006).

3.7.2 Internal validity

The importance of internal validity is to make sure that the process of collecting the required data is uniform and reliable at all times (Neuendorf 2002). In this research, internal validity was ensured by utilising the same structure of the interview and research instrument. According to Golafshani (2003), the fact that the research is adaptive will draw differing supplementary questions. The author further states that internal validity can also be achieved by numerous contacts at each entity.

3.7.3 Reliability

“The extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable” (Golafshani 2003: 598). Reliability looks at accuracy of methods and techniques used in research to produce data. Therefore, it is very important for the research instrument to be reliable. In other words, one needed to be certain that the responses obtained will not be affected by any person using the research instrument (McCarthy 2007).

A situation that appears to be puzzling can be simplified by conducting a good qualitative research. This is more so when reliability is used to evaluate quality (Smith 2009). Reliability of this study was assured through the process of selecting respondents. It was important for respondents to have a deep understanding of the South African electricity supply industry in order for them to provide trustworthy and dependable data. The validity and reliability of this study was reinforced by using the test as proposed by Yin (2009).

Table 9: Test for validity and reliability (Yin 2009)

TESTS	CASE STUDY TACTIC	WAS THE TACTIC USED?	RESEARCH STAGE WHERE TACTIC WAS USED
Construct validity	• Making use of many source of evidence	Yes	Data collection
	• Confirm chain of evidence	Yes	Data analysis
	• Interview transcripts must be reviewed by respondents	Yes	Data analysis
Internal validity	• Check for matching patterns	Yes	Data analysis
	• Build explanation	Yes	Data analysis
	• Usage of logic models	Yes	Data analysis
External validity	• Usage of replication logic	Yes	Research design
Reliability	• Usage of case study protocol	Yes	Data collection

CHAPTER 4: PREVIOUS ATTEMPTS OF REFORM

4.1 Introduction

The National Energy Regulator of South Africa (NERSA) is responsible for the regulation of the electricity market in South Africa; and for many years the generation, distribution and transmission of electricity have been monopolised by Eskom which is 100% owned by the state.

South Africa has been contemplating on restructuring the electricity supply industry for almost two decades without any real implementation taking place. Since the early 2000's, there have been proposals for new structures and regulation for the separation of the elements of the electricity supply value chain i.e. from generation, transmission through to distribution, and to introduce competition in the market by introducing private companies. The purpose of this chapter is to discuss previous attempts to reform the ESI which ultimately led to the establishment of the Renewable Energy Independent Power Producers Procurement Programme that has been used as a vehicle to introduce IPPs in the market, which is later discussed in Chapter 5.

4.2 Reforming the South African ESI

4.2.1 Government's objectives for the ESI

The South African electricity supply industry has assisted government in delivering on some important social and economic objectives e.g. approximately 90% of households have access to electricity. Additionally, until around 2008, electricity prices have been generally low and this assisted the competitiveness of the market, especially in the sectors that consume a lot of power. The government controls big assets in the ESI which are critical to achieving future social and economic goals, including:

- promotion of rural development through electricity;
- continuously improving access to reliable electricity supply;

- competitive and sustainable electricity tariffs to support industrial development;
- reduced sovereign debt and achieving socio-economic goals by exploiting value in assets owned by the government;
- encourage foreign direct investment into the country;
- increasing the participation of black South Africans in the economy through the Broad-based Black Economic Empowerment; and
- security of power supply.

However, one of the respondents to this study emphasised that the important question to be asked is following:

"Is the ESI currently structured in a manner that will assist the state to achieve these goals?"

The first two objectives could potentially be achieved in almost any ESI structure. Electrification is an activity that needs capital investment and is the responsibility of the distribution business, not the generation side which is more focussed on power supply. However, it is important for the country to have an ESI that is efficient as this could result in a sustainable electrification effort and reforming the ESI has the potential to unlock economic value from the sector which can be used to achieve electrification objectives.

The objective of security of supply, on the other, can prove to be challenging to achieve. Capacity investments that are done by monopoly utilities tend to result in over-investment and this has been the case with Eskom in the past and also recently (as Eskom announced in 2017 that the utility now has excess capacity). Investments that are driven by the market are likely to result in optimal efficiencies. As highlighted by one of the respondents in this study:

"Commodity markets have the ability to provide security of supply, but this is still being debated. Some commodity markets result in over-investment and sometimes under-investment. The situation may be

worse when it comes to electricity due to challenges of storage and the inability to stockpile. Under-investment is likely to create volatility of prices and even result in black-outs in some instances. The Integrated Resource Plan can show early warning signals to various stakeholders regarding the risks associated with under-investment, and the government may need to intervene by way of capacity investments in the market."

4.2.2 Earlier attempts to reform the South African ESI

Around the late 1990's and early 2000's, the South African government's response to challenges relating to operational efficiencies, technical capacity and poor financial management, in the distribution side of the ESI, was to create energy distributors that are more viable financially. The thinking at that time was to take distribution business away from Eskom and merge it with municipal distributors into six regional electricity distributors (REDs). Furthermore, the Eskom Conversion Bill was meant to consolidate the privatisation of Eskom and convert Eskom into a public company wholly owned by the state. Eskom would then be liable for paying taxes and dividends. Eskom would also have the ability to establish subsidiaries for the different business divisions. Below are other considerations that enticed government to continue pursuing the idea of reforming the industry:

- Low electricity prices in the future as well as economical sustainability – The government wanted to make sure that electricity prices are significantly reduced as a result of operational and allocative efficiencies, but should not be to the detriment of the utility.

  - *Operational efficiencies:* Globally, it has been demonstrated that introducing competition in the generation side of the industry has in many instances resulted in reduced costs as well as improved productivity. Electricity, therefore needs to be regulated in a manner that ensures that these benefits are passed on to consumers and not only investors.

- *Allocative efficiency:* Following many years of excess capacity, the South African government had to make investments decisions, particularly in new power stations. It was important that the decisions were taken with industry structure in mind in order to ensure that capital was allocated in an efficient manner. Usually, the costs that come as a result of bad investment decisions are merely passed on to customers. Some stakeholders argued that when industry reform takes place, there would only be minimum tariff increases as investors will tolerate a more equitable portion of the risk and hence will be incentivised to make least-cost investments.

- Unlocking economic value – The government wanted more economic and financial benefits from state-owned entities. There had been only small financial benefits received by government from the resources that owned by the public and invested in Eskom; and the utility paid no tax. The government could have restructured the ESI, so as to enhance the industry value including the associated financial returns either in the form of cashflow or profits from privatisation. This income received could have been used for social benefits in terms of better funding transparency of the electrification programme, in addition to providing financial support for other social imperatives like reducing the debt of the state. There would have been an important trade-off between maximum profits as a result of privatisation and making sure that the value of electricity assets is not too high to a point that electricity prices increase due to revenue streams that are necessary for investors to achieve their financial targets.

- Broadening economic ownership – South Africa needs to encourage and promote active participation in the economy by most citizens. Around the early 2000's, Eskom was one of the biggest as well as the best performing state-owned enterprise (SOE). Its power stations presented ample opportunities for the promotion of broad-based black economic empowerment by offering discounted equity which could have been repaid through earnings and dividends. An initial public offering (IPO) could have enabled broader participation by the public, at that time.

- Foreign direct investment (FDI) – South Africa did not have sufficient savings domestically and it was important to attract global funds into fixed domestic investment in order to grow the economy. Experience has shown that international investors are generally interested in financing new and existing power stations, especially where the rules of engagement are clearly understood by all interested parties.

4.3 Government policy in the electricity sector

4.3.1 Policy decisions for the electricity distribution industry

The considerations around reforming the South African ESI dates as far back as 1992. A decision was taken immediately after the establishment of the National Electrification Forum, which included a prolonged engagement amongst civic representatives, labour unions and industry participants; to establish the National Electricity Regulator (NER) which has since been renamed to the National Energy Regulator of South Africa (NERSA). The NER then put together the Electricity Working Group which was tasked to devise proposals for restructuring the electricity distribution industry. The government then established the Electricity Restructuring Interdepartmental Committee, which presented its proposal to Cabinet which focused on combining municipal electricity utilities and Eskom into six REDs. The REDs were planned to start operating as from 2004.

One of the interviewed respondents said it was important to note the following:

"Full retail competition was not part of the proposal at that stage, even though it was envisaged later on. According to the plan, the REDs would have franchised customers within their geographic boundaries and would be responsible for both the distribution and selling of electrical power."

4.3.2 Policy decisions for the electricity supply industry

Over and above the electricity distribution, the government had also started reforming the electricity supply industry. The basis for reforming the ESI was in the White Paper on Energy Policy which was promulgated in 1998. The White Paper had the following objectives for the ESI:

- access to energy for the poor;
- supplying high-quality electricity at a low cost, thereby improving the efficiency and competitiveness of the country's economy; and
- using natural resources to achieve environmental sustainability.

The White Paper also highlighted the importance of improving governance within the energy sector and attaining energy security using a diversified power supply. It further states that there needs to be some considerations in order to make sure that the ESI as a whole is successful, and these include:

- customers having the right to choose their preferred power supplier;
- introduction of competition in the ESI, particularly the power generation side;
- access to the transmission network must be open and non-discriminatory; and
- introducing the private sector in the ESI.

The White Paper further stated that Eskom would need to be unbundled into two separate companies, with one focusing on generation and the other on transmission; and that the different power stations would be divided into various companies. The Minister of Minerals and Energy at that time further stated that the government's foremost goals to restructure are to:

- reduce costs and prices by increasing efficiency when making decisions around investments and operations;
- increase profitability to government;

- increase participation of black South Africans in the ESI through Black Economic Empowerment;

- improve the poor's access to electricity, R&D, energy efficiency, and environmental sustainability.

In the second half of 2000, the government published a Policy Framework on restructuring which was entitled "An accelerated agenda towards the restructuring of state-owned enterprises", which highlighted the following:

- Eskom would be corporatized i.e. every division of the utility (generation, transmission and distribution) be converted into a separate entity;

- there would be a creation of various generating companies in order to encourage internal competition before the participation of the private sector is introduced in the ESI; and

- introduction of strategic equity partners into various business units of Eskom Enterprises.

The Policy Framework further states that transmission would most likely remain under the control of government; and that it will most likely operate as a separate enterprise. The Eskom Act of 1987, as amended from time to time, was replaced by the Eskom Conversion Bill of 2001. The Bill converted Eskom into a public company (Eskom Holdings Limited) with the state being the sole shareholder. This was the first step in the process of unbundling Eskom. As a result of this, Eskom is now required to pay taxation and dividends. According to a memorandum to the Conversion Bill, the reason for converting Eskom into a public company is to improve efficiency and competitiveness in the Eskom's operations; expose Eskom to international trends; and ensure that the utility is operated based on sound principles of cooperative governance. It continues to state that:

> *"The unbundling of Eskom would be beneficial to the country, especially if overtime, the utility decided to take advantage of being listed on a stock exchange where private individuals would have the option of acquiring shares in the power utility."*

In 2001, the proposal to restructure the ESI, which would ensure that the electricity sector is liberalised, was approved by Cabinet which also approved that:

a. for Government to achieve its developmental and social goals, Eskom should continue its dominance in the existing ESI;

b. there would be an introduction of a limited participation by the private sector within the existing power generation market;

c. 10% of the existing generation capacity should be sold to Black Economic Empowerment (BEE) before the end of 2004;

d. in order to make sure that there is no discrimination and that there is non-discriminatory access to the transmission network, a separate transmission company wholly-owned by the state would be created, with ring-fenced transmission system operator and market operator roles. The company would operate independently of the generation and retail businesses. At the beginning, this transmission company would be a subsidiary of Eskom Holdings;

e. as time progressed, there would be a multi-market model of power generating plants, customers as well as traders, which could be implemented using a number of platforms such as future markets, bilateral contracts, and day-ahead markets;

f. there was a regulatory framework in place which would ensure that there is participation of IPPs with different primary energy sources;

g. the transmission company would also be responsible for planning and development of the transmission network;

h. as implementation progresses, and in consideration of the strategic goals of the Southern African Development Community (SADC) region, the Southern African Power Pool (SAPP) should become an independent system operator for the region,

where there would be participation of both public and private power generation companies; and

i. by changing the function of the regulator, which would involve changing the legislative framework that defines the NER's role; a new framework must be developed which will focus on licensing, changing the price-setting routine and creating the necessary capacity for monitoring the effectiveness of the restructured ESI.

4.4 Conclusion

There is an urgent need to get on with restructuring the electricity industry in South Africa and this was recognised as far back as 1992 (Eberhard 2001), but progress since then has been slow . According to Hansen (2000), the government proposed restructuring the industry into a number of regional electricity distributors that would take over the electricity distribution function from municipalities and Eskom, who will be given shares in the REDs in exchange for their distribution assets. It was also proposed by government that the REDs be controlled by boards consisting of customers, trade unions, national and provincial governments, municipalities and Eskom. To date, none of these proposals got to be implemented (Ciglmayr 2013).

CHAPTER 5: INTRODUCING IPPs THROUGH THE REIPPPP

5.1 Introduction

As discussed in Chapter 1, the first research question of this study focuses on understanding the impact of introducing competition in the South African Electricity Supply Industry, particularly the introduction of Independent Power Producers. Having outlined the methodology applied to examine this research question in the previous chapter, the purpose of this chapter is to present the findings relating to this research question.

Power constraints experienced in South Africa have forced the government to, for the first time, allow Independent Power Producers (IPPs) to participate in an electricity supply industry which has always been monopolised by the state-owned utility, Eskom. IPPs were introduced in the electricity supply industry using the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) as a vehicle. The participation of privately-owned generation companies in the electricity market was ratified by the government in 2003. It was envisaged that ownership of the power generation component of the electricity value chain would be split between Eskom (70%) and IPPs (30%). However, over a decade later; the contribution of IPPs in the generation of electricity has been minimal as over 93% of South African electricity is still being generated by Eskom. In July 2016, Eskom took a decision not to sign any more IPP agreements but was forced to revise its decision due to pressure from IPP companies and a statement by the president of the country in February 2017 where he categorically announced that IPP agreements will be signed. This resulted in a statement by Eskom in the following month where the power utility proclaimed that it plans to shut down four of its coal-fired power stations to accommodate renewable IPPs. This would result in a total of 7 600 MW (from Hendrina, Kriel, Camden and Komati Power Stations) being removed from the grid. The decision, which was expected to be implemented over a few years is a significant one since it would potentially expedite the industry reform process.

In many liberalised electricity markets, the focus at the beginning is on restructuring the generation part of the industry and coming up with suitable and sustainable price

mechanisms. The transmission and distribution parts of the industry tend to be impacted only to a lesser extent and this is mainly due to their monopolistic nature. As the introduction of competition takes place over time, there is an increase in the need to introduce changes in regulation that will create a conducive environment to move towards reducing monopolistic behaviour in the market. In the past, public interest and the natural monopoly which is inherent in companies owned by the state have been used to justify regulation of the market.

The supply of electricity by IPPs is a key focus of the government of South African for the improvement of the country's electricity situation. The Department of Energy (DoE) ran a competitive bidding process to procure renewable energy from qualifying IPPs. About 4 000 MW from various renewable energy companies was secured in the first three bidding stages of the government's Renewable Energy Independent Power Producer Procurement Programme.

As renewable energy from IPPs connected to the grid becomes more common internationally, there have been debates about which policy instruments will be most effective in accelerating and sustaining private sector investment into power generation. Feed-in tariffs (FITs) have been the more preferred supporting instrument by government to expedite investment in renewable energy generation from the private sector. FITs reflect the actual cost of producing some types of energy as predetermined by government analysis, instead of being set because of a bidding process. FITs are mostly implemented in long-run power supply agreements to generators of power from renewable resources. On the other hand, there has been an emergence of competitive tenders or auctions in most areas as acceptable mechanisms, particularly in emerging markets. Tenders normally result in reduced tariffs while simultaneously offering sufficient advantages for renewable energy producers to enter the market.

South Africa is currently at the centre of this discussion. In 2009, the South African government started considering the use of FITs for energy produced from renewable resources, but competitive tenders were preferred instead. The initial outcomes of the REIPPPP have been generally encouraging. Round 1 of the bidding process managed to attract a lot of local and international project developers as well as private investors

who have contributed private expertise including investment into renewable energy technologies at very competitive prices. In Rounds 2 and 3, the REIPPPP managed to promote competition which resulted in reduced prices. The bidding rounds were all completed in just under 3 years with transparent and timely evaluations. The projects are now either under construction or are already being operated.

5.2 From REFIT to REIPPPP

South Africa's commitment to minimise its green-house gas emissions was the driving force behind procuring power generated using renewable resources. In order to increase power supply from renewable energy sources, the country started by exploring the option of renewable energy feed-in tariffs (REFITs) with the REFIT policy being approved by NERSA in 2009. Prices were mainly meant to recover production costs as well as a 17% return on equity (after tax) and were also linked to inflation. Feed-in tariffs that were published at the beginning were generally considered to be generous by most developers. This included wind energy at 15.6 US c/kWh, concentrated solar power at 26 US c/kWh, and solar PV at 49 US c/kWh. However, there was some significant uncertainty regarding the nature of the licensing and procurement process. There was some uncertainty with regards to Eskom's intention to support the REFIT programme as well as the legal legitimacy of FITs within the country's procurement framework.

There was a new type of uncertainty which was introduced in March 2011 by NERSA which involved a publication of a consultation paper advocating for lower FITs. The paper argued that some parameters, including the cost of debt and exchange rates, had changed. The new tariffs were reduced by 25% for wind, concentrated solar power was less by 13%, while solar PV was lowered by 41%. Additionally, inflation would not be used to index the capital component of the tariffs (Table 9). Critically, in NERSA's amended financial assumptions, the required return on equity remained unchanged.

Table 9: REFIT prices and REIPPPP prices (DoE 2016)

	REFIT (R/kWh)		REIPPPP (R/kWh)		REIPPPP (US c/kWh)
	2009	2011	Bid Cap	Round 1	Round1
Wind	1.25	0.94	1.15	1.14	14.3
Solar PV	3.94	2.31	2.85	2.76	34.5
CSP	3.14	1.84	2.85	2.69	33.6

More regulatory and policy uncertainty was introduced. The DoE and National Treasury received a legal opinion which concluded that FITs were not competitive and consequently were not allowed by the national public finance and procurement regulations. This happened at a time when NERSA was concerned that FITs were quite high. The DoE and National Treasury then took the responsibility of reviewing the approach by government. The central objective of realising renewable energy technologies at a larger scale with the private sector remained unchanged, but the structure of the transactions which included FITs changed substantially.

A number of consultations, albeit informal, were held with various project developers, financial institutions and lawyers during the first six months of 2011. The engagements were very essential in terms of alleviating concerns by the market arising from the previous REFIT process and giving feedback from the private participants in terms of legal, technology and design issues.

Later in 2011, the Department of Energy indicated that there will be a more competitive bidding process to be launched i.e. the REIPPPP. Following that, the REFITs were officially discontinued by NERSA. No power purchase agreements had been signed during the REFIT days due to the fact that there was never a practical procurement process which could be implemented.

One of the individuals interviewed responded as follows:

> *"What I observed is that; the discontinuation of FITs was not welcomed by some renewable energy project developers, especially those that managed to secure sites and started resource measurements as well*

as environmental impact assessments (EIA), but, it was the same developers who benefited from Round 1 of the competitive REIPPPP bidding process."

5.3 Economic Development Goals vs Pricing

5.3.1 Requirements for economic development

The highly contentious part of the REIPPPP was the fact that it relied a lot on non-price issues when bids are being evaluated. These factors, which appeared under the heading of "economic development requirements" in the bid documents, were designed to encourage bidders to focus on black economic empowerment, localisation, job growth and community development. Economic and social development which was responsible for 30% of total bid value, has contributed a lot in the REIPPPP procurement process as compared to the expected contribution of non-price criteria.

These requirements were contentious for many reasons. Most international bidders viewed the requirements as too demanding with a significant contribution in the bid valuation. On the other hand, local bidders which were supported by labour organisations, viewed the requirements as too relaxed and not sufficiently stringent. There seemed to be some confusion amongst different types of bidders regarding some of the criteria, particularly those requiring the inclusion of local economic development plans in the bids. However, there was initially no guidance given in terms of how these plans were supposed to be prepared and evaluated. Furthermore, as the process progressed through various bidding rounds, there were some requirements of economic development that proved to be more burdensome, especially when responding to complaints received from local stakeholders. There were talks of introducing further changes in some of the criteria, particularly between the second and third bidding rounds. This made it challenging for bidders to finalise their proposals because timelines were very tight between bidding rounds.

There has been a huge difference between the focus of REIPPPP on localisation and the requirements under existing frameworks such as the Broad-Based Black Economic

Empowerment (BBBEE) Act of 2003 and the Preferential Procurement Policy Framework Act (PPPFA), promulgated in 2000. An exemption was given from the requirement of the PPPFA i.e. the allocation of 90% of the bid score being allocated to price and 10% to complying with preference categories. Instead, the REIPPPP bid scoring was split two-fold i.e. 70% for price and 30% for non-price “economic development” criteria.

Unlike BBBEE, the REIPPPP put more emphasis on black job creation more than it did on black ownership while enterprise and socio-economic development were reclassified as targets for local community development instead of BEE targets. Generally, REIPPPP targeted jobs in all sectors of the economy, benefits of local content as well as the development of local communities, more than BEE. Table 10 shows the level of contribution for traditional socio-economic objectives like BEE.

These deviations from existing requirements for local content implied that the government saw the REIPPPP as a program that is “inherently excellent for achieving positive socio-economic outcomes”. The government saw an opportunity to support and improve domestic manufacturing in a sector that is significantly underdeveloped. Due to the distributed nature of renewable energy generation, the location of the different projects presents an unusually strong focus on rural communities that would ordinarily not be attractive to investors.

Table 10: Economic development objectives of the REIPPPP (Eberhard, Kolker and Leigland 2014)

			Objectives		
Categories	**Overall Weights**	**Description**	**BEE**	**Community Benefits**	**Jobs & SA Content**
1. Job Creation	25%	SA-based employees who are citizens			6.25%
		SA-based employees who are black citizens	6.25%		
		Skilled employees who are black citizens	6.25%		
		SA-based employees who are citizens from local communities		6.25%	
2. Local Content	25%	Value of local content expenditure			6.25%
3. Ownership	15%	Black shareholding in the project company	3.75%		
		Black shareholding in the construction contractor	3.75%		
		Black shareholding in the operations contractor	3.75%		
		Local community shareholding in the project company		3.75%	
4. Management Control	5%	Black top management	5.00%		
5. Preferential Procurement	10%	BBBEE procurement expenditure	3.33%		
		SMME procurement expenditure			3.33%
		Women-owned vendor procurement expenditure			3.33%
6. Enterprise Development	5%	Community enterprise development contributions		5.00%	
7. Socio-econ. Development	15%	Community socio-economic development contributions		15.00%	
Totals			**32%**	**30%**	**38%**

There were many different concerns around local economic development in the REIPPPP bidding process with some being incorporated in the Economic Development section of the RFP e.g. the “Qualification” section of the RFP stated that to ensure compliance with the requirements of the bid, there must be a minimum of 40% participation of a South African company. Other parts of the RFP that required submission of financial models which were built by qualified model auditors, required

that there should be confirmation on the audit letter that foreign currency does not form part of at least 60% of project capital investment.

The key presentations of these types of requirements were incorporated in RFP volumes on Economic Development. Table 11 below shows the measurement of scoring categories. It also shows “thresholds” as well as “targets” relating to “onshore wind,” which is one of the categories for renewable energy. Reaching the threshold level only means that a bid is complying marginally. Scores were allocated by the bid for these categories only when there was a bridge of threshold levels.

Different types of documents needed to be submitted in order to substantiate the economic development commitments, including:

- An economic development scorecard that scores economic development performance of the bidder against targets of government
- Different types of documents to confirm compliance. These included shareholder certificates, employee information as well as agreements
- An economic development plan which recognises the socio-economic requirements of local communities situated closer to the site of the project and proposes a plan for achieving those requirements
- A plan for reporting over the project life, broken down in different quarters

The standard Implementation Agreements (IAs) that formed part of the RFP outlined a detailed system of performance rewards as well as penalties based on reports submitted on a quarterly basis by the different contractors. The formulas that appear in a schedule to the IA were used to measure performance against each economic development objective. Performance credits or penalties were determined on a quarterly basis, then added together when the measurement period ends. This helped to determine if there were any under-performance penalty payments due to the DoE by the contractor during the period. Additionally, termination points could be triggered if performance scores during a quarter are lower than the IA threshold.

Table 11: Scoring categories of the REIPPPP economic development (Eberhard et al. 2014)

		Onshore Wind* 1st Round Scoring	
Element	**Measurement**	**Threshold**	**Target**
1. Job Creation	SA-based employees who are citizen /number of SA-basedemployees	50%	80%
	SA-based employees who are black citizens/number of SA-based employees	30%	50%
	Skilled employees who are black citizens/number of SA-based	18%	30%
	SA-based employees who are citizens from local communities / number of SA-based	12%	20%
2. Local Content	Value of local content expenditure /total project value	25%	45%
3. Ownership	Shareholding by black people in the project company/total shareholding	12%	30%
	Shareholding by black people in the construction contractor/total shareholding	8%	20%
	Shareholding by black people in the operations contractor/total shareholding	8%	20%
	Shareholding by local communities in the project company/total shareholding	2.5%	5%
4. Management Control	Black top management/total size of top management	--	40%
5. Preferential Procurement	BBBEE procurement spend/total procurement spend	--	60%
	Qualifying SMME procurement spend/total procurement spend	--	10%
	Women-owned vendor procurement spend/total procurement spend	--	5%
6. Enterprise Development	Enterprise development contributions/revenue	--	0.6%
	Adjusted enterprise development contributions/revenue	--	0.6%
7. Socio-economic Development	Socio-economic development contributions/revenue	1%	1.5%
	Adjusted socio-economic development contributions/revenue	1%	1.5%

In the event that contractors do not rectify the cause of each termination point to the satisfaction of the DoE, the scores were combined together at the end of the measurement. If the total is more than the IA thresholds, the DoE has the right to terminate the contract. In keeping with this performance management system which is somewhat labour-intensive and complicated, DoE is entitled to acquire the services of independent verification expert, whose responsibility will be to check the mandatory

reporting for each contractor and also confirm if contractors are complying with economic development commitments.

The REIPPPP cautioned, that over time, the IA thresholds and targets for the local content aspect of the economic development category would be increased, as manufacturing capacity increased. Table 12 shows a summary of the requirements and results for local content scoring.

Table 12: Requirements and results for local content scoring (DoE 2016)

	First Bid			Second Bid			Third Bid		
	Threshold	Target	Actual Bid	Threshold	Target	Actual Bid	Threshold	Target	Actual Bid
Onshore Wind	25%	45%	27%	25%	60%	48%	40%	65%	47%
Solar PV	35%	50%	38%	35%	60%	53%	45%	65%	54%
Solar CSP	35%	50%	35%	35%	60%	49%	45%	65%	44%
Biomass	25%	45%	No bids	25%	60%	No bids	40%	65%	40%
Biogas	25%	45%	No bids	25%	60%	No bids	40%	65%	No bids
Landfill Gas	25%	45%	No bids	25%	60%	No bids	40%	65%	42%
Small Hydro	25%	45%	No bids	25%	60%	No bids	40%	65%	No bids

Additional changes to local content requirements were introduced as the bidding process progressed from one bidding round to the next. One of the respondents indicated that:

> *"During the first round, the term "local content" was understood to include overall costs of every project at the date of commercial operation, without taking finance charges and land into account. In the second round, the meaning of "local content" changed so that overall costs only referred to expenditure on South Africans and local goods. The omissions were increased to also consider products and services coming from other countries, together with land and finance charges."*

There was a requirement in the second bidding round that stated that all bidders must furnish more details on their plans of achieving the objectives of local content. Bidders were required to submit details of each component and activity to be carried out with

the aim of achieving the local content objectives. The breakdown was used to determine the aspects relating to EPC contracts as well as non-EPC components. Finally, the second round also identified components in the renewable technologies' value chain that were targeted by the government to contribute in the South African manufacturing sector. For example;

- towers and blades for wind technologies
- modules for solar PV
- inverters for solar PV
- metal structure utilised in solar PV

The scoring metrics was not changed to reflect these components as the DoE suggested that there may be a need for a steady rollout to increase manufacturing capacity in the country. Nonetheless, the DoE indicated that the focus of subsequent bidding rounds will be based on the prioritised components with the anticipation that, ultimately, they would all be manufactured locally.

The meaning of local content was improved further during the third round. The new definition excluded costs that were incurred by the preferred bidders when connecting their generators to the transmission and distribution networks. Furthermore, for the purposes of calculating local content, materials (aluminium, steel, etc.) used in the manufacturing of components were considered to have been sourced in South Africa. This change signalled the aspirations of the Department of Trade and Industry to inspire local manufacturing of components such as solar PV mounting structures as well as wind turbine towers, to maintain cost competitiveness by looking for the best prices internationally for aluminium and steel. During the third bid round, bidders also needed to submit details of applicable costs that were more comprehensive than it was required in the first two rounds. Additionally, bidders were also required to distinguish between costs relating to key components and/or equipment on the one hand, as well as costs relating to "balance of plant" on the other.

The manner in which the economic development criteria was scored also changed as the bidding rounds progressed. Bidders who complied with the economic development

criteria and made their commitments as high as possible, were going to be incentivised by the DoE. There were no points granted for commitments that were equal to or less than the threshold. The complying bidder offering the highest assurance in terms of a particular component of the economic development criteria was now granted maximum points for that component, on condition that this commitment was more than the stipulated threshold. Other bidders received points, in proportion, depending on where they were positioned between the threshold level and the highest compliant bidder. No points were awarded in instances where there was no threshold stipulated.

Table 13 shows the outcomes of the economic development criteria for the different renewable energy technologies, as calculated by the DoE. The capacity of power being offered in each round had an influence on the results.

Table 13: Economic development outcomes of Rounds 1-3 of the REIPPPP (DoE 2016)

	Round 1	Round 2	Round 3
Solar PV			
Local content %	38.4	53.4	53.8
Local construction jobs	2381	2270	2119
Local operations jobs	6117	3809	7513
Wind			
Local content %	27.4	48.1	46.9
Local construction jobs	1810	1787	2612
Local operations jobs	2461	2238	8506
CSP			
Local content %	34.6	43.8	44.3
Local construction jobs	1883	1164	3082
Local operations jobs	1382	1180	1730

5.4 Economic development: criticism and controversy

Most stakeholders have been generally impressed with the REIPPPP and spoke positively about the programme. However, there has been some level of discontent with the need to comply with local content requirement.

5.4.1 Job creation

According to the outcomes of the economic development criteria as presented in Table 13; wind, concentrated solar power (CSP) as well as solar PV in the various bidding

rounds, are expected to contribute almost 35 000 operations jobs and about 20 000 construction jobs. If these numbers are realised, they will signify a substantial achievement, but not necessarily sufficient to satisfy all expectations in terms of creating jobs. Some stakeholders are of the opinion that combining all requirements of the economic development criteria can prove to be counter-productive, particularly in as far as job creation is concerned. For example, the requirements for local content are indicated in value terms, but the highest value components of the manufacturing and construction chain are only sometimes related to the parts that produce the most jobs.

5.4.2 Capacity building vs ownership and jobs

The requirement to have South African ownership and management control in bidding companies, as well as the need to create jobs for South Africans, together accounted for forty-five percent of the non-price value of bids. However, according to global experience;

> *"this kind of focus has the potential of being misdirected. For example, it may be necessary to insist on local ownership, but this is not tantamount to capacity building which is more focused on developing critical skills such as operational, technical and management skills in companies and local labour supply."*

Therefore, in order to ensure the achievement of industrial capacity building, policymakers need to emphasise, in an organised way, on basic policy weaknesses that affect the trade and industrial policy, development of infrastructure, as well as skills transfer. If not, these requirements end up being somewhat more than just extra costs for foreign operators and ultimately the consumer.

5.4.3 Production

The requirements for local content, especially in the third bidding round, made companies to shift from just procuring local materials (for components such as support structures) towards establishing local production capacity for high value components.

However, many aspects made this quite riskier for competing companies. Firstly, internationally, manufacturing of solar PV and wind components include established technologies which are quite mature and industries that are well established. Furthermore, these industries are already in a state of global over-capacity and fierce competition which inevitably results in small profit margins or even no profits at all. The most important question for bidders starting with the third round is if the demand for renewable energy in South Africa, which is to a large extent government-driven, is sufficiently sustainable to make the establishment of a manufacturing capacity, feasible from a commercial point of view. This happens in a setting where consumers are not happy with the price of electricity which has in recent times been escalated at above-inflation rates. The desire om some international experts is that the government should invest in research and development around innovative renewable technologies instead of protecting local power producers which in most cases use standard technologies and are not competitive.

5.4.4 Enterprise and socio-economic development

According to one of the respondents:

> *"The one issue that was so confusing for most REIPPPP bidders has undoubtedly been the economic development requirements for enterprise development and socio-economic development, which together are responsible for 20% of the non-price value."*

Bidders had to make an assessment of needs of communities who reside within fifty kilometres of project sites and devise strategies which will articulate how the needs of the communities will be satisfied with contributions from the income generated by the projects. Socio-economic development plans needed to be submitted (with proposals) by each bidder. The DoE offered no direction in terms of how to prepare plans that will be accepted, how to show possible benefits, and has also not provided any clue of how the scoring of submissions will be done.

Some energy experts highlighted that all the bidders were just developers of renewable energy projects, not necessarily experts in community development by any means,

and the fact that the absence of direction from the DoE risks serious mistakes in developing grant programmes. Amongst other issues, energy experts warned that it was too early to devise plans for socio-economic development that are meaningful as part of the bidding process. They also highlighted that there was a risk that the 50 km radius requirement (which they considered to be illogical) could divide villages and communities into those who befit and those who do not. What exacerbate these matters is that it was the responsibility of the project developer to inform communities about these and any other requirements for economic development.

A huge conflict of interest among developers and eventual owners of the REIPPPP projects was highlighted by other critics. Developers had reasons to promise significant value for the community so that they can secure projects, but eventual owners (in instances where they are not the ones who developed the projects) end up being the ones who actually make sure that promises made are realised. This can end up in communities having unrealistic expectations.

The last concern between the different bidders was the fact that some of the benefits (financial) for local communities, especially dividends, were unlikely to be realised until such time that the servicing of loans was complete, which will typically be well into the life of the infrastructure.

5.5 Success factors, weaknesses and risks

Throughout the different bidding rounds, the REIPPPP has proved to be a successful programme with great accolades around the world. It is considered to be the most successful public effort that successfully attracted investment from the private sector. Committed investments of R192 billion have been secured to date with a generating capacity of 6 328 MW of power from different renewable energy technologies. This puts the REIPPPP amongst the top 10 renewable energy programmes in the world that have been privately funded. Electricity prices for renewable technologies have reduced significantly and are now more competitive (particularly wind and solar PV).

The following section discusses the factors that are responsible for the successful implementation of the REIPPPP. Additionally, the section also highlights some of the weaknesses of the programme, together with the risks as the programme progressed.

5.5.1 Factors associated with the management of the programme

a. Support from politicians

There was an immense political support within the country which the REIPPPP benefited from and this came in the form of quite a lengthy history of renewable energy policy statements, but more significantly, South Africa declared its dedication to clean energy at the COP15 gathering that took place in Copenhagen and also at the COP17 which was hosted by South Africa in Durban. The Green Accord was signed by stakeholders, including business and government.

One respondent highlighted the following critical questions that need to be asked:

> *"Why did the South African government willingly commit to the reduction of greenhouse gas emissions when the country was not obligated under the United Nations Framework Convention on Climate Change (Kyoto protocol)? And why did South Africa continue despite the fact that its COP15 offer was dependent on financial backing that has not even materialised?"*

After COP15, South Africa changed its planning for electricity. A carbon emissions cap was introduced in the country's IRP, and the different options of renewable energy technologies became more prominent even when the total cost of the electricity plan escalated. This was a departure from the norm, especially because South Africa is highly dependent on coal as a source of energy, and it is also experiencing high levels of poverty and other development challenges.

b. Institutional setting

The mostly informal institutional status of the IPP unit of the DoE acting as a dedicated project office of the DoE, encouraged and made it possible to have an operating model that gave emphasis to solving problems in order to ensure the success of the

programme instead of simply applying government operational policies and procedures that were more focused on enforcing the rules.

c. The management team

The REIPPPP team as well as the team leader had a lot of years of experience working and dealing with the private sector. The team was very knowledgeable in terms of PPP contracts, dealing with and managing consultants as well as credibility with various stakeholders, including the private and public sector.

d. Management style

The DoE IPP unit did not begin with the kind of distrust of private investors that usually characterises South African government agencies. This was mostly attributed to the fact that the team was used to working with private sector infrastructure projects which helped them forge relationships with lawyers, consultants and bankers. Discussions with the private sector on how to design and implement the REIPPPP started almost immediately and continued as part of the process.

e. Program resources

The programme managed to successfully attract funding from funders such as the DBSA, National Treasury jobs fund and donors. It also established a vehicle to attract fees from projects that have been closed. The programme managed to maintain independence from government fiscus.

f. Quality of transaction advice

When selecting transaction advisors, the DoE IPP unit ensured there was both local and international representation and that the advisors had the capacity and capability to successfully transfer global best practice in renewable energy as well as PPPs into the REIPPPP. Legal and financial experts had to sit together when drafting procurement documentation, including contracts. The ability of these experts to cooperate resulted in a quality procurement process.

g. Weaknesses in managing the program

The REIPPPP program was characterised by high transaction costs and this was true for the bidders as well as government; and definitely higher as compared to a REFIT program. In most cases the government was very reliant on external advisors. There was a possibility of transferring experience and skills in subsequent bidding rounds and to develop the necessary competence in the much-anticipated independent system and market operator (ISMO). However, it was not clear how fast can the competence be developed to an extent whereby the amount of advice received externally was significantly reduced. It is important to carefully handle the early exit of external advisors as it can potentially be perceived as a sign of program failure.

h. Risks associate with managing the program in the future

One of the most substantial risks to the success and sustainability of the REIPPPP involves one of the program's main success elements i.e. its ad hoc nature. The non-departmental institutional setting, the entrepreneurial approach of the programme as well as the fact that the programme was independent of the formal government budget, have all assisted in facilitating the programme's positive performance and circumvent the postponements and indecisiveness that stood in the way of developing IPPs in previous attempts. However, this informal nature will unavoidably make way for some form of formalisation, even if it is only to assure security of funding as well as sustainability for the REIPPPP. The challenge will then be to find a way to continue with institutionalization in a manner that conserves most of the success elements of the programme. In the future, it would make sense to place IPP procurements in the ISMO, should the unbundling of Eskom happen at a later time.

5.6 Factors relating to the design of the program

5.6.1 Expediting roll-out of new generation

Notwithstanding the higher initial cost of renewable energy, one respondent emphasised that:

"the REIPPPP programme gave the country something that many believed was needed urgently i.e. a somewhat quickest way to roll out new capacity for electricity generation."

As much as it will take a number of years for the bigger power stations planned by Eskom to start producing electricity, the REIPPPP was intended to roll out a substantial electricity capacity in a short space of time, making use of procurement and implementation processes that are transparent.

Another respondent highlighted that:

"various stakeholders as well as those who are critical of the higher initial cost of renewable energy, seem to have assumed a wait-and-see approach towards the REIPPPP, thereby giving the programme sufficient amount of time to build momentum. As the cost of renewable energy reduces over time, stakeholders within the ESI were wondering why is the country not increasing the amount of renewable energy being contracted."

5.6.2 Size of the program

As previously mentioned, REIPPPP is the biggest national IPP programme ever to be undertaken in Africa. The program instantly attracted awareness of the energy industry project developers internationally, especially as a result of the weakening of the European renewable energy markets. The size of the programme meant that it will result in many preferred bidders being selected.

5.6.3 Potential project profitability

At the beginning, there were real prospects for the different developers to make sizeable profits. When the documents for the first bidding round were publicised in 2011, stakeholders saw tariffs that were very similar to REFITs with maximum limits set at or very close to REFIT levels. This meant that any particular project had the potential to yield a return on equity of approximately 17%. This obvious possibility for profitability during the first round helped in creating and increasing interest in the

programme from many bidders and this continued to be the case in subsequent rounds.

5.6.4 Discontinuation feed-in tariffs

The change from feed-in tariffs to competitive tendering seems to have assisted with the sharp reduction of tariffs after the first bidding round, and this decrease was the most important aspect in government's commitment to carry on supporting the successful implementation of the REIPPPP programme. For most developing countries such as South Africa, the motivation for increased usage of possibly expensive renewable energy technologies makes sense only when there are visible efforts being made to actively manage costs. The REIPPPP does not decisively demonstrate that a competitive tender system is more suitable to do that as compared to FIT programs, however, to a larger extent, it can be implied that this could be true and needs to be explored more vigorously.

5.6.5 Bid rounds

The main change in design made in 2011 was to alter the REIPPPP from being a once-off tender to being a number of bidding rounds. The various bid rounds had a major impact in terms of creating confidence in the programme amongst the different stakeholders, including investors and operators; and resulted in increased levels of competitiveness as the number of participants in the tendering process increased. Overall, there was an increase of about 49% in the number of bidders from Round 1 to Round 2, and another 18% increase in Round 3.

5.6.6 PPP regulations exemption

Exempting independent power producers from national PPP regulations by defining Eskom (which is wholly-owned by government), in its dual role as both the contractor and off-taker, as something other than a government agency, uses a distinction based on definition, that would not necessarily be possible in other countries. Whatever the reasons may be, exposing these IPPs to the country's complicated and lengthy PPP rules would have significantly slowed and, even undermined the REIPPPP.

5.6.7 Requirements for economic development

One respondent indicated that:

> *"requirements of the REIPPPP in terms of economic development have been contentious, sometimes causing confusion, and were also costly for bidders to respond to."*

However, another respondent highlighted that:

> *"as it happens in other countries, South African requirements for economic development, have assisted in generating the much-needed political support from important stakeholders such as investors, politicians, and the public in general."*

The increase of the role of these elements to thirty percent of bid value assisted in increasing the prominence of considerations for economic development and emphasise their significance. The economic development dimension of the REIPPPP program has generally being viewed as effective, according to committed offers during various bidding rounds.

5.6.8 Guarantees

The support given by government was demonstrated by providing sovereign guarantees which formed part of the Implementation Agreements supporting Eskom's procurement of electricity from various independent power producers. The transactions were examined and evaluated by the National Treasury's Fiscal Liability Committee which was responsible for approving the sovereign guarantees. The government has no contingent liability fund or a reserve fund that is reserved for each transaction.

The country's relatively strong international credit standing (at that time) meant that investors as well as banks will agree to accepting sovereign country risk even if there is no political risk insurance. Interestingly, government guarantees were sought regardless of Eskom's investment grade credit rating. This demonstrates that there

were concerns pertaining to the utility's financial standing and maybe the possibilities of reforming the ESI and unbundling Eskom.

5.6.9 Weaknesses relating to program design

a. Market readiness overestimated

Initially, there was an overestimation of the readiness level and size of the South African renewable energy market. As a result, bid prices were too close to the price caps as well as a low level of competition. It could have been more prudent to start smaller and over a period of time, steadily expand the program, with increased offers for power capacity in the bidding rounds that followed.

b. Use of single-price offer

Another aspect that could have contributed to limited competition is the fact that the single-price offer was used, instead of a dynamic reverse auction which was used in Brazil, for example.

c. Excessive cost of transactions

The transaction costs for the REIPPPP program were mostly high and this was true for the bidders as well as government; and definitely higher as compared to a REFIT program, even though these costs were in the end very low for investors in comparison with the overall project costs. Without the ability to access sufficient expertise and financial resources, it would have been quite a challenging task for the DoE IPP unit to attain the levels of quality that play a big role in making sure there was always interest in the REIPPPP from the private sector.

d. Bias against SMEs

Bigger and more established companies have the ability to cover higher costs due to the size of their balance sheets, however the same cannot be said by small and medium enterprises (SMEs) as these high costs can be unaffordable by these companies and tend to work against many government objectives that are in support of SME participation in renewable technologies. However, the fact that there are a lot

of community trusts and investors participating in the REIPPPP, signifies that there are opportunities for new players. SME's were introduced into the programme by large companies as minority shareholders on some bids. Additionally, the whole REIPPPP programme has created a lot of opportunities for SMEs where they can play various roles, including the provision of advisory services, acting as economic and social development consultants. The IPP procurement for small projects which is running simultaneously aims to contribute more than the REIPPPP in order to inspire participation of local SMEs.

5.6.10 Program design risks going forward

There are various types of risks pertaining to the design of the programme which could potentially be problematic in the future if they are not properly mitigated.

a. Delivery failure

The first aspect has to do with the fact that there is a likelihood the expected outcomes from the economic development requirements may not be realised. Particularly, the supporting of new industries aiming to produce components for renewable energy technologies will encounter challenges in an industry (globally) which is already facing over-supply and fierce competition. There is a possibility that increasing number of jobs emanating from this type of requirement will not be sustainable over a lengthy period of time and may possibly end up in high electricity costs as compared to if there were no requirements. There may be only lesser than expected economic and financial benefits for local communities. This will most certainly lead to displeasure regarding the community development attributes of the criterion. There is an expectation that every preferred bidder or project must invest a minimum of 1% of its revenue in developing the community, however only a handful of developers had the necessary experience to be able to design effective programmes. Moreover, the benefits coming from local community shareholding will only be realised in the long-term after shareholder loans have been fully repaid.

As warned by one respondent:

"there is likely to be some level of unhappiness from the local community should the REIPPPP fail to achieve these outcomes. This may also highlight, at a national level, the fairly high costs of certain renewable energy technologies, raising questions about whether it was a wise thing to do to pursue these technologies in the first place."

b. Failure to manage and monitor

The second aspect of risk has to do with the probability that the economic development undertakings may not be properly managed or monitored by the government. There are many instances where agencies that are responsible for monitoring the performance of the local content aspect in developed countries, did not sufficiently do what was expected of them even when they had a substantial number of professionals. The REIPPPP managed to produce 64 contracts at the end of the first three bidding rounds. Each contract had a 20-year lifespan and involved commitments to up to seventeen economic development targets, with performance reporting being done every quarter. The quarterly reporting will be used as a basis for the calculation of credits or performance deductions, and as termination points. In as far as termination points are concerned, in many instances, contractor rectification programs need to be revised and this could trigger a dispute resolution in some of the cases.

c. Deemed energy payments and transmission constraints

There is general consensus that there needs to be an investment in Eskom's transmission network as it has either not been adequately upgraded or was never synchronised with the implementation of REIPPPP and the associated new capacity. The risk here is that there could be some delays in connecting completed projects to the national grid. The challenge is not necessarily the shallow connections i.e. the transmission connections to the closest substations that are either being funded or constructed by project developers, but instead the investment in the transmission system that needs to be made by Eskom in order to strengthen the transmission backbone to allow for a seamless evacuation (or wheeling) of all the new power that is being produced in the distant regions. In such instances, the off-taker (Eskom) will be responsible for deemed payments for power, even if there was no electricity injected in the transmission network.

d. The role of Eskom as the single-buyer

For many years now, this issue has been debated ad nauseum by various stakeholders within the South African ESI. Some stakeholders have argued that Eskom is in a distressed financial situation, mainly due to the mismanaged of the power utility. One respondent said:

> *"the international development community and other interested parties have previously, in many occasions, advocated for an unbundling of Eskom into companies i.e. generation, distribution and transmission, which can ultimately be privatised."*

The utility's possible future circumstances highlight serious risks to the REIPPPP, and this has been evident in 2017 when Eskom was refusing to sign some of the IPP power purchase agreements. Another respondent indicated that:

> *"The financial situation at Eskom has deteriorated to unprecedent levels in recent times and this has resulted in sovereign downgrade by the rating agencies which may eventually result in the government's sovereign guarantee being called on to pay independent power producers."*

5.7 Private sector participation

5.7.1 Project sponsors

Many different global project developers, equity shareholders as well as sponsors participated in the REIPPPP. Preferred bidders during the first three bidding rounds involved over 100 equity shareholders with almost 46 taking part in more than one project and 25 participating in not less than three. Figure 15 shows shareholders who took part in three or more projects. The most notable equity shareholders included the Industrial Development Corporation, Standard Bank, Old Mutual, Africa Infrastructure Investment Fund as well as the likes of Thebe and Mulilo. A power utility from Italy,

Enel Green Power, participated mostly in the third bidding round and succeeded on 6 projects.

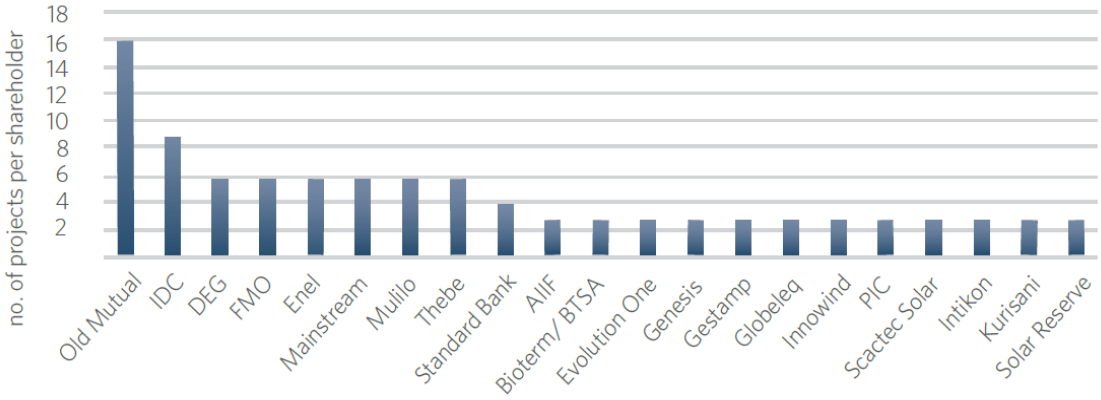


Figure 15: Shareholder participation: Bidding rounds 1-3 (Eberhard et al. 2014)

5.7.2 Funding

Approximately 87% of the projects in the first three bidding rounds were project financed. A corporate bond with a value of about R1 billion was issued by Touwsrivier Solar Park, a project financed during the first bidding round whereas Stortemelk, which is a small hydro-power plant was corporate financed at the beginning, but this has since changed as the project was ultimately financed using debt. Almost 35% of projects in the third round have all been corporate financed by Enel, an Italian power utility which whose bids were not successful in the first two rounds. According to industry reports, there was a lower than expected return on equity particularly for corporate funded projects in the third bidding round. As a result, questions have been raised as to whether projects should continue being corporate financed in subsequent bidding rounds.

On average, over 60% of funding was debt with more prominence in the second round and not so much in the third round. Another 25% was funded using shareholder loans as well as equity, with corporate financing used on the remainder.

Figure 16 shows that most debt funding (about R57 billion) was sourced from commercial banks and the balance came from Development Finance Institutions (FDI)

whereas pension and insurance funds also participated, albeit to a lesser extent. 86% of debt in the first three rounds was raised in South Africa.

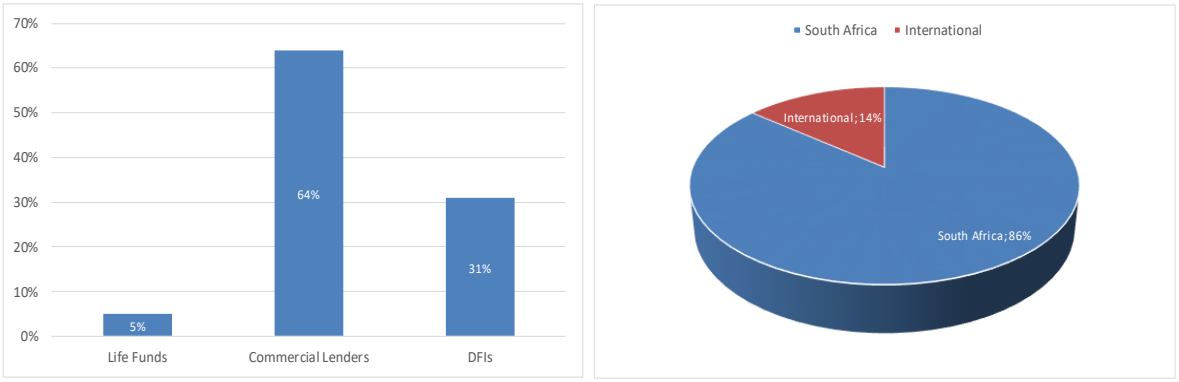


Figure 16: Debt financing in REIPPPP: Round 1-3 (Eberhard et al. 2014)

Lending in the REIPPPP was mostly dominated by the 'big five' South African commercial banks, namely RMB, Nedbank, Standard Bank, Investec and ABSA. Figure 17 shows the relative share of their commercial and overall debt financing. 33% of the projects were financed by Nedbank followed by Standard Bank with 25%, ABSA with 20%, RMB with 16% and lastly Investec with 6%. Each one of these banks have participated as lead debt arrangers, even though it was not for every deal, and some other projects, they have also played the role of co-senior lenders or as providers of subordinated mezzanine debt.

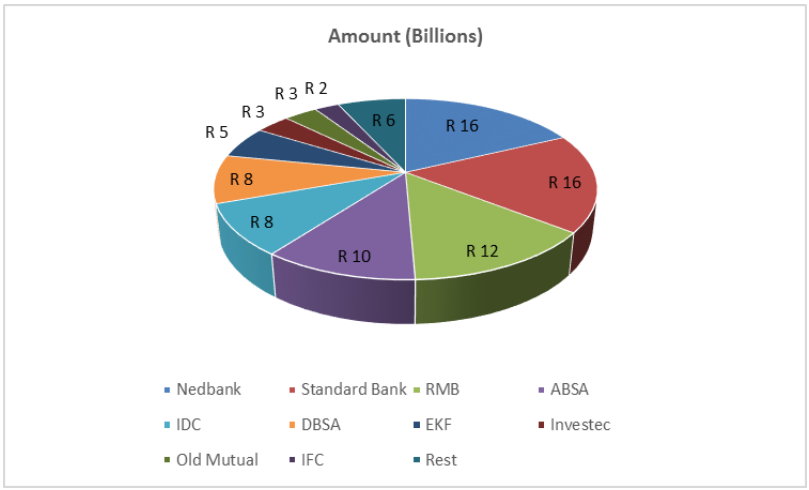


Figure 17: Initial providers of debt (DoE 2016)

The Development Bank of Southern Africa (DBSA) and the Industrial Development Corporation (IDC) were responsible for the remaining local debt funding. The IDC was involved in twenty deals while the DBSA participated in sixteen. These were mainly in organising financing for BEE as well as participation by the community (Figure 18).

Insurance and pension funds also played a role in local financing e.g. Liberty, Old Mutual and Sanlam. Old Mutual's participation has been multifaceted as the company got involved through its Ideas Fund, including Future Growth, where it has a majority shareholding. It was also indirectly involved through African Clean Energy Developments (AECD), which is a joint venture between Africa Infrastructure Investment Managers and AFPOC (a company registered in Mauritius). As time goes, there is an expectation that commercial banks will end up selling down more of their debt to these 'secondary capital markets', allowing them to provide on-going debt financing in subsequent bidding rounds.

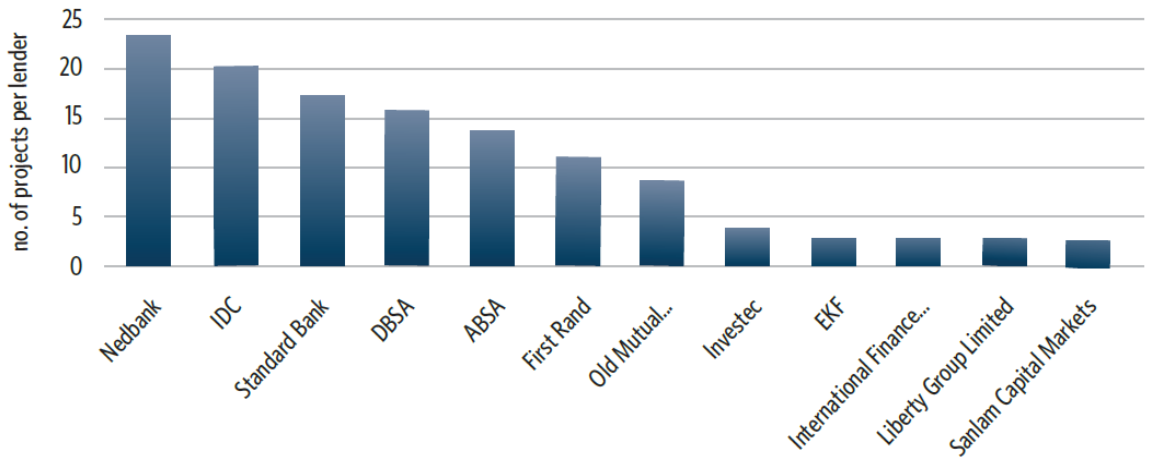


Figure 18: Number of projects per debt provider (Eberhard and Naude 2017)

The involvement of international DFIs included the Danish Export Credit agency (EKF) and the World Bank's International Finance Corporation (IFC) with each getting involved in three projects, while others such as the African Development Bank (AfDB), the Netherlands Development Finance Company (FMO), the European Investment

Bank (EIB) as well as the Overseas Private Investment Corporation (OPIC), were only involved in one project each.

5.8 Cost of solar PV and wind power

The Council for Scientific and Industrial Research (CSIR) conducted a comparative study of the cost of electricity generated from different energy sources in South Africa; and published its findings in 2016. According to one of the respondents:

> *"the CSIR study showed that the cost of new solar PV and onshore wind was now almost 40% cheaper than the cost of new baseload fossil power stations. The study was based on information confirmed by the DoE's IPP Office which manages the procurement process of new generation capacity from the private sector."*

As illustrated in Figure 19, the CSIR study showed that solar PV and wind prices bid as part of the 'expedited round' of the REIPPPP fell to as low as 62 c/kWh from between 69 c/kWh and 95 c/kWh in the fourth bidding window. This is a significant reduction from the costs seen during the first bidding window that took place in 2011, when the tariff for solar PV was 365 c/kWh, while that of wind was 151 c/kWh for a 20-year PPA.

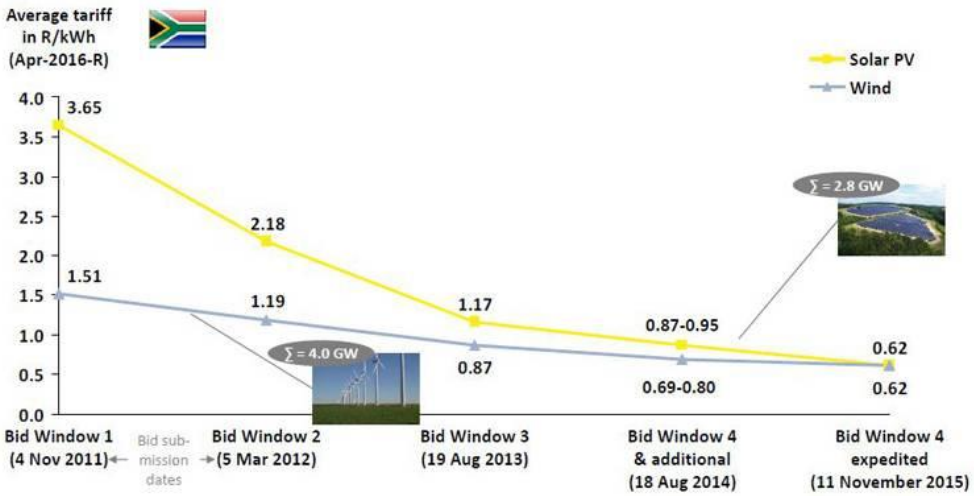


Figure 19: Cost of solar PV and wind from 2011 to 2015 (CSIR 2016)

The first two coal baseload IPP projects, which were given the status of preferred bids in October 2016, were found to be on par with tariffs for renewable energy IPPs. It was estimated that the average price coming from the 557.3 MW Thabametsi and the 306 MW Khanyisa fossil projects would be 103 c/kWh instead of the prices that were initially announced which were lower than 82 c/kWh. This increase was mainly due to the inflationary adjustment as the consumer price index (CPI) was lower in April 2014 when the rates were submitted. Additionally, the qualification tariffs related to the two projects did not consider the “shallow grid connection” costs, which had to be included in the final tariff. By contrast, the renewables IPP projects included the cost of shallow grid connections.

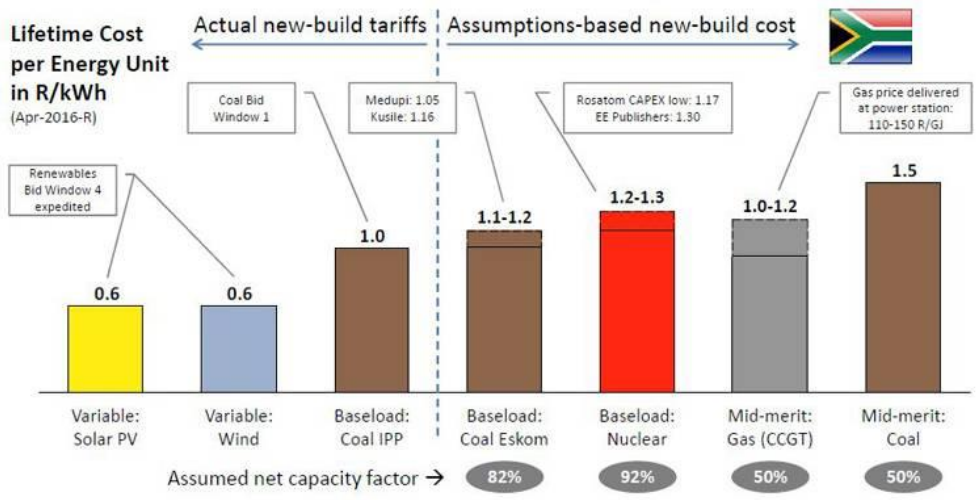


Figure 20: Cost comparison of different electricity technologies (CSIR 2016)

The CSIR study also makes a strong argument for transitioning to an energy mix comprised mainly of solar PV and wind and supported by other technologies which will be able to respond when there is no sufficient wind or sun. According to the study, when combining the 62 c/kWh from solar PV and wind, with other “flexible” technologies e.g. gas, which are said to be costing around 200 c/kWh, the result is a “mixed-cost” of about 90 c/kWh. This is definitely lower than a cost of 103

c/kWh for baseload coal and between 117 c/kWh and 130 c/kWh assumed for nuclear power as shown in Figure 20.

5.9 Conclusion

From the beginning, the REIPPPP was by and large based on lessons learned from a previous, unsuccessful attempt which made use of feed-in tariffs and has progressed over time, through various bidding rounds. The REIPPPP presented a faster approach for rolling out new electricity capacity and the size and structure of the bidding process was designed in such a way that the outcome would result in the selection of various preferred bidders, presenting an opportunity for private sector participation. The programme also gave project developers an opportunity to generate profits due to the programme structure being linked to the “REFIT-like” tariff caps, especially in the first bidding round. The change to a competitive tendering system contributed significantly to the sharp cost reduction in subsequent bidding rounds.

The series of bidding with considerable allocations of capacity assisted in generating the necessary confidence in the programme. Some exemptions from certain of the national public-private partnership regulations, as well as the conditions of the Preferential Procurement Policy Framework Act also made it possible to expedite the implementation of the programme, without having a negative impact on quality and transparency issues. Additionally, the fact that it was required for all bids to be fully structured with debt and equity, essentially helped to avoid the trend of competitive tenders incentivising low balling (or under-bidding) in order to win tenders. Some of the programme’s economic development requirements ended up being with unexpected controversies, however they managed to attract the much-needed political support for the REIPPPP.

The success factors, weaknesses and risks of the REIPPPP can be summarised under three general headings i.e. market factors, program design factors and programme management factors. In as far as the management of the program is concerned, the mostly informal institutional status of the IPP unit of the DoE made it possible to have an approach that focused on and highlighted problem solving, instead of enforcing administrative issues, and transparency and quality remained a priority. The DoE IPP

management team and the team leader had many years of experience and knowledge, especially with regards to PPP, as well as credibility with stakeholders from both the private and public sectors. The team also managed to address mistrust issues from the private sector which at times impacted negatively on the relationship between the South African public and private sectors. They also managed to obtain the necessary resources for the implementation of a quality program. These resources were mainly used for the appointment of knowledgeable advisors who, amongst other things managed to transfer lessons learned from the global development community into the country.

Regardless of the successes, the ad-hoc status of the DOE IPP unit presented a few risks. In order for the REIPPPP to progress sustainably, there will need to be a creation of institutional capability within a formal institution such as the ISMO. There were also some programme design weaknesses and there is evidence that there was an overestimation of the size as well as the readiness of the local renewable energy industry. For example, the level of competitiveness, particularly during the first bidding round, was very limited, with bid prices being very close to the maximum price that were indicated in the RFP.

There are some stakeholders who argue that the programme's cumbersome upfront administrative requirements as well as higher bid costs have contributed to higher prices at the beginning of the programme as compared to countries such as Brazil, and tends to be biased against SMEs. There could be some merit for the latter critique, however it is important to note that bid costs were nonetheless very small as compared to the overall values of the different projects.

Market factors that have an impact on the programme included the general slow-down in global renewable energy markets, which means that the REIPPPP managed to appeal considerably to the private sector in other countries. The REIPPPP also benefited the country's sophisticated financial market, which participated by offering project finance on a long-term basis.

CHAPTER 6: MARKET ENTRY BARRIERS

6.1 Introduction

This chapter presents findings relating to the second research question of this study i.e. barriers to market entry that were experience by the different IPPs during the various bidding windows of the REIPPPP which were discussed in Chapter 5. Some of these market entry barriers were as a result of policies which shaped the current market structure while other barriers were due to the requirements of the REIPPPP. Later on, the chapter also discusses market entry barriers associated with the establishment of a green power market in South Africa which aims to introduce more private sector participants.

Unlike during the apartheid era, power planning in South Africa is no longer left exclusively to Eskom. The DoE is now mandated to produce an electricity plan for the country. The Minister of Energy, based on this plan, is required to issue intermittent determinations in terms of the amount of electricity capacity that would be required in the future and which technologies would be used to generate that electricity. New capacity can only be licenced by NERSA in line with the limits set by ministerial determinations.

It is generally recognised that IPPs should be gradually introduced and participate in the South African electricity supply industry in order to enhance the country's power generating capacity and reduce Eskom's monopoly. Subsequent to the promulgation of the Energy Policy White Paper in 1998, the Cabinet accepted and approved a 30% ownership of Eskom by the private sector in terms of generating capacity, and work started on designing a competitive wholesale power exchange. However, in 2004, the wholesale market was abandoned and there was a shift to a single-buyer model with the off-taker being Eskom. It was anticipated that IPPs will still play a pivotal role in generating power, but to introduce IPPs were not put in place immediately and some of the procurement programs which were run by Eskom for base-load IPPs and cogeneration proved not to be successful. No IPP contracts were conclude besides a few short-term power purchase agreements amounting to about 400 MW with some industrial generators.

The government of South Africa is implementing a policy that provides legal frameworks for the regulation of larger renewable energy generators (more than 5 MW) which are connected to the transmission grid. This has been in place for more than a decade and is mainly due to the demand of electricity exceeding available generating capacity. South Africa has come to understand the importance of having the private sector participating in ensuring security of energy supply in the country. In order to make this possible, the government has devised a road map which is made up of long-term plans aligned with the IRP and other short-term policies.

6.2 Integrated Resource Plan

The DoE developed the IRP 2019 which stipulates the proposed new generating capacity for South Africa from 2010 until 2030. The IRP 2019 promulgates the country's strategy for making sure there is sufficient generation capacity to meet the energy demand which will ensure sustainable development in an environment characterised by economic, social and technical constraints. According to the DoE, the purpose of the IRP 2019 is to establish forward-looking investment strategies for electricity transmission and generation for the betterment of the country.

The scope of the IRP 2019 includes demand-side management (DSM) as well as pricing issues. It proposes additional capacities which include those generated from sustainable technologies. The development of the IRP 2019 considered factors such as technical expertise, political interests and public participation to make sure that there is a reasonable common understanding of how to plan for the future electricity demands of the country. It was also based on some legal references, including White Papers, Acts, etc.

According to one respondent:

> *"when it was first developed, the IRP 2010 was supposed to be reviewed and updated by the DoE at least biennially, as circumstances change."*

The inputs emanating from the various public participation meetings were considered as part of the decision-making process to ensure that there was fair representation of

relevant interest groups. The final adjustment of IRP 2010 included the reassessment of renewable energy technologies, learning rates as well as the disaggregation of past grouping of renewable resources into different technologies like solar PV, concentrated solar power and wind, were considered in order to establish some forms of subsidisation. Particularly the inclusion of learning rates resulted in an increased quantity of renewables considered during the reassessment process. Additionally, cost of nuclear were escalated by forty percent.

6.2.1 White Paper on the Energy Policy

The White Paper was made public by the Department of Minerals and Energy in 1998. The context of the policy was changed due to significant changes that came as a result of the lifting of embargos after the dawn of democracy in South Africa. The aim of the White Paper was to re-evaluate policies in the electricity sector with the primary focus being security of electricity supply and investor confidence and consumer protection. The policy had the following aspirations:

- Energy must be accessible and affordable
- Stimulation of economic activity
- Reducing the impact of energy-related activities on the environment
- Improved security of supply

Other considerations of the White Paper included, quality of supply and Demand Side Management (DSM). As part of diversify the energy mix, the White Paper advocated for development of new standards as well as codes of good practice for renewable energy sources.

6.2.2 Integrated Energy Plan

The Integrated Energy Plan (IEP) was first published by the DME in 2003. This was followed by various iterations, with the latest being published in 2016. The IEP 2016 is more of a framework for decision making than it is a blueprint for the energy sector.

The IEP 2016 highlights that historically (pre-1994), decisions in the energy sector were focused around security of supply. Until recently, it never considered the impact of alternatives such as renewable energy sources on the economy, environment and society. Figure 21 shows the energy planning framework which is now embedded in the IEP 2016.

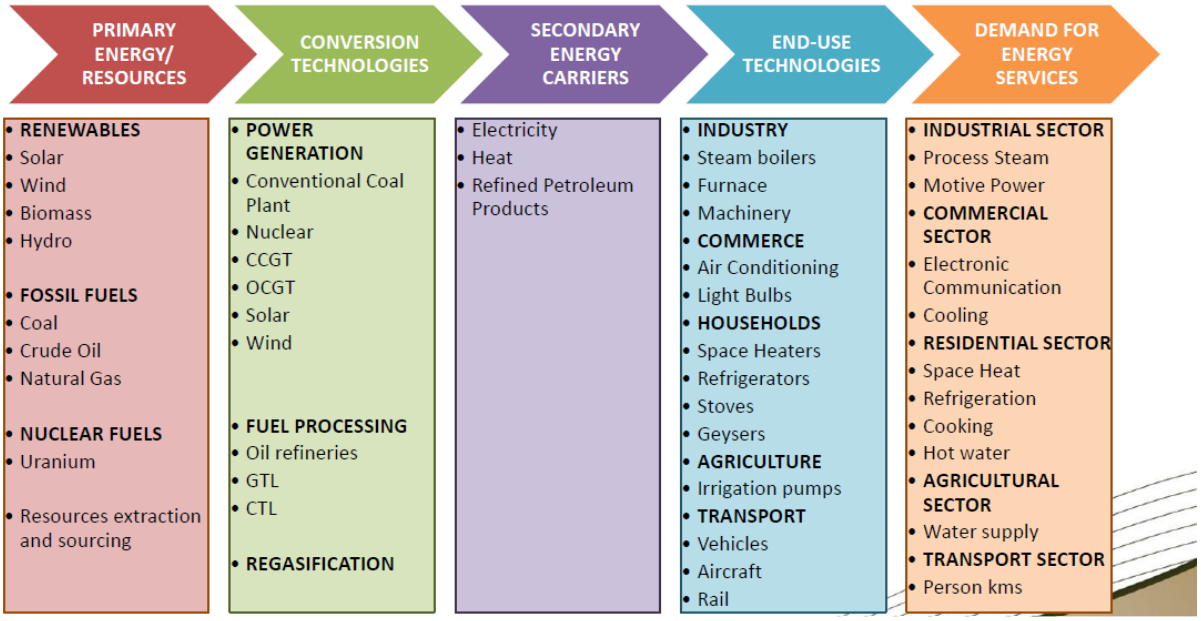


Figure 21: Energy planning framework (DoE 2016)

The Energy Planning Framework takes care of all sources of energy available in the country, it considers the different types of technologies available and all relevant priorities as communicated by government. It also proposes a suitable energy mix as well as policy recommendations. Figure 22 shows the IEP and plans for the energy sector.

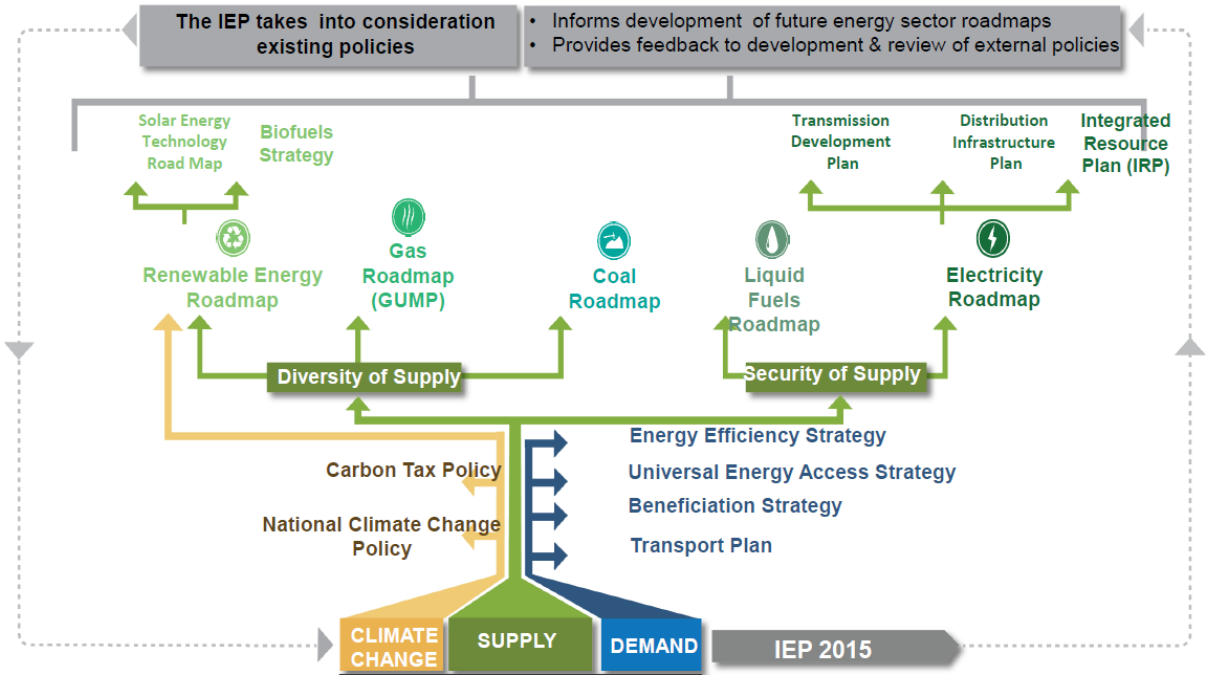


Figure 22: The IEP and Sector Plans (DoE 2016)

6.2.3 Renewable Energy White Paper, 2003

The White Paper on Renewable Energy advocates for a shift to sustainable energy resources. It demands important facets of renewable energy implementation which include regulatory, legal, financial aspects and policy considerations. One of its main objectives is to develop a suitable regulatory and legal framework for tariffs and pricing in order to support renewable energy sources and to promote private investment.

Renewable energy targets were set by the South African government, following the promulgation of the Renewable Energy White Paper in 2003. The aim was to reach a capacity of 10 000 GWh by 2013 using renewable energy resources. Until the implementation of REIPPPP, not much had been done towards achieving the target. There was also a lot of confusion in terms of what the target actually meant i.e. was the target an annual target or a cumulative target? Was is it limited to electricity production i.e. other renewable energy services were not being considered? Clarity was finally provided by the DoE indicating that the target would be met by a mix of solar water heaters (13%), hydro (10%), bagasse (59%), landfill gas (6%), other

biomass (1%), and wind (1%). The targets were unfortunately not achieved by 2013, as it was originally envisaged.

However, as one respondent indicated;

> *"while the Renewable Energy White Paper was not that effective in practically implementing strategies, policies that are meant to alleviate the impact of climate change have been more impactful. In many respects, this was surprising since as a non-Annex 1 country under the Kyoto Protocol, South Africa does not have any obligations to reduce greenhouse gas emissions. Yet, some research was instituted by the Department of Environmental Affairs to look at Long-Term Mitigation Strategies."*

These strategies became the basis for South Africa pledging at the Copenhagen Conference of Parties (COP) in 2009 that the country would reduce its greenhouse gas emissions by 2025 to 34% lower than normal. This undertaking was made with the proviso that South Africa would get financial aid and transfer of appropriate technologies from the international community. The South African ESI is responsible for almost half of the country's carbon emissions, and these emissions were capped at around 275 Mt/annum CO_2 equivalent.

6.2.4 The Electricity Regulation Act

The Electricity Regulation Act (ERA), No. 4 of 2006, sets out rules and guidelines for the country to put in place a bid programme and for the contribution of IPPs in generating new capacity. It regulates access for the buyer and the seller; and stipulates other requirements into a Power Purchase Agreement. The Act has since been amended following changes in the subsidy scheme for IPPs from a feed-in tariff to a bidding process, which took place in 2011.

6.2.5 The National Energy Act

The National Energy Act (NEA) was developed by the DoE with the purpose of establishing an Integrated Resource Plan, which resulted in the IRP 2010. The Act

also established the South African National Energy Development Institute (SANEDI) which is an agency of the DoE, reporting directly to the Minister of Energy. The mandate for SANEDI is to act as a regulatory body focusing on energy efficiency as well as research and development (R&D).

6.3 The Renewable Energy IPP Procurement Programme

The Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) is a programme emanating from the DoE. The aim of the programme is to encourage participation and investment by private entities in order to stimulate the development of renewable energy technologies in South Africa. The programme also aims to diversify the country's energy mix while reducing South Africa's reliance on coal technologies which are known to pollute the environment. The country aims to have 18 800 MW of electricity supplied from renewable sources by 2030.

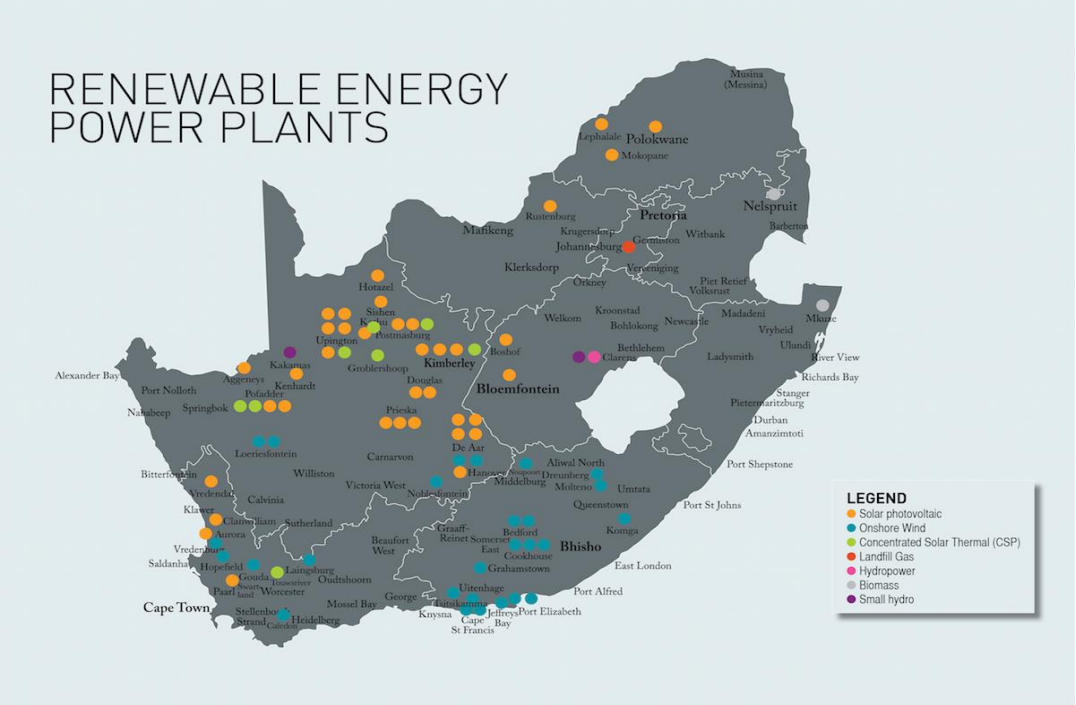


Figure 23: Location of renewable energy power plants (Intelligence 2016)

Over 25% i.e. 6 378 MW of this target has already been achieved through various projects. Figure 23 shows the different renewable technologies and their geographical

locations. Figure 24 shows the additional 6 378 MW which was achieved over several rounds of bidding.

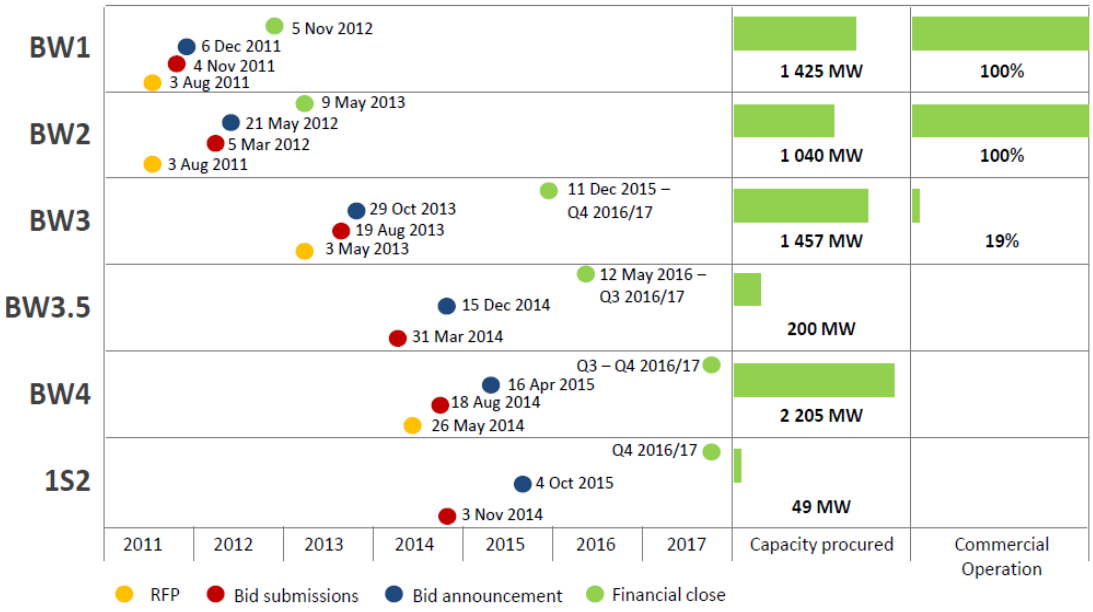


Figure 24: Progress of the REIPPPP (Deloitte 2017)

The required funding came from a number of different private foreign investors, private local equity as well as some commercial and development banks, as illustrated in Table 14. Some of the funding was earmarked for the purposes of black economic empowerment in order to represent local communities. The total amount towards funding the REIPPPP is approximately R192.6 billion of which 28% comes from foreign direct investment.

Table 14: Companies involved in the four bidding rounds of the REIPPPP (Intelligence 2016)

	IPPs & Project Developers	Project Financiers & Equity Firms	OEMs & Suppliers
Americas	BrightSource Energy (U.S.) Globeleq (U.S.) SkyPower (Canada) SolarReserve (U.S.) SunPower (U.S.) SunEdison (U.S.)	International Finance Corporation (U.S.) Overseas Private Investment Corporation (U.S.)	First Solar (U.S. SunPower (U.S.)
Asia	China Longyuan Power (China) Shapoorji Pallonji Group (India)	China Development Bank (China) Industrial and Commercial Bank of China (China)	JinkoSolar (China) ReneSola (China) Vikram Solar (India)
Europe	Abengoa (Spain) Acciona Energia (Spain) Building Energy (Italy) EDF Energies Nouvelles Enel Greenpower (Italy) Engie (France) Grupo Cobra (Spain) Juwi Renewable Energies (Germany) Mainstream Renewable Power (Ireland) Norwegian Investment Fund (Norway) Scatec Solar (Norway) Solafrica (Switzerland) Solairedirect (France)	Actis Africa (UK) Deutsche Bank (Germany) Investec (UK)	ABB (Switzerland) Elettronica Santerno (Italy) Energia Ercam (Spain) FG.de (Germany) GRI Renewable Industries (Spain) Nordex SE (Germany) Siemens (Germany) SMA (Germany) Vestas (Denmark)
Middle East	ACWA Power (Saudi Arabia)		
South Africa	AE AMD Renewable Energy; Afri-Devo; Ample Solar; CEF Group; Enzani Technologies; Emvelo; Ennex Developments; Eskom; Mulilo Renewable Energy; Old Mutual Life Assurance Company; Red Cap Investments; Simacel; Solar Capital; Thebe Investment Corporation; Usizo Engineering	ABSA Bank; African Infrastructure Investment Managers; Industrial Development Corporation; Nedbank; Public Investment Corporation; Rand Merchant Bank; Standard Bank	ARTsolar DCD Wind Towers

6.3.1 Institutional setting

Previously, the government gave Eskom the responsibility to contract IPPs, but Eskom did not manage to carry this out, probably due to a lack of capacity or according to some critics, due to a lack of incentives for the power utility to reduce its status of being a monopoly. In as far as the REIPPPP is concerned, the DoE managed the program,

but the DoE also acknowledged that, similar to Eskom, they did not have the required capacity and capability to manage such a complex and huge program. As a result, the Public-Private Partnership (PPP) Unit of the National Treasury was asked to assist with running the process. A project office (the DoE IPP unit) was established by a small team made up of technical staff from the DoE and the PPP unit, which was setup to function effectively as a separate entity outside of the formal departmental structure of the DoE, in order to facilitate the REIPPPP process.

The REIPPPP management team

The National Treasury PPP unit appointed a senior manager to run the REIPPPP. The manager was involved in establishing the rigorous project appraisal framework and was also involved in the promotion of IPPs since 2007. Other members of the team included individuals with legal and technical expertise. This resulted in both the private and public sectors having a positive view of the team with sufficient expertise in terms of closing PPP agreements as well as a reputation of solving problems instead of being mere regulators.

The DoE IPP unit did not begin with the kind of distrust of the private sector that usually characterises South African government agencies. According to one respondent;

> *"this was mostly attributed to the fact that the team was used to working with private sector infrastructure projects which helped them forge relationships with lawyers, consultants and bankers."*

Discussions with the private sector on how to design and implement the REIPPPP started almost immediately and continued as part of the process. Three respondents indicate that;

> *"from the onset, the management of the program was in a manner that was tailored towards creating enthusiastic participation by players from the private sector. The bidding process was characterised by high standards as well as security arrangements and transparency. Documentation was of high quality and could be accessed through a specially developed website."*

Other respondents indicated that;

> *"many players from the private sector were quite impressed by the effort made by the IPP unit to meet most deadlines. The deadline for first round financial close was missed by several months, but other delays were not that major."*

Based on the above, the dominant view is that market entry barriers were low with a few minor challenges. Overall, the participants were satisfied with the implementation of the programme.

Another critical aspect of the way the program was managed included the use of private international and domestic advisors to assist in designing and managing the programme, reviewing bids, and incorporating lessons learnt into the programme as it moved from one bid window to the next. Table 15 shows a list of consultants that were involved in evaluating the different bids.

Table 15: REIPPPP evaluation consultants (Eberhard et al. 2014)

INTERNATIONAL REVIEWERS
Legal: Linklaters (UK)
Technical: Tony Wheeler Consulting (UK)
Governance: Ernst & Young
PROJECT MANAGEMENT
SPP Project Solutions
LEGAL EVALUATION
Bowman Gilfillan
Edward Nathan Sonnebergs (ENSafrica)
Ledwaba Mazwai
Webber Wentzel
TECHNICAL EVALUATION
Mott MacDonald
FINANCIAL EVALUATION
Ernst & Young (EY)
PWC

Program resources

It was very important to have the necessary financial resources in order to have access to experienced and reputable advisors from the private advisory. Some funding was required to pay for the specialists, rent, website development as well as the complex bidding process. A memorandum of agreement (MOA) between the Development Bank of Southern Africa (DBSA), the DoE and National Treasury made it possible to make the required funds available. The DBSA was required to provide a portion of senior debt on the projects and provide R80 million to pay for consultants, building capacity and the project office. Additionally, several donor agencies from countries such as the UK, Denmark, Spain and Germany provided the much-needed funding for procurement of technical assistance service. A grant amount of US$6 million from the Global Environment Facility (GEF) was facilitated by the World Bank for advisory services.

A team of consultants had already joined the program by the end of 2010 and the design of the programme had already commenced at that time. As soon as it was known that the REFIT process will no longer be implemented, external donors advised on the program's tender process following a study of tender processes in other countries including France, Germany, India and others.

An amount of R100 million was made available by the National Treasury in 2011. Some of this amount was used to repay the DBSA, even though the DBSA acted as the payment agent for the program. These funds saw the REIPPPP through the first round and part of the second round. Following that, the program relied a lot on registration fees from bidders as well as fees paid by successful preferred bidders. Preferred bidders were required to pay a project development fee equal to 1% of total project costs on the date the Implementation Agreements became effective.

The importance of this was highlighted by one respondent who said:

"these funding arrangements were critical as they assisted the REIPPPP to avoid the formal government budget in bidding rounds that followed."

6.3.2 Request for proposal

Project developers had to satisfy some requirements in order for them to qualify for the next step of the REIPPPP bidding process and these were clearly outlined in the Request for Proposal (RFP). The contents of the RFP included general requirements, qualification criteria for each bidder and the criteria to be used when evaluating submitted bids. The RFP also contained six additional documents which described other requirements in terms of financial, legal, technical and economic aspects of the programme. Applicable government policies were also included.

The first step involved obtaining a copy of the RFP documents at a non-refundable fee of R15 000.

6.3.3 General requirements, rules and provisions

This part of the RFP dealt with all the rules applicable to bidders. The RFP stipulated the rights of the DoE, the structure of the RFP as well as timelines that needed to be adhered to by all bidders. A bid response had to include among other things, confirmation of payment of a development fee equal to 1% of the total project costs, which will be used to cover the DoE's costs as well as a guarantee of R100 000 per megawatt for submission, and R200 000 per megawatt after being selected as a 'Preferred Bidder'. The bidder was required to confirm a binding offer to the DoE. The bid response remained valid and binding for a period of 300 days from the day on which it was submitted.

6.3.4 Criteria to qualify

The qualifying criteria was the most important aspect of the RFP process. In order to be selected as preferred bidders, project developers were required to satisfy all consent criteria. These included technical, financial, legal, environmental as well as economic development criteria.

The main challenge experienced by the IPPs was compliance with the environmental and financial criteria, especially with regards to the amount of time and high

expenditure involved. Below are the financial requirements that proved to be challenging for IPPs:

- As a condition for submission, the DoE required bank guarantees and funds, without any legal consent, before a preferred bidder's status can be granted.

- IPPs were compelled to allocate between 40% and 50% of project funds by a national lender, which limited broader options. The share depended on the type of renewable technology was acquired.

It was generally accepted that both the RFP and the REIPPPP were created very well and that interested parties were sufficiently consulted. In a nutshell, most respondents were comfortable that the qualification criteria in the RFP and bankability criteria as set out by investors were aligned. The RFP generated a good framework whereby developers had to design the project and became a foundation from which different projects were assessed by investors. However, one of the respondents to this study indicated that:

"The investors' criteria, expanded on the criteria set out in the RFP and were much more burdensome and broad."

Generally, it can be asserted that as much as the RFP sought to indicate each project's level of readiness, the financiers were much more concerned with the level of risk that comes with each project. Table 16 shows the various technologies that were considered for selection in the REIPPPP. Each technology procured was required to be commercialised by no later than the dates set out in the RFP.

Table 16: Allocation of generation capacity (Pieters et al. 2014)

Technology	Capacity
Onshore Wind	6 360 MW
Concentrated solar thermal	1 200 MW
Solar Photovoltaic	4 725 MW
Biomass	210 MW
Biogas	110 MW
Landfill Gas	25 MW
Small hydro	195 MW
Small Projects	400 MW
Solar Parks	1 500MW
	14 725 MW

The REIPPPP was meant to be of a rolling nature in accordance with the Ministerial Determinations, the IRP 2010 and any other subsequent integrated resource plan. This meant that the power capacity will be procured though a continuing programme of bid windows which will be timed in a manner that will ensure that there is a minimum of one bid window each year.

6.3.5 Environmental impact assessment

The approval by the DoE for the RFP's environmental criteria was dependent on the completion of an environmental impact assessment (EIA) which had to be confirmed by the Department of Environmental Affairs (DEA). According to the RFP, all bidders had to comply with the following which must form part of the bid response i.e. submit evidence that the bidder has attained and identified all other Environmental Consents.

The EIA was carried out by the DEA, which was representing the interests of various environmentally sensitive individuals and organisations. The main focus of the assessment was on agricultural and geotechnical report as well as a botanical faunal paleontological impact assessment. The evaluation process also looks at social and visual impact assessment. All the reports combined, form a complete EIA. According to the EIA procurement programme, a developer had to publicise all specialist reports that were related to each envisaged concern. This was followed by a public participation meeting where participants get to submit their comments and appeals. It was the responsibility of the developer to provide a statement of response and address all complaints to the satisfaction of all parties concerned. The developer was also responsible to appoint an accredited independent consultant whose task will be to assess the reports prior to approval by the DEA. The EIA process is considered complete once all issues have been resolved and documented in a Record of Decision (RoD), which is the final scoping report.

Generally, different stakeholders were content with the environmental criteria and how it was developed and managed. The process was so rigorous to an extent that developers could not bypass any part of the environmental criteria. This agrees with the assertion that no major challenges were raised by most developers regarding the

EIA process. The DEA was involved in most projects, and their process of authorisation was aligned to the legislated time frames.

On average, the EIA process took almost fourteen months to be completed, which is in line with the twelve months requirement for a full EIA as stipulated in the National Environmental Management Act (NEMA). In particular, for wind farms, it was required that a period of twelve months be allocated to the monitoring of birds and bats in order to generate sufficient data required for the approval of site layouts. For example, in some instances the micro-siting of wind farms had to be changed in order to accommodate the migration paths of birds and bats. Over and above the requirements of the RFP, some developers had to prove that they have complied with the Equator Principles (EP) since at least three of South Africa's major banks are members of the EP Association. Members only participate in financing those projects that comply with ten EP requirements. Usually, if the EIA did not align with the EP, it had to be amended before it could be accepted by lenders.

Investors were generally in agreement that the requirements were reasonable in terms of the amount of legal and regulatory documentation that was needed to submit a bid, although they insist that the required documentation were extensive and consumed a lot time. This is attributable to the fact that fulfilment of legal requirements usually results in reduced levels of project risk. At the same time, project developers were under the impression that the level of regulatory and legal requirements was too onerous for a bid submission. However, they understood the need for these requirements, as they made sure that once a preferred bidder is selected, the project will be ready for execution. This perception is attributable to the amount of risk and development costs associated with satisfying these requirements.

The RFP listed some requirements, but there was confusion in terms of what additional information was needed. Consequently, those who were bidding for the first time experienced some challenges with identifying the required authorisations and permits.

6.3.6 Technical criteria

The technical requirements as stipulated in the RFP were found to be quite reasonable by developers whereas financiers, as anticipated by developers, wanted more detail. It is generally agreed that the more detailed the technical data, the lesser is the perceived risk of a project. Investors were more concerned with production forecasts, equipment; and Engineering, Procurement and Construction (EPC) conditions. They wanted as little risk as possible on the projects, while the RFP on the other hand was more focused on the viability of projects. There were some concerns about the geographic spread of the IPPs. The is a possibility that grid capacity limitations could have a negative impact on the feasibility of some projects due to generating plants being concentrated in specific areas. This challenge, however, is expected to disappear with time as obvious renewable energy locations are taken and used up; and developers are compelled to consider other difficult areas elsewhere in the country.

6.3.7 Criteria for economic development

Even though the criteria could be measured easily, different developers had some fears specifically regarding the requirements for local community shareholding and local content. The bankability of projects was negatively affected to some extent by the fact that projects needed to have some ownership by South Africans in addition to other requirements of black ownership and local content. Most developers found it challenging to satisfy these requirements and therefore posed additional risk. It was thought that these criteria would not be able to realise the intended objectives. The local content requirements mostly increased the EPC costs which is viewed as contradicting the objective of reducing the overall cost of renewable energy as produced and supplied by IPPs.

Other challenges were created by the country's lack of manufacturing capacity as well as unclear specifications in terms of how far down the supply chain the content would need to be local. For example, is it enough that wind turbine towers are manufactured in South Africa from imported steel? Some developers also highlighted the fact that if government wants to achieve the objectives for economic development of the

REIPPPP, the weighting of these criteria would have to be significantly higher in bid selection. One respondent indicated that:

> *"It was felt that developers who tried to comply with and achieve the economic development requirements did not benefit adequately from this. This was mainly because of pricing which had a significant weighting in comparison to other elements in the selection criteria."*

6.3.8 Criteria for pricing and costing

The cost of the project and associated tariff were undoubtedly the most essential features for all stakeholders. The DoE, through the RFP price caps, was trying to reduce the tariffs over a period of time as competition in the industry increases. Developers had a dilemma of maximising profits while simultaneously maintaining competitive tariffs. Investors were looking for a tariff that will expose the projects' minimum levels of risk.

There were complications that came as a result of the tariff that had to be concluded for the bid submission. The period between selecting a preferred bidder and financial close took no less than six months to even twelve months in some instances. Unfortunately, EPC prices increased significantly for the first two rounds during this period, as a result of the global economic downturn. More challenges were also experienced when EPC contracts were finalised. The different developers emphasised that this was one of the main reasons the achievement of financial close was delayed.

6.3.9 Financial structuring

The financing of projects was structured largely according to what the lenders required. In general, renewable energy projects were financed using international best practices, even though the approaches were more conservative, particularly for the first round of bidding. Table 17 below shows the different financial parameters.

Table 17: Financial parameters for REIPPPP projects (Pieters et al. 2014)

Parameter	Range
Debt/equity ratio	70/30 - 80/20
Loan term	15 - 17 years
DSCR[1]	1.35 - 1.25 annual DSCR
	1.15 - 1.2 dividend lock-up DSCR
	1.05 - 1.1 project default DSCR
Type of lender	Single commercial lender
IRR[2]	15% - 20%
Weighted average cost of capital	10% - 12% (JIBAR[3] used as base)

[1]Debt service coverage ratio, [2]Internal Rate of Return, [3]Johannesburg interbank agreed rate

The more investors showed interest and willingness to participated in the REIPPPP, the greater was the improvement of the debt/equity ratio and the DSCR required on a project. Most projects that were financed during the first-round were based on a 70/30 debt/equity ratio, however the ratio increased to 80/20 as the perceived risk of the projects reduced and competition increased. In other situations, lenders were able to provide 5% mezzanine loans in order to improve the attractiveness of projects and make it possible for developers to bid a lower tariff.

The loan term for first-round projects was 15 years as compared to later projects that had loan terms of up to 17 years. Some projects had an annual DSCR as low as 1.25, whereas the lowest default DSCR was 1.05. As the REIPPPP progressed, it became apparent that the preferred model was to have a single lender instead of multiple lenders. However, in some instance, the size and risk of a project advocated for multiple lenders. Development Finance Institution (DFI) funding was not that popular in the projects that were evaluated. Developers, mostly were of the opinion that DFI interest rates were too high and that the requirements to obtain DFI funding were too onerous. The developers were responsible for carrying the development costs for the projects, which were approximately R10 million to 20 million. These high development costs resulted in increased risk to developers, particularly as a result of losses that would possibly have to be borne in cases were a bid was not successful. These high costs and risks made it difficult for new, smaller, and (or) less sophisticated companies to compete with those that were experienced and well-funded.

6.3.10 Financial close requirements

The requirements for reaching financial close were not that different from any other project-financing requirements. However, the process that needed to be followed in order to satisfy these requirements came with its own challenges. According to most respondents, particularly those who were participating for the first time;

> *"the challenge was with the identification and getting all the necessary documentation in a reasonable time. Over and above the RFP and regulatory requirements, the primary concern amongst lenders and equity investors was mainly regarding the viability and credibility of any original equipment manufacturer (OEM) or EPC contractor on the projects, over the long-term."*

This resulted in lenders requiring strict equipment and EPC guarantees which proved to be more expensive than international standards. Some of the guarantees that were required included:

- From equity providers, a guarantee by the holding company;
- From EPC contractor, a performance guarantee from the holding company; and
- Equity and debt providers to provide EPC payment guarantees.

Another requirement by the lenders was a wrapped EPC contract with one party being responsible for the delivery of guarantees. This could mainly be attributed to the level of risk that the lenders were comfortable with. This kind of arrangement is not usually favoured by OEMs. Ideally, OEMs only want to supply equipment without being too involved in the projects.

Other than challenges with the EPC contract finalisation, there was generally no issues experienced with the above-mentioned agreements.

6.3.11 Problems and delays encountered in the REIPPPP

Some challenges and delays were encountered in bringing the REIPPPP projects to financial close; and this was caused mainly by the strain which was put on the DoE as bid documents were being evaluated. There was a lot of work to be completed in a short space of time which resulted in an overload as there was only a limited number of local and suitably-qualified resources (particularly banks and law firms) available.

There were serious delays that were caused by Eskom grid connection issues. EPC prices and construction interest were negatively affected by Eskom timelines (minimum 2 years). This lowered the incentive to have projects completed sooner that the planned time. Eskom's costing was also challenging. An estimated grid connection cost which was at least 60% accurate had to be included in the bid submission. An Eskom price that was 80% accurate would usually cost up to R2.5 million. This resulted in a major risk for developers who had to conclude the tariff on a grid connection price which is only 60% accurate.

Most developers were also irritated by the water use licence application which could only be processed by the Department of Water Affairs (DWA) after obtaining a preferred bidder status. Comprehensive designs which were quite expensive and riskier for the developers had to be submitted for each water crossing in the plant. Development costs were increased by the extent of detail required in a bid and had to be carried at risk. According to bidders, there was too much detail required on some aspects of the projects, especially at the bidding stage, causing four problems:

a) Bidders struggled with getting complete information for bid submission.
b) Some developer ran out of funds as a result of delays in bidding dates, and this led to other interested parties looking elsewhere for better opportunities.
c) It was difficult for new and smaller development companies to compete with well-funded and experienced bidders.
d) A lot of pressure was put on the resources and selection timelines due to the amount of documentation that needed to be reviewed in the preferred bidder selection process.

Additionally, some bidders highlighted the fact that Eskom was the only buyer of the power produced, as a risk. The risk lies in that should the PPA of any producer be withdrawn for any reason, they will not be able to sell the power anywhere else. This challenge increased the risk in all projects, and as a result had an impact on the cost of debt charged by financiers.

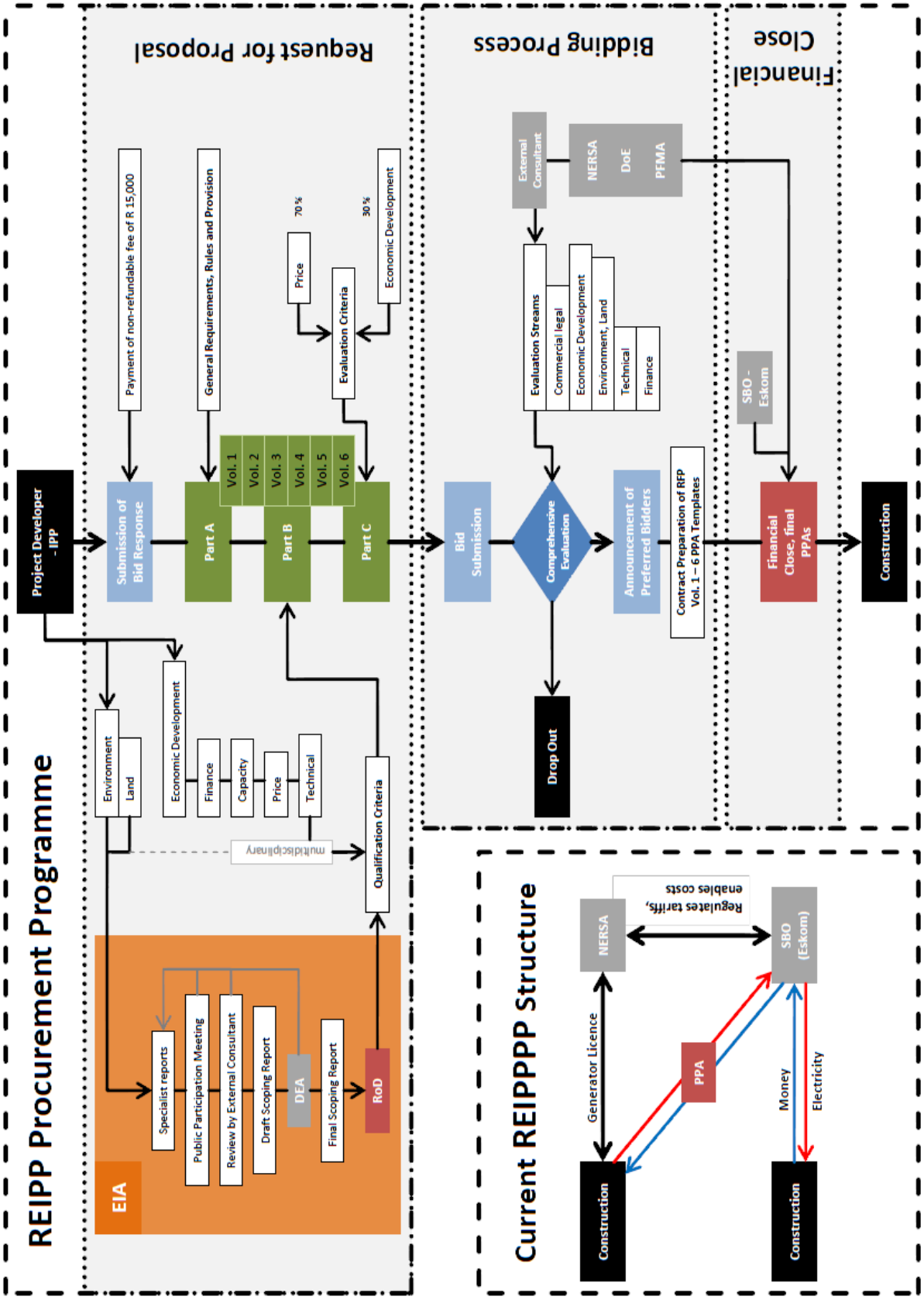


Figure 25: The REIPPPP procurement programme (Ciglmayr 2013)

5.3.12 Evaluation criteria

Two steps were undertaken in order to conduct the bid evaluation process. Firstly, bidders were required to comply with minimum threshold requirements in areas such as economic development, land, commercial and environment. For example, the environmental aspect of the review process assessed approvals while the land review on the other hand focused on registration of lease, duration as well as evidence of land use applications. Commercial aspects of the review involved the project structure and the bidders' acceptance of the Power Purchase Agreement. Each technology type had its own technical specifications e.g. wind technology developers were required to submit wind data that was collected over a year for the designated site and a generation capacity forecast that was verified independently. The requirements relating to the economic development aspect, in particular, were complicated and resulted in some confusion among the different bidders. One of the respondents indicated that:

"All bids that successfully complied with the threshold requirements proceeded to the second step of evaluation."

Two prices were required from each bidder with one being fully indexed for inflation and the other only partially indexed. Bidders were initially allowed to determine the proportion that would be indexed, however this changed in the rounds that followed. Minimum and maximum limits were introduced for the proportion that could be indexed.

The purpose of the evaluation criteria was to rank all bids that were received. The evaluation criteria were based on the annual tariffs in R/kWh and the coincidental economic development, with a split between finance and social issues weighing 70% and 30%, respectively. The tariff assessment was set based on the following principle i.e. the probability of it being accepted increased as the tariff decreased. The economic development had to guarantee a national or regional benefit.

5.3.13 Final outcomes

Table 18 shows a summary of the amount of power procured during the different bid windows as at September 2016.

Table 18: Power procurement: Bid Window 1-4, as at September 2016 (Eberhard and Naude 2017)

	Wind	PV	CSP	Biomass	Biogas	Landfill	Hydro	Total
BW 1								
Capacity offered (MW)	1,850	1,450	200	13	13	25	75	3,626
Capacity awarded (MW)	649	627	150	0	0	0	0	1,425
Projects awarded	8	18	2	0	0	0	0	28
Average tariff (ZAR c/kWh)	114	276	269	N/A	N/A	N/A	N/A	N/A
Average tariff (USD c/kWh) ZAR8/$	14	35	34	N/A	N/A	N/A	N/A	N/A
Total investment (ZAR m)	13,876	23,559	11,891	0	0	0	0	49,326
Total investment (USD m) ZAR8/$	1,734	2,945	1,486	0	0	0	0	6,166
BW 2								
Capacity offered (MW)	650	450	50	13	13	25	75	1,276
Capacity awarded (MW)	559	417	50	0	0	0	14	1,040
Projects awarded	7	9	1	0	0	0	2	19
Average tariff (ZAR c/kWh)	90	165	251	N/A	N/A	N/A	103	N/A
Average tariff (USD c/kWh) ZAR7.94/$	11	21	32	N/A	N/A	N/A	13	N/A
Total investment (ZAR m)	13,783	13,841	5,097	0	0	0	722	33,442
Total investment (USD m) ZAR7.94/$	1,736	1,743	642	0	0	0	91	4,212
BW 3								
Capacity offered (MW)	654	401	200	60	12	25	121	1,473
Capacity awarded (MW)	787	435	200	17	0	18	0	1,457
Projects awarded	7	6	2	1	0	1	0	17
Average tariff (ZAR c/kWh)	74	99	164	140	N/A	94	N/A	N/A
Average tariff (USD c/kWh) ZAR9.86/$	8	10	17	14	N/A	10	N/A	N/A
Total investment (ZAR m)	16,969	8,145	17,949	1,062	0	288	0	44,412
Total investment (USD m) ZAR9.86/$	1,721	826	1,820	108	0	29	0	4,504
BW 3.5								
Capacity offered (MW)			200					200
Capacity awarded (MW)			200					200
Projects awarded			2					2
Average tariff (ZAR c/kWh)			153					153
Average tariff (USD c/kWh) ZAR10.52/$			15					15
Total investment (ZAR m)			18,319					18,319
Total investment (USD m) ZAR10.52/$			1,741					1,741
BW 4 (a)								
Capacity offered (MW)	590	400	0	40	0	15	60	1,105
Capacity awarded (MW)	676	415	0	25	0	0	5	1,121
Projects awarded	5	6	0	1	0	0	1	13
Average tariff (ZAR c/kWh)	62	79	N/A	145	N/A	N/A	112	N/A

Average tariff (USD c/kWh) ZAR12/$	5	7	N/A	12	N/A	N/A	9	N/A
Total investment (ZAR m)	13,466	8,504	0	1,195	0	0	245	23,411
Total investment (USD m) ZAR12/$	1,122	709	0	100	0	0	20	1,951
BW 4 (b)								
Capacity offered (MW)	650	520	450	100	15	40	25	1800
Capacity awarded (MW)	686	398	0	0	0	0	0	1,084
Projects awarded	7	6	0	0	0	0	0	13
Average tariff (ZAR c/kWh)	72	85	N/A	N/A	N/A	N/A	N/A	N/A
Average tariff (USD c/kWh) ZAR12.5/$	6	7	N/A	N/A	N/A	N/A	N/A	N/A
Total investment (ZAR m)	15,330	8,363	0	0	0	0	0	23,693
Total investment (USD m) ZAR12.5/$	1,226	669	0	0	0	0	0	1,895
TOTALS								
Capacity offered (MW)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Capacity awarded (MW)	3,357	2,292	600	42	0	18	19	6,328
Projects awarded	34	45	7	2	0	1	3	92
Total investment (ZAR m)	73,423	62,411	53,256	2,257	0	288	968	192,603
Total investment (USD m) ZAR12.5/$	7,540	6,892	5,690	207	0	29	111	20,470

Outcomes of Window 1

To a certain extent, the DoE was surprised by the results of the first bidding window. The DoE was expecting to receive twelve bids and close three projects during the first round. Their biggest fear when the process started was that no bids would eventually be closed. The issues experienced with REFIT, tight deadlines, a slow global market, as well as the rigorous qualification process were all issues that were attributed to the modest expectations by the DoE. Yet in the last quarter of 2011, the total number of bids received was 53 for a power capacity of 2 128 MW. One of the respondents of this study said that:

> *"It took almost 4 weeks to evaluate the bids and an announcement of preferred bidders was made in December 2011, which happened to be at the same time the COP17 meeting was held in Durban."*

Ultimately, out of the 53 bids received, 28 were selected as preferred bidders offering a total capacity of 1 425 MW with an investment amount of $5.97 billion. Out of all the preferred bidders, 18 were based on PV technology with a capacity of 627 MW, 2 on CSP technology with a capacity of 150 MW, while 8 were based on wind technology with a capacity of 649 MW.

The financial close deadline for the first round was July 2012 and end of 2014 was the deadline for commercial operation, however the dates were later extended due to government taking longer than anticipated to conclude its guarantees; and advisors were inundated with so many projects reaching closure almost at the same time.

Most projects managed to reach full financial close within a 10-day period immediately after the signing of agreements and meeting conditions precedent, in the fourth quarter of 2012. All investments were closed on the same day and the process was used to standardize and limit the risk associated with foreign exchange, even though the risk presented significant challenges to the banking system. All projects were constructed and the first project came on line in November 2013. Nine other projects were supposed to started operating around March 2014 with the remaining schemes coming on line a year later.

Even though bidders could not know the exact total bidding capacity, they were able to recognise that the tight deadlines and the associated stringent threshold qualification criteria would ultimately mean less capacity will be available for bidding than was made available in the first round. Accordingly, the prices that were bid were in most cases not affected by competitive limitations; and they were only slightly below the limits published in the request for proposals. Higher initial transaction costs as well as possible uncertainty with regards to policy contributed to higher prices.

Outcomes of Window 2

The same RFP that was used in Round 1 was also utilised in the second round. However, the total power capacity to be procured was reduced to 1 276 MW with the aim of encouraging competitiveness in terms of bidding. The price caps were left unchanged, even though the RFP indicated that the DoE anticipated tariffs to reduce and was considering lower price caps in the following Round 3. This was mostly based on an analysis of global prices and technological innovation and improvements. Additional changes involved putting a limit for the partial indexing and a bit stricter rules in terms of pricing of local content.

The total number of bids received for Round 2 were 79 which is 50% more than those received in Round 1, regardless of the reduced capacity offered. The bids received

had a total capacity of 3 233 MW. A team consisting of both local and international experts was responsible for the evaluation of tenders and the process was conducted in a secure environment which had 24-hour surveillance.

The prices for Wind and solar PV in the second round were more competitive as they reduced by an average of 40% for solar PV and 20% for wind. The bidding price range was also wider than in Round 1, with a minimum price of a minimum of 17.6 US c/kWh and a maximum of 22.4 US c/kWh for solar PV; and 10.2 US c/kWh and a maximum of 11.4 US c/kWh for wind. The price for concentrated solar reduced by 7% to 32 US c/kWh, with one preferred bidder taking up the remaining capacity. There was not much competition with regards to small hydro. There were only two qualifying bids which were both capped at 13 US c/kWh.

According to one of the respondents of this study:

> *"The local content terms offered by preferred bidders were much more improved in Round 2 as bidders were responding to higher targets stipulated in the bid documents."*

The average local content for solar PV increased from 38% to 53% and from 27% to 48% for wind, while that of concentrated solar increased from 34% to 43%. The deadline for financial close for Round 2 was shifted from December 2012 to May 2013 when all 19 projects signed their agreements. Some observers and commentators have praised Round 2 and it outcomes, especially the reduced prices and improved local content terms. They believe these actually saved the reputation of REIPPPP and even suggested to the government that competitive tenders may be the optimal option to ultimately reduce prices as compared to feed-in tariffs.

Outcomes of Window 3

The RFP for Round 3 was based on that of the previous round but with some modifications. The total capacity offered was capped to 1 473 MW, various technologies having individual caps. Individual small hydro technologies had their maximum size increased by 30 MW to 40 MW. The price cap for wind technologies was reduced from 115 c/kWh to 100 c/kWh, solar PV reduced from 285 c/kWh to 140

c/kWh, concentrated solar's base price was reduced to 165c/kWh while that of small hydro reduced from 103 c/kWh to 85 c/kWh. Later on, a bid note was released which removed price caps for both solar PV and Wind while increasing the cap for small hydro technologies to 106 c/kWh. The price caps for landfill gas and biomass was increased to 94 c/kWh and 140 c/kWh. All these prices are in South African cents.

Just in Round 2, the bid evaluation process was done under strict security conditions with a special emphasis made on making sure there was transparency. All individuals and companies that formed part of the evaluation process were required to declare any interest they may have.

93 bids were received with a total capacity of 6 023 MW and 17 preferred bidders were selected and notified in October 2013. The preferred bidder's total capacity was 1 456 MW. This included 200 MW concentrated solar, 435 MW solar PV, 787 MW wind, 16 MW biomass and 18 MW of landfill gas. There was a further reduction in prices during Round 3. The price for Solar PV reduced by 68% as compared to Round 1 prices and the price for wind energy reduced by 42%. Concentrated Solar Power also dropped. There was a slight increase in local content for solar PV from 53.4% in Round 2 to 53.8% and for CSP from 43.8% to 44.3%. On the other hand, for wind, local content actually dropped slightly from 48.1% in Round 2 to 46.9%. July 2014 was the target for Round 3 financial close and projects were required to reach commercial operation within four years after submitting bids i.e., by the end of 2017.

6.4 Barriers to renewable energy technologies

Promoting the use of renewable energy technologies can assist in solving challenges of electricity supply and climate change aspects of the energy supply in South African. However, even though the country has a high potential of resources, the deployment of renewables technologies has been at a rather slow and disappointing pace. The challenges relating to the dissemination of large-scale renewable energy in South Africa are plenty, but not impossible to overcome. The following section discusses the main barriers.

As much as there are some natural barriers e.g. limited use of biomass, and certain technology needs, including waterless cooling systems (as a result of water shortages), the leading barriers can be found in the South African energy innovation system as well as in the economics that come with renewable technologies.

The South African innovation system is characterized by a high path dependency with its roots in the apartheid era, when it was politically necessary to not rely on external energy supplies, research and innovation around energy has focussed on fossil fuels. South African electricity and fuel are mostly produced from coal as the resource is available in abundance. Sasol and Eskom are the two main producers of fuel and electricity, respectively and are responsible for the bulk of investment in energy-related research and development. The two companies are almost monopolistic employers of university graduates in their respective sectors. This has resulted in an extreme bias in innovating fossil fuel technologies. On the other hand, renewable energy technologies do not have the required educational capacity. As a result of their status (monopolistic energy providers), both companies enjoy a substantial amount of power. Sasol and Eskom use their influence to protect their interests, especially pertaining to their core business. Therefore, it is highly unlikely that they will support and promote the use of renewable energy technologies.

However, the barriers are not limited to the path dependency of the South African energy innovation system. The are other economic features that are considered barriers for the successful deployment of renewable energy technologies which can be divided into risk and cost factors. Figure 26 shows the typical risk assessment and lending cycle of renewable energy projects.

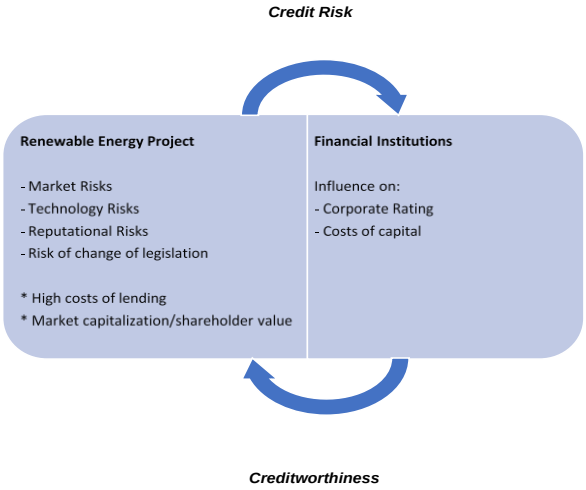


Figure 26: Lending cycle of renewable energy projects (Pegels 2010)

Typically, the market for renewable energy technologies is still at its infant stages. The lack of maturity leads to higher levels of risk emanating from higher volatility. In an event that there is a change in legislation, there is no certainty as to whether the economics of a particular project will change, especially if the technologies are politically supported by schemes such as feed-in tariffs. Feed-in tariffs are created by the market; therefore, this will add to the market risk. For example, solar technology market growth rates in Spain fell as a result of changing feed-in tariffs in 2008.

6.5 Barriers to setting up a green power market in South Africa

One of the respondents in this study emphasised that:

> *"For many years, corporate energy buyers have ignored green power technologies. These technologies were mostly thought of as immature and expensive. They were also considered to be unattractive for large-scale power purchases by corporates participating in competitive markets. However, that kind of thinking is changing."*

As a result of the government's decision to adopt and support clean energy technologies, South Africa is encouraging the use of green power even though it is currently on a "willing buyer – willing seller basis". Some large multinationals have started creating a cost-competitive market for green power by supporting renewable

technologies in an aggressive manner. In South Africa, the City of Cape Town has committed to buying wind power from the Darling Wind Farm in the Western Cape.

There are three main aspects that seem to be the driving force behind the emergence of green power as a preferred source of energy for corporate users, namely:

- Increasing awareness by the private sector as well as concern about environmental issues
- Improvements and innovation in green power technologies
- Restructuring of the energy supply industry

When a business buys green power, it is procuring not only electrons, but it also obtains a number of benefits that it otherwise may need to secure using contracts or the corporate's budget. Specifically, green power can:

- assist with stabilising energy costs in a company
- be used to hedge against the risk of changes in environmental regulations
- benefit companies in terms of generating power on-site
- make consumers think of a company as a caring business
- enhance relationships with local communities
- enhance relationships with government authorities and the NERSA

6.5.1 Challenges of buying green power

There are a few challenges facing many businesses as they participate in the green power market for the first time:

(i) Corporate Challenges

- Cost is normally the deciding factor in terms of choosing a particular energy source
- Not many businesses have mechanisms that are established enough which can be used to articulate the non-energy advantages of green power to relevant decision makers in the company
- Some corporates are unable and others even unwilling to pay a premium for electricity

(ii) Marketplace Challenges

- Current pricing programs for clean energy are not suitable for industrial and commercial customers
- Businesses may not necessarily be in a position to secure output for their projects, independently
- Some green power technologies come with inherent operational limitations
- Additional power sources may be necessary to offset such operational limitations, resulting in increased costs
- Depending of the choice of technology and location of the business, certain green power technologies may be disadvantaged by unsuitable locations as well as high costs

(iii) Policy Challenges

- There is currently no incentive, from a policy point of view, for having superior environmental characteristics of green power
- There could be challenges relating to the integration of green power into the grid

6.5.2 Challenges of creating a green power market in South Africa

a) Voluntary nature of the market

The green power market involves willing buyers, willing sellers as well as network operators who provide access to its wires and customers. To find a seller who is prepared to offer its power at a price which is higher than that of Eskom (or a Municipality) is theoretically not such a big challenge, however there is only a few of them and they are not necessarily willing to take part in the voluntary market. The main dilemma is to find that customer who is willing to pay a premium for the offered power. These are normally exceptional customers who are quite discerning and with some unique attributes.

South Africa's industrial and commercial sector is quite sophisticated but at times it does not have the pressure of international issues because of its "developing country" status. Therefore, the country is somewhat protected against global pressure groups. This makes it a real challenge to find customers who are willing to pay a premium for Green Power purely based on the merits of global requirements. One responded indicated that:

> *"South Africans are generally unconcerned with climate change issues notwithstanding the country's adoption of the Paris Agreement."*

b) Monopoly in the power market

South Africa's ESI is generally monopolistic with Eskom being the main player together with licensed re-distributors. Customers do not necessarily have a choice except for some who consume more than 100 GWh per annum. Anti-competitive behaviour is usually anticipated from incumbent licensees such as Eskom. It is very difficult for a trader in a voluntary Green Power market to behave as a monopoly because of the protection from regulatory authorities and the competition law.

Most of the revenues made by municipalities comes from electricity users. As a result, municipalities are unwilling to give up this source of income. One can ask a question i.e. why would an entity enjoying monopolistic benefits decide to introduce competition

which will take away those benefits? The fact that the Green Power market is currently so small makes it difficult to be regarded as a threat to Eskom. Until there is free access to the market and the number of participants increases significantly, this will be the biggest challenge to the green power market for a very long time.

c) Government intervention

It is generally believed that the challenge of climate change and reduction of green-house gas emissions is government's problem. As a result, the government is expected to fund the supply of green energy. Therefore, there have previously been some resistance at a municipal level to allow a Green Power trader access to the grid and customers. Some customers were even indicating that they will wait for government to intervene first before they can consider purchasing green power. However, this sentiment is slowly changing given the establishment of PowerX as discussed later.

d) The Renewable Energy industry

The South African renewable energy sector has resulted in mixed performance results i.e. there has been some successes as well as some failures. Only a few renewable energy projects can really be regarded as being successful without government interventions, including subsidies and grants. Additionally, there have been some major fallacies regarding viable renewable energy technologies like solar PV and wind. Economic models are normally used are in most cases based on government subsidies and other assistance. The Green Power market is usually judged based on previous experiences and was not necessarily really given a fair chance to be proven until in recent times.

e) Piloting the Green Power market

The pilot project was restricted to a very small size. The market size was not big enough to make a significant impact and this made it difficult to be taken seriously by

most stakeholders. It involved only four generating units and five customers for a total of 40 GWh per annum. Any expansion of the market in the future was going to be challenging. This will also make it challenging to market to new customers. In the event that additional sales are allowed, there are going to be difficulties with regards to the speed of approving new transactions. These transactions will need to be thoroughly scrutinised and evaluated before they can be allowed to proceed. One way of dealing with this challenge is to limit the sales volumes in the jurisdiction of each licensee.

f) The pioneering nature of the market

There were a lot of unknowns because the market was a first in South Africa, therefore a lot of caution would be required. This was the main reason for piloting the project i.e. to allow room for mistakes and be able to learn from those mistakes. The international Renewable Energy industry and Climate Change proponents had taken note of the developments in South Africa and were monitoring with interest, the progress made.

g) Growing the market

At the beginning, the Green Power market started trading in exports from existing generators only. Different generating pants signed contracts with Amatola Green Power (AGP), now known as PowerX, so that they could increase their export volumes based on the offered price. There was no new capital investment necessary, but it was anticipated that with time all existing power capacity would be used up and new capacity investments would be needed, as a result. Significant incentives would be required to entice investment in additional new capacity. A PPA with a trader in the power market is deemed to be risky, except if it is supported by long-term power sales agreements.

AGP’s pride was its ability to identify “quick wins” of power capacity in South Africa. The company has worked hard to secure future supplies from sources that were considered to be unlikely. It also experienced some resistance from various project

developers as they considered the Green Power trading market as very risky. They were mostly worried that there were no long-term PPAs with the consumers.

h) Funding of new investments

There was a general reluctance to by financiers to invest in a scheme that did not have a secure market. As indicated earlier, a PPA with a trader is viewed as risky if that trader does not have a power supply agreement with its customers. As a result, there are projects that were being considered by financiers but did not materialise as they were either abandoned or deferred to a later staged when the market becomes more stable in terms of trading.

i) Revenue neutrality

There were differing opinions in terms of what it actually means to be revenue neutral and this remained a challenge for the Green Power market. Simply put, revenue neutrality merely means that not Green Power transaction will result in the network operator's financials being negatively affected. This suggests that the Green Power supplier or trader had to price its power to the consumer at a high-enough price so that there will be adequate funds to cover all income which will make sure that there is sustainability for the trader/supplier. Due to the fact that the market is small and also that it is still at it infancy in terms of development, the premiums paid thus far are not sufficient to ensure economic viability going forward.

j) Information systems

There was some level of cynicism regarding the data integrity and this was mainly caused by the unusual way that information was being disseminated from origin to the ISMO and back to billing agents. Proper systems and procedures are required to address this issue.

k) Tariffs

Tariffs that are currently used to bill customers are in most cases “bundled” and do not necessarily consider other aspects envisaged by the NERSA. For example, the two-part tariff used by most Municipalities. It is important that these tariffs be unbundled first so that the effect of Green Power transactions on the normal electricity bill from either Eskom to the Municipality; or from the Municipality to the consumer, can be determined.

l) Discrepancies in billing dates

The ISMO is responsible for clearing the market and this involves the “lining up” of the billing information between power suppliers and consumers. Practically, this requires that there is consistency between the start and end dates of the billing period. Eskom and municipalities have a number of billing periods they used and this makes it almost impossible to achieve. Therefore, it is very important to standardise billing periods for all market participants. There existing systems in place that can make this a simple task, but it would be even better if there is alignment of billing dates.

m) Number of contracts and how they are linked

Before any transaction can be undertaken place within an area supplied by a municipality, the following agreements are required between:

- the municipality and Eskom
- the customer and the trader
- Eskom and the trader
- the municipality/Eskom and customer
- all of the above with the ISMO

It is also important to have the start dates and billing periods coordinated.

n) Signing of PPAs following delays

After delays of almost three years, R56 billion worth of power purchase agreements for 27 renewable energy independent power producers were finally signed on 4 April 2018. This opened the way for construction of a total combined additional capacity of 2.3 GW. Out of the 27 signed projects, 12 are solar PV and 12 are onshore wind, with the other three being Concentrated Solar Power. This was a significant milestone after a protracted period of uncertainty for both the renewable energy industry and private sector investment in the electricity supply industry. Going forward, the DoE undertook to communicate better with investors in terms of South Africa's future energy procurement plans and also acknowledged that the stop-start modus operandi is not good for investment.

These 27 IPP projects earned the status of preferred bidders in 2015 already, after Bid Window 4 of the REIPPPP. However, as discussed in Chapter 4, the process was halted following Eskom's announcement that the power utility would no longer sign any further PPAs with renewable energy IPPs, mainly because of the country having excess generating capacity and Eskom not having sufficient funds to buy power from IPPs.

The signing of these 27 PPAs was initially planned to take place on 13 March 2018, however this was postponed by the DoE following two organisations i.e. the National Union of Metalworkers of South Africa (NUMSA) and Transform RSA, approaching the courts with the aim of interdicting the projects, as they fear that the IPP projects would result in job losses in the coal sector. The case was however dismissed by the court and struck off the roll, making way for the signing that took place on 4 April 2018. The DoE indicated that they are also concerned by the potential job losses in the coal sector but also stressed that the 27 new projects are expected to create 58 000 new jobs, particularly during the construction phases and that most of these jobs would be in rural areas.

According to the theory of public choice, as discussed in Chapter 2; it should be expected that as IPPs are introduced in the electricity supply industry, politicians and those who are politically connected will tend to want a 'piece of the pie' by acquiring equity and sitting on boards of the various IPPs while using their political influence to

implement regulations that will ensure that their profits are maximised. However, this was not the case in South Africa. Instead, politicians and those who are politically connected, especially some prominent board members and executives of Eskom, did not want Eskom to sign Power Purchase Agreements (PPA) claiming that the country now has excess capacity and the utility does not have money to buy the power to be supplied by IPPs. As indicated above, this resulted in a three-year delay before Eskom could sign the PPAs. Independent Power Producers have been seen by many as a threat to Eskom's balance sheet since they will be competing with Eskom directly in terms of power generation. Some of Eskom board members and executives have been implicated in corruption allegations where they have been accused of stealing money from the utility either by ensuring that their friends and families are awarded tenders to do certain jobs for Eskom even when they did not have the required skills and (or) experience.

Furthermore, another group that is against the introduction of IPPs in the South African ESI is the unions, with NUMSA taking the lead, as discussed above. Unions argued that IPPs are not good for the country as many people will lose jobs. Those who support IPPs did not agree with the unions indicating that unions are really concerned about losing membership more than they are concerned about job losses.

6.6 Conclusion

About 51 projects with a capacity of 2 700 MW became operational during the first five years of the REIPPPP. Most of these projects are from the first two Bid Windows with all but one project from Bid Window 3 having reached financial close. Projects emanating from Bid Windows 4 and 3.5, and those from Small Projects IPP Procurement Programme (SP-IPPPP), have been waiting for the DoE to facilitate financial close.

As from November 2016, projects from Bid Window 4 were in the process of getting the necessary approvals and nearing financial close. The REIPPPP progressed in terms of the planned targets for Bid Windows 1 to 3.5. The DoE was however very much delayed in facilitating financial close for Bid Window 4 and SP-IPPPP, and there were also delays caused by Eskom in terms of providing budget quotes to Preferred

Bidders of Bid Window 4. Furthermore, the announcement of the Expedited Bid Window (BW 4.5) preferred bidders was seriously delayed. All of this had a negative impact on the projects in terms of reaching financial close.

Regardless of successful implementation of the REIPPPP, the most significant shortcoming of the programme has been the related high transaction costs incurred by the different bidders, which includes all costs that were incurred during bid development and up to the day the projects were commercialised. Even though renewable energy competitive tenders are normally more complicated and therefore more expensive for Independent Power Producers than other alternatives such as feed-in tariff programmes, the REIPPPP requirements were more stringent on bidders. However, the dominant view is that market entry barriers were low with a few minor challenges. Overall, the participants were satisfied with the implementation of the programme.

CHAPTER 7: COMPTETITION IN THE ELECTRICITY SUPPLY INDUSTRY

7.1 Introduction

The purpose of this chapter is to discuss the findings relating to the third research question of this study which is about the prospects of having a competitive electricity market in South Africa. It discusses issues such as ownership and access to the transmission network, pricing and also presents various restructuring options. The chapter must be read with the findings presented in Chapter 6 in mind as they can affect the manner in which competition is introduced as well as the extent of that competition.

Electricity markets are vulnerable to utilities exercising their market power. This is mainly because of a number of issues such as, lack of electricity storage capacity, availability of transmission lines, inelastic demand and security of supply as well as the associated varying marginal costs of generating plants. The extent of market power is likely to change over time depending on changes in congestion on the transmission network and varying load levels.

Some structural separation has taken place in various global electricity markets, albeit at a smaller scale. However, transmission congestion tends to segment electricity markets and is directly contributing to the exercise of market power in the generation market. This is likely to result in the introduction of new generation capacity, as is currently the case in South Africa with the introduction of independent power producers which are expected to bring along competition in the market. However, there needs to be a balance between building new generating plant and constructing sufficient capacity in the transmission network.

The REIPPPP has benefited from the global demand and supply of renewable energy technologies. The programme has managed to attract a lot of attention from the private sector, globally and this can be attributed to the general slow-down in OECD markets, resulting in increased competition and reduced prices as the bidding process progressed from one round to the next.

7.2 Market power and generation

In the Renewable Energy White Paper, the DME has set an annual target of 10 000 GWh to be contributed to the total electricity consumption by renewable energy technologies. The White Paper alludes to solar, wind, biomass and small-scale hydro as the principal energy sources. The focus is more on large and economically viable projects instead of small-scale electrification programmes, notwithstanding the fact that electrification is seen as an important and urgent issue in rural areas. The South African government has also committed to developing a strategy on renewable energy sources, with the aim of putting into practice and operationalising the goals set out in the White Paper.

Due to the fact that Eskom has a competitive advantage and the necessary skills, knowledge and experience in coal-fired power generation, IPPs are deemed to be more capable of contributing to the country's renewable energy targets. In order to achieve the target of 10 000 GWh, the South African government has undertaken to strengthen competition in the electricity supply industry. Currently, the playing fields are not level as IPPs (through the REIPPPP) are required to sell their power to Eskom as the monopolistic buyer. One of the respondents expressed the following view:

> *"To me, this highlights an existing issue of conflict of interest as Eskom is 'competing' with IPPs while simultaneously playing the role of single buyer of their electricity."*

In early 2010 the South African president announced the intended creation of an Independent System and Market Operator (ISMO) which will be separate from Eskom. Once operational, this ISMO was envisaged to be responsible for the contractor of IPPs. This was a critical step to limit Eskom's market power and create an enabling environment for renewable energy power producers.

Even though power demand in most countries seems to be adequately sustained by the many competing electricity generators, power markets are still susceptible to market power which is caused by various factors, including;

a) electricity demand is nearly entirely inelastic, to an extent that withholding even a small amount of power can substantially affect the price;

b) due to challenges relating to electricity storage capacity and capability, the amount of power consumed must always be matched by production capacity;

c) when there is congestion in the transmission network, it is very important to have a separate power market in various locations. Some generators of electricity can have substantial market power within their local area and other electricity generators can have market power simply because their output is needed to reduce transmission bottlenecks;

d) at any given point in time, different generators usually have different marginal cost, therefore, there is a possibility of some generators operating at or close to their maximum output making them unable to respond to an increasing price. Although there is quite a number of different generators active, if the capacity of most of these generators is constrained, the other generators will now have the ability to significantly exercise their market power.

There are other aspects that can also contribute to enhancing market power e.g. the same group of electricity generators operate in the same market and therefore are able to meet frequently and may learn to use pricing signals to communicate. Other related markets such as ancillary services may also have elements of market power.

Just like in most markets, market power can negatively impact the overall efficiency. Market power tends to distort short-term production and consumption decisions and can encourage inefficient investment decisions in the long term e.g. decisions relating to the location or technology choice of new generators or energy intensive consumers.

Due to escalating concerns over market power, different actions have been taken by policymakers in order to address the issue of market power. Some of the actions include improvement of transmission capacity, limiting bids from generators, and improving the responsiveness of power demand to changes in prices. Another way of responding to market power is by structurally reforming the generation market. Even

though there have been some attempts of structural separation in South Africa, there is still room for addressing concentration in generation markets.

The introduction of new generation capacity in the market e.g. IPPs, can be used to reduce market power. New generation capacity has been introduced in countries such as the UK, however the scope of new entrants differs from country to country. In instances where inexpensive supplies of coal are committed in long-term contracts or where all hydro-generation sites are not available, there could be only a limited scope for new low-cost generation. There are also environmental concerns raised as a result of electricity generation and this can prolong and increase the cost of approving new capacity. In some countries, most of the new capacity is in the form of gas-fired generators making accessibility to supplies of gas a critical consideration in promoting the new generating capacity. As stated by one of the respondents to this study;

> *"In South Africa, new generation has been in the form of renewable technologies, particularly solar photovoltaic, concentrated solar power and wind. This makes the availability of solar and wind critical in making a case for these technologies."*

7.3 Transmission

The electricity transmission network is a critical component of the electricity supply value chain. It is responsible for evacuating power from the generators to the consumers, improving reliability of supply and promoting cross-border electricity trading. Main issues regarding transmission involve the avoidance of bias against third-party generators, charging for accessing the transmission system as well as incentivising appropriate and efficient investment in upgrading the transmission network. There seem to be a visible trend towards insisting on stronger forms of separation with the aim of preventing any bias. There is also a developing agreement of the need for real-time prices that are differentiated geographically.

For as long as adding new transmission lines is costly, it is normally inefficient to build a network which is able to cater for all flows of power without any congestion. However, congestion results in segmented power markets and will contribute to the existence of

market power. This effect can be significant e.g. in Denmark, congestion on the transmission network resulted in an increase in the price-cost mark-up (3% to approximately 42%), suggesting that market power was exercised.

The most important thing for policymakers was to determine how should the transmission congestion be reflected in the network access charge which will be charged to power generators and consumers. Normally, the price charged for accessing the transmission network depends only on the loss factor or time-averaged congestion. While this approach offers some locational signals to the different generating entities or end-users, it does not offer real-time incentives for these entities to alter their demand and supply in order to indicate real-time changes in network congestion. In South Africa, Eskom owns the transmission system and also owns most power generating plants. As a result, there has been a threat that Eskom will discriminate against rival new entrants (IPPs), as it was the case when Eskom refused to sign power purchase agreements with IPPs.

In the medium-to-long term, whether electricity market reforms become successful or not will be dependent on introducing incentives for appropriate as well as efficient new transmission lines. Even though geographical (nodal) prices are able to provide some information about the geographical location and timing of upgrade the transmission network, there is still an unresolved issue of determining efficient incentives for investing in transmission networks.

7.4 Reform on the demand side

The electricity supply industry is almost unique in that only a few customers pay a price which is directly dependent on the wholesale spot price of electricity. Consequently, demand is virtually inelastic. This results in an increased impact of the exercise of market power.

Most consumers of electricity pay a time-averaged price for electricity, making them completely unaffected by movements in the wholesale spot price. There is absolutely no incentive for these consumers to reduce their electricity consumption, especially on occasions when pricing is significantly increased due to higher-than-average load,

congestion on the transmission network, or outages experienced by the different generators. Even a slight increase in the elasticity of demand has the ability to lower the electricity price and the degree of market power exercised by generators.

7.5 Institutional arrangements

As it is the case in many regulatory reforms, restructuring the electricity market resulted in the formation of new institutions e.g. new market operators and new regulatory authorities. The functions of these institutions often tend to overlap with one-another as well as with the function of the national competition authority, resulting in a need for co-operation. There have been instances where regulatory responsibilities are being carried out by the national competition authority.

In most OECD countries, the restructuring of the electricity market has resulted in the establishment of a totally new independent authority responsible for regulation. In some instances, the national competition authority has been given the powers to execute the functions of the regulator. Over and above the formation of a new regulatory authority, restructuring of the electricity market also results in the formation of new institutions to perform the functions of market operator as well as system operator. These functions are normally separated from managing a profitable transmission network provider.

In terms of controlling and managing anticompetitive behaviour of market participants, there is normally an overlap between the functions of the electricity regulator and those of the competition authority. There are significant overlaps of responsibilities in countries such as Canada, but the affected institutions have devised a joint statement which clearly outlines the jurisdictions of each institution. Brazil on the other hand, has introduced limitations to the share of the market, as part of the privatisation process. The limits on market share are managed by the competition authority of the country, in consultation with the electricity market regulator.

7.6 Enforcing competition

Like in other network industries, whenever there is a restructure of the market, there is usually an increasing number of competition enforcement cases which include abuse of dominance cases and mergers on the other hand.

Globally, competition authorities have been actively against anti-competitive behaviour within the power supply market, which includes controlling and managing mergers and controlling the abuse of a dominant position. For example, the Japan Fair Trade Commission (JFTC) issued a warning to Hokkaido Electric Power Company following a finding that the company was planning to charge an exorbitant adjustment fee and a penalty for cancellation, to its customers when they want to change their preferred supplier in the market. In the same vein, the Swiss competition authority found that a transmission network company abused its powers when they refused to transport electricity from a power generating entity outside its franchise. In Germany, the competition authority has instituted formal proceedings against 12 out of 23 network operators after they were suspected of abusing the power they had through their dominant position.

In cases where different power generators are merged together, the European Commission has attempted to improve and support competition by demanding diversification of generating plant and the bolstering of interconnection capacity of the transmission network. For example, during the acquisition of Energie Naden-Württemberg AG (EnBW) by Zweckverband Oberschwäbische Elektrizitätswerk and Electricité de France (EdF), the EC demanded diversification of 6 000 MW of generating capacity and the cancellation of the exclusive contract between EdF and Compagnie Nationale du Rhône as a condition of the transaction. In another case, EdF agreed to strengthening the network interconnection capacity by gradually increasing the commercial capacity from 1 100 MW to 4 000 MW.

7.7 Competition and pricing

As previously stated, there were 28 qualifying bids during Round 1 of the REIPPPP, however investors tended to bid for lesser power capacity than what was actually being offered. As highlighted by one of the respondents;

> *"Most bidders understood that only a few projects would be ready in time to be able to meet the qualifying criteria, consequently, bids were generally very close to the price caps. Bidders assumed that due to the lack of competition, it was highly unlikely for their bids to be rejected even though their proposed prices were high."*

The dominant view is that the South African electricity market is not yet conducive for competition to take place and that some regulatory reforms are required to make change market conditions.

Lesser capacities were made available in Round 2 and Round 3 and this resulted in a substantial increase in competition, both in terms of the number of bids received as well as the number of bids that satisfied and exceeded the qualification challenges. As a result, there was a significant reduction in prices as shown in Table 19.

Table 19: Bid Prices of the REIPPPP in 2011 (SA c/kW) (Eberhard et al. 2014)

	Round 1	Round 2	Round 3
Wind	114.3	89.7	65.6
Reduction from previous round		-21.5%	-26.9%
Total reduction from round 1			-42.6%
Solar PV	275.8	164.5	88.1
Reduction from previous round		-40.4%	-46.4%
Total reduction from round 1			-68.1%
Concentrated solar power	268.6	251.2	146.0*
Reduction from previous round		-6.5%	-41.9%
Reduction from previous round			-45.6%

In Round 1, the real returns on equity were very close to the 17% (in South African Rand) that was initially expected when the original feed-in tariffs were being

determined. Equity returns reduced a bit during the second round for wind and a little more for solar PV. Between 12 and 13% returns (in US dollars) were achieved. Round 3 saw returns falling even further, particularly for some of the corporate funded projects.

Without a doubt, the reduction in prices in Rounds 2 and 3, which led to reduced returns is attributed to an increase in competition. However, there were other factors that contributed to the price reductions e.g. globally, prices for renewable energy equipment had reduced mainly as a result of a surplus in manufacturing capacity; and ongoing technology innovation plus economies of scale. The REIPPPP was well positioned to take advantage of these international factors. Transaction costs were also reduced during Rounds 2 and 3 as compared to Round 1, as most of the project sponsors and investors became familiar with the REIPPPP tender specifications and requirements.

7.8 Restructuring for competition

In order to have effective competition in the South African ESI, all participants must be guaranteed a non-discriminatory access to the distribution and transmission networks. Additionally, there should not be any power generator with market power. The easiest manner to achieve these goals is to reform the electricity supply industry and this is normally one of the first steps in the restructuring process. The old vertically integrated monopoly industries are vertically structured i.e. distribution and transmission are separate from generation, which are then managed as separate, independent companies. There is also horizontal unbundling, where generation is divided into several companies which will compete with one another (without any one company having market power) and/or the new power generators are allowed to participate in the market. Every power generator may then deliver their power to consumers using the transmission and distribution system (wholesale competition). This is normally the practice in most countries that are reforming their electricity industries. It has not been always successful, and it is important to ensure that no one generator can regularly manipulate the price setting area in the market.

In some instances, e.g. California, power generators have been allowed to continue owning their transmission lines with an independent systems operator (ISO) having the responsibility to oversee the non-discriminatory access to transmission. However, this method of operation was found to be quite expensive and problematic to regulate.

In most countries, IPPs and/or importers have been the vehicle used to introduce competition in the electricity market, as is the case with South Africa. Normally, these IPPs have to guarantee future electricity sales by making use of a power purchase agreement (PPA) with the dominating entity (single-buyer model). Most financiers insist on these PPAs so that they can secure an income stream that is predictable enough to be able to service debt. South Africa's REIPPPP has also adopted a similar modus operandi which has also been used by other developing countries. The following comment was made by one of the respondents:

> *"This approach comes with a few compromises as it has no full wholesale competition because the dominant utility (Eskom) will ordinarily have a lot of market power as it controls the existing generation capacity as well as the transmission network."*

There is also a threat that power utilities and governments could be trapped in costly power purchase agreements that will not be competitive in the future i.e. PPAs are likely to have a fixed price over the duration of the contract. However, prices could be reduced as the market becomes fully competitive.

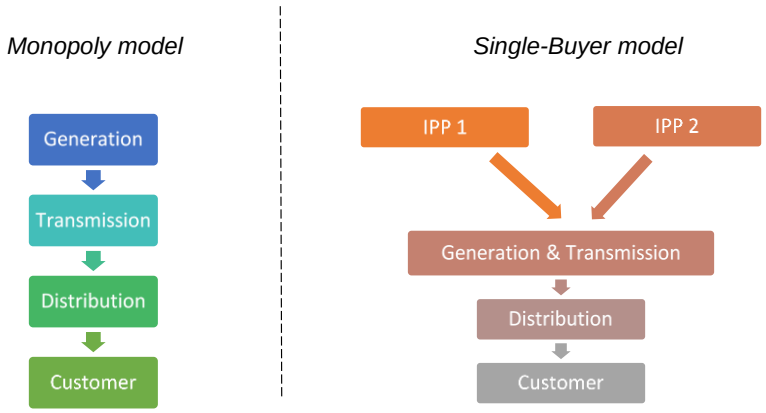


Figure 27: Monopoly and single-buyer models (Newbery and Eberhard 2008)

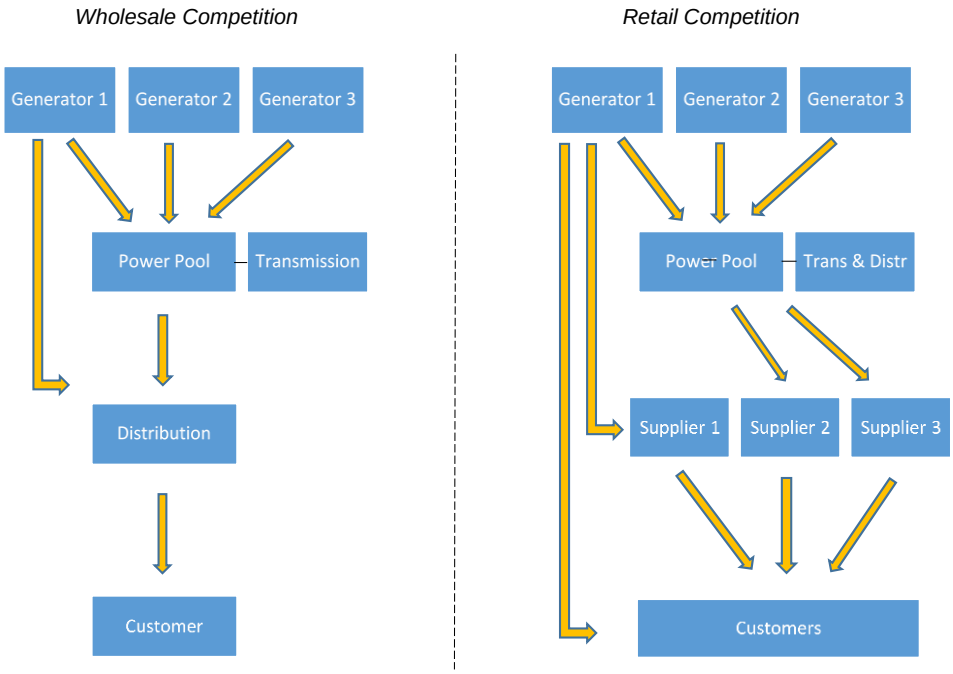


Figure 28: Wholesale competition vs retail competition (Newbery and Eberhard 2008)

There is a general agreement amongst stakeholders that South Africa should move towards having a full wholesale competition where generation will be separated from transmission while simultaneously unbundling generation into different companies which will compete (without anyone being large enough to exercise market power).

When the restructuring process has reached a mature stage, the supply of power normally gets separated from the operations and ownership of the distribution network and various suppliers or retailers would compete to sell power to their customers, or put differently, customers would have the opportunity to choose who supplies them with electricity (retail competition, Figure 28). Choice of supplier for larger customers would be introduced at the same phase as wholesale competition. This will then be extended to smaller customers at a later stage. Suppliers of electricity buy their power from the wholesale market. Transmission and distribution companies will then have to be paid a price (which will be regulated) in order for the electricity to be evacuated and delivered to customers. As a result, customers will see their electricity bill divided into different sections i.e. the energy part, which is the price of electricity bought from a generator; and a transmission and/or distribution part, which is the cost of wheeling

power from the generator to the customer. Customers can also choose to buy their power directly from generating entity. Some European countries have adopted the retail competition route where large customers are allowed to choose their supplier first and then competition is extended to other electricity customers, regardless of size.

Based on the theory of economic regulation and the theory of public choice, one would expect the introduction of IPPs in the South African electricity supply industry to have resulted in customers having the choice of a preferred supplier where the choice could be based on price and (or) quality of supply. However, this has not been the case in South Africa. As discussed in Chapter 5, when IPPs were introduced (using the REIPPPP as a vehicle), all IPPs had to sign PPAs with Eskom, making Eskom the sole off-taker of the power generated by these IPPs. This meant that all customers still have to buy their power from Eskom at a price set by the utility and approved by the regulator. Customers have no choice in terms of who supplies them with electricity and they will pay the Eskom price instead of the IPP price which is significantly lower. Therefore, the introduction of IPPs has had no benefit for the customer with regards to choice and pricing.

Even though there are new players in the market there is still no real competition in terms of power supply and to a large extent, Eskom remains a ‘monopoly’. Therefore, this is a contribution to both the theory of economic regulation and the theory of public choice in that as much as the introduction of IPPs in developed countries like Germany resulted in customer choice and reduced prices, this has not happened in developing countries; with South Africa being the case in point. Developing countries have to deal with other issues such as corruption and financial mismanagement. Although there are other suppliers (IPPs) that can provide cheaper electricity to customers, politicians preferred a model that does not allow customers to buy electricity directly from IPPs so that Eskom can be kept operating to ensure their interests and not customer interests are being taken care of.

7.9 Restructuring options for the South African ESI

The policy statements on the South African ESI involve a number of possible structures. The government has indicated its preference of a managed restructuring

process and therefore there is a possibility that some of the models discussed below could be implemented in succession. The main differences in the models mostly have to do with the changing level of Eskom versus private ownership as well as the different extents of asset separation, hence different degrees of regulation and competition.

The models will inevitably yield various pricing outcomes. There will also be varying implications for unlocking economic value for the South African government, widening economic participation and growing FDI. Below are some of the models that could have been considered by the government:

7.9.1 Integrated monopoly

In this model, Eskom remains pretty much the same. There could be participation by strategic equity partner. Variations are dependent on whether the management and control of distribution and transmission networks is still under Eskom, or whether it is limited to a generation monopoly.

Both generation and transmission are dominated by Eskom which also controls almost half of distribution. Independent power producers have been allowed limited participation in the market. The IPPs sell their power to Eskom through power purchase agreements. Electricity prices are regulated.

Private sector participation is allowed and will take the form of a strategic equity partner. However, there is a possibility that consumers could be prejudiced if the privatisation of Eskom was to take place now. Effective regulation would be challenging to implement and consumers may end up becoming victims of private monopoly rents and profits. There are some stakeholders, including those within the Departments of Energy and Department of Public Enterprises, who believe that competition must be introduced first before allowing private equity participation.

7.9.2 Dominant supplier model

This is actually the restructuring model that was preferred by the South African government in the early 2000s, however, as previously mentioned, it never got to be implemented. Here, Eskom keeps ownership of 70% of generation through an

integrated company with distribution being the responsibility of REDs. The other 30% of generation will be sold to an independent participant. Under this model, Eskom would still be the dominant supplier of electricity while being subjected to regulation. In terms of which 30% would be sold to independent participants, the options are that either Eskom keeps the high-cost power stations or Eskom keeps the low-cost generators. Transmission will still be owned by Eskom.

Eskom gets corporatized and the generation and transmission divisions of the utility would be converted into separate subsidiaries. The distribution division would be amalgamated with municipal distribution into a national distribution company called EDI Holdings and then into the REDs. The thinking at that time was that initially, mothballed power stations would be sold a BEE company. There different alternatives in terms of which power stations would be further divested. The government had indicated that, for the state to achieve its developmental and social goals, Eskom should continue its dominance in the market and that limited participation of private players would be introduced.

At that time, it was unclear whether or not social goals referred to electrification. If it did, then there was no clarity as to why Eskom should continue being the dominant player in generation, because the REDs were supposed to be assume the responsibility of electrification throughout the country. Eskom's power pool might continue, internally, whereby the different power stations and clusters “bid” a “price” and the amount of power required for the following day (day ahead). Various Eskom generators would be dispatched in merit order starting with the lowest prices until there is sufficient power available to meet the demand. Commercial operation of the different generators was ring-fenced with internal competition being simulated.

Essentially this is a single-buyer model, as there is a high likelihood that a private generator will have to sell its power to Eskom. Alternatively, there could be an external cost-based power pool where there would be IPP participation. A further option involves the government allowing independent power producers to negotiate separate PPAs with large customers. One of the respondents indicated that;

> *“There have been arguments from Eskom that it would like to continue owning the transmission assets. At that time, it was aiming to develop*

its linked telecommunications infrastructure which would allow the utility to bid for a new fixed line telecommunications licence."

However, another respondent stated that:

"There were other possible alternatives e.g. the Eskom Enterprises division could take control of the fibre optic assets using a subsidiary telecommunications company as a vehicle and a new independent transmission company would be able to sign strict Service Level Agreements for its own telecommunications requirements."

Eskom further argued that the utility's credit rating would be negatively affected if it were required to strip its transmission assets. However, Eskom's generation business has a much bigger asset base as compared to the transmission business. The utility further argued that it would like to be a major participant in terms of operating and building transmission lines in the rest of Africa. This was also an option for an independent transmission company which is South African and could have been a favoured option from the viewpoint of African countries who might guard against a big powerful Eskom's involvement in both transmission and generation investments in their countries.

In the event that the transmission system is not independently owned then another option for ensuring non-discriminatory access could have been the establishment of an Independent System Operator (ISO). The formation of an ISO could have been costly and challenging to regulate. The easiest manner to ensure non-discriminatory access to the transmission network is to place the assets and operations in a separate independent entity. In this model, the government could find it challenging to attract new investment into the ESI because most investors may have concerns with Eskom's inherent conflict of interest, as the owner of transmission, having bias towards its own power station at the expense of new participants. IPPs would most likely want to enter into long-term PPAs, which will mean consumers could be tied to non-competitive prices for many years. Eskom has the ability to apply excessive market power in this situation, therefore there would be a need to regulate wholesale electricity prices.

7.9.3 Subsidiary generation model

This involves Eskom maintaining ownership of 70% of its generation assets but placing clusters of power stations into subsidiary companies who are in competition with one another. Transmission would be placed in a separate company owned by the state in order to ensure that there is non-discriminatory access to the system and external trading mechanisms are created.

A separate government-owned transmission company is formed with a guarantee of non-discriminatory access to the transmission network. This model also includes the formation of an external transparent power exchange and some trading arrangements. An independent transmission company as well as a power exchange that has transparent market rules and parallel trading mechanisms will result in greater confidence from potential investors. However, there will still be concerns in terms of Eskom using its subsidiaries to apply undue market power, which could result in the utility having the ability to influence prices. The Competition Commission may have its own reservations with this kind of structure.

7.9.4 Divesting most of generation assets

This model involves Eskom retaining ownership of 35% of generation. Divested generators are taken up by at least four IPPs, creating five different competing clusters of generating assets. There would be sufficient competition under this arrangement, even though those clusters with strategic asset configurations will have the ability to increase prices above the levels of perfect competition.

The model acknowledges that for the industry to be competitive, Eskom's market power must be drastically reduced and there needs to be a significant number of new entrants in the market. BEE and private equity participation, including an initial price offering (IPO) could be used as tools to ensure privatisation of divested assets. A power market would be formed various industry stakeholders participating in a number of trading arrangements, which may include a short-term power exchange and a balancing market, together with long-term bilateral agreements and futures contracts. This model is in line with a growing global consensus in terms of the future of the

world's electricity supply industries. Those who support of the model have argued that competition will most likely bring more improvement in operational efficiencies as well as reduced prices than the other models.

Substantial empowerment of black individuals and companies could be realised, including a fiscal revenue which will assist in reducing debt. There could also be a considerable amount of inward investment, as a result. Financial and economic returns will be much better as compared to other models. Eskom would have no choice but to be competitive and this may result in a management culture that could put Eskom in a better position to invest internationally and contribute to other aspirations of the country. The economic development in SADC could be enhanced substantially as generation projects within the region could have access to the South African electricity market and would be able to participate with a lot of market certainty. The fact that there would still be some part of generation owned by the government would make it possible for the state to intervene quite easily in investments for future generation, should there be a need, if the market is unable to satisfy the growing electricity demand.

7.9.5 Maximum separation of generators

This model entails putting each generation asset in a separate company and selling it to private investors. This would result in fierce competition which will reduce prices to the lowest possible levels. Government has not really considered this type of model, but is an important reference case.

The model has all of the benefits of the previous model that entails divesting the generation assets, with security of supply being the one aspect that could prove to be challenging, and this could be compromised in the event that investors are not able to satisfy the growing demand of electricity. Furthermore, stranded assets can pose some challenges as power stations with high costs may find it quite difficult, if impossible, to survive. These high-cost power stations would only be sold if their asset value was discounted by government. Full privatisation of Eskom has not been seriously looked at as an option by the South African government.

7.10 Implications for competition and regulatory oversight

The main purpose of having competition regulation and regulation which is specific to a certain sector is to tackle market failures (including market power being abused by dominant players), externalities and information asymmetries, natural monopolies, as well as ensuring that the distribution of outputs is done in a more equitable manner.

- Competition regulation is more concerned about market structures, controlling and management of anticompetitive behaviour as well as reviewing mergers;
- Economic regulation implements measures for controlling monopoly pricing and ensuring that consumers are protected adequately using tools like cost-of-service regulation (e.g. rate of return) or incentive regulation which could include price or revenue caps, or performance-based franchising regulation;
- Technical regulation aims to determine and monitor standards in order to ensure compatibility and to deal with safety and environmental protection issues; and
- Public interest regulation is more concerned with equity imbalances and distribution. It is generally expected that as competition is introduced, the scope of regulation should reduce. A competitive market that is operating very well must be able to result in improved incentives and outcomes than a market which is more regulated, even though in reality there is still some level of monitoring and oversight required to make sure a competitive behaviour prevails.

7.10.1 The roles of the Competition Commission and the NERSA

According to the Competition Act, the Competition Commission has a clear jurisdiction over competition matters in other regulated industries, which includes the electricity supply industry. The Competition Act also makes provision for the Competition Commission to have the responsibility to:

- *negotiate agreements with any regulatory authority to co-ordinate and harmonise the exercise of jurisdiction over competition*

matters within the relevant industry or sector, and to ensure the consistent application of this Act;

- *participate in the proceedings of any regulatory authority;*
- *advise, and receiving advice from any regulatory authority; and*
- *over time, review legislation and public regulations, and reporting to the Minister concerning any provision that permits uncompetitive behaviour.*

The Electricity Regulation Act, on the other hand, gave NERSA the legislative responsibility of regulating access to the market by power suppliers (through licensing) and approving electricity prices. Currently, there is no formal agreement between the Competition Commission and the NERSA. The two regulatory bodies, together with the government, will need to devise a common understanding regarding the reform of the ESI which will assist in introducing competition in the industry, and must clarify who will be responsible for what in overseeing competition. One of the respondents commented as follow:

"It is generally accepted that electricity generation and sales are competitive functions, and that currently both of these functions are under monopolistic control, therefore it might be fitting that the Competition Commission takes a more pro-active approach in advocating for a shift towards competition."

The Competition Commission's task would be to make sure that a competitive status of the ESI is preserved if; generation is unbundled into competing companies; there is guaranteed open-access to the transmission network; electricity trading instruments are put in place; and retail competition is instituted. The Competition Commission and Tribunal will have to monitor and managed any signs of abusing market power or proposed mergers that are likely to discourage competition.

Any agreement between the Competition Commission and the NERSA would need to make provision for giving the NERSA the responsibility of monitoring market power issues and referring them to the Competition Commission will be responsible for taking

action against those who abuse market power. The NERSA is in a better position and also more prepared to detect any form of anti-competitive behaviour within ESI, due to the challenges and trading mechanisms of the market.

7.10.2 NERSA's role in a competitive environment

As previously mentioned, the NERSA can provide professional support to the Competition Commission in terms of monitoring and ensuring competition in the ESI. Furthermore, it can play another role to encourage better operational efficiency in the market:

- One of the most critical issues when introducing competition is to decide on the best suitable market structure. The NERSA had previously studied a few market scenarios and modelled studies that show the best structure for generation clusters, the need for open access to the transmission network, using an independent transmission company; and the setting up of various electricity trading mechanisms. This will require an agreement with the Competition Commission as well as government. Simultaneously, Eskom and municipal distributors must be urged to implement the required reform.

- As far as possible, entrance to the competitive aspects of the ESI must not be restricted (even though licences must still be needed in order to ensure there is sufficient compliance with technical standards as well as requirements for local planning and environmental imperatives).

- Price in the competitive aspects of the ESI must not be regulated, unless there is evidence of market power and abuse.

- Another function of the NERSA is to ensure that market codes and rules are established in a manner that improves efficiency. This would include:

    - A grid code with clear rules that outline connection standards as well as rules for system operation;

- Rules for market membership in terms of the various electricity trading mechanisms i.e. futures market, day-ahead market, bilateral contracts, etc. (this includes clear procedures for bidding, clearing and settlements);

Typically, the NERSA would not be caught up in the daily governance of all these functions, instead it would play a critical role in terms of assisting with designing an optimal set of market arrangements and would also be responsible for a review, periodically. These markets must be flexible and responsive; therefore, the overall governance arrangements should include relevant stakeholders who can from time to time assist in improving the systems.

- One of NERSA's role, together with the market operator, would be to monitor pool prices, bilateral contracts, the balancing market as well as reporting anti-competitive behaviour to the Competitions Commission. There are some characteristics of electricity systems that renders them susceptible to gaming behaviour by power generators:

    - Economical storage of electrical energy remains a challenge and there needs to be adequate supply to match demand. As a result, in order to meet demand fluctuations, only those generators that already in operation or those with the flexibility of running whenever they are needed, such as gas and hydro generators, would be suitable. These generators would then be able to potentially "capture" the balancing market at the expense of non-operating but available generators.

    - To a large degree, electricity demand is fairly inelastic. Regardless of high prices and the fact that generators can exploit this fact, electricity remains a necessity. Short-term inelasticity of electricity is mostly worsened by limited or even sometimes lack of demand-side participation, resulting in limited demand response to changes in prices.

    - Wholesale demand comes with some level of predictability. Aggregate demand is forecasted by the market operator and this information is made available to all generating units.

- Variable costs of generating units remain fairly constant and therefore this makes it easy for generators to predict the supply curve shape (by changing bids at initial stages to establish the shape. It is theoretically possible for different generators to bid strategically in order to game the system; and this is made possible by the predictable nature of issues raised above, together with having some intelligence into bidding patterns of competitors and their maintenance plans. This would effectively shift the supply curve towards the left and increase prices. This is more evident at the steep part of the supply curve and not on the relatively flat side.

- The power pool is not a single market but rather a few markets that change with time and location i.e. the demand during peak periods is quite different from the demand during off-peak times, and there could be transmission challenges (creating load pockets), depending on the geographical location of the different generators.

- Transmission constraints and ancillary services challenges requires that some generating plants run purely because of their geographical location as well as technical characteristics. After a while, it becomes obvious that generating plants are quite important and their owners could ask for a premium by bidding higher than their marginal costs.

These are not arguments against the introduction of competition in the ESI, instead they are reminders that the sectoral regulator would need to frequently monitor possible market power and abuse. Continuous manipulation of electricity prices will be evident and can cause severe regulatory sanction, including further forced market reform.

7.10.3 Regulating the transmission network

The natural monopoly aspect of the electricity supply industry is the vital backbone of the system and it is critical for the NERSA to make sure that the entity that owns the transmission network offers its services to customers at minimum cost, while simultaneously carrying out its main responsibilities which include operating and

maintaining the network, reduction of system losses; as well as investing in expanding the transmission network.

One of the respondents to this study highlighted that:

> *"For the NERSA to be able to effectively regulate the distribution and transmission costs, there needs to be an intimate knowledge of existing assets, new and future investment needs, system operation overheads, etc. Ideally, economic regulation should be incentivised, as this will allow investors to take advantage of efficiency gains and passing some of the benefits to customers."*

7.10.4 Regulation of distribution

The restructuring proposal by government for the electricity distribution sector in the early 2000s suggested the unbundling of the national distribution assets (some owned by Eskom and others by local governments) into six regional electricity distributors. Only large customers (those consuming more than 100 GWh) would be able to choose who supplies them with electricity. As a result, it is unlikely that there will be retail competition anytime soon. The costs of offering retail services such as power purchases, customer services, billing, etc. for all other customers could be combined with the costs of distribution and will therefore be regulated by the NERSA.

Retail tariffs are currently regulated by the NERSA using a 'yardstick' method. Electricity distributors are compared and prices are forced into a narrower band that is close enough to the most efficient distributor. Going forward, it is likely that a price cap or revenue cap incentive regulation will be introduced, which includes a specified efficiency gain. A benchmarking exercise between different distributors could be required in order to decide what this efficiency gain should be. NERSA's concern is not limited to the level of pricing but it is also concerned about the structure of available tariffs. Pricing policy is used to establish the extent of cost-reflectivity when recovering income from various customers at different periods of the day and season.

There will always be little incentive for retailers to pass their energy savings benefits, until retail competition is introduced. In the event that there is an introduction of full

retail competition in the future, the NERSA will only regulate the natural monopoly aspect of distribution and the Competition Commission will have oversight of competitive retail (sales). The horizontal integration of retailers would need to be restricted. The retailers should ideally be separated from the transmission company as well as from distribution companies. If this is not done, then the distribution and retail operations should be clearly ring-fenced. The government, through the Department of Energy, would still need to make a policy decision in terms of whether generation companies would be allowed to own retailers or vice versa.

Introducing retail competition will need considerable investment in information technology. Usually, competition for consumers would necessitate the installation of hourly or half-hourly meters. Installing these meters could prove to be a costly exercise and may end up being a barrier to switching suppliers. The NERSA may consider instituting a load-profiling system such as the one used in Norway, which could result in the significant reduction of these costs. The future licencing of distribution and transmission operators would still be the responsibility of the NERSA. The NERSA would also continue fulfilling its mandate of regulating technical standards in the ESI.

7.10.5 Regulating benefits for the public

As the restructuring of global electricity markets continue, the delivery of some vital ‘public benefit’ programmes continues to under threat with no new programmes being introduced. Examples of these public benefits involve environmental protection and energy efficiency programmes, public-interest R&D activities, and electrification programmes for both the urban and rural communities. As much as these programmes result in significant welfare improvements, most of the time they are expensive to implement and normally need some level of public sector involvement. As societies enjoy these benefits, consumers usually do not invest in these goods themselves as they are able to take advantage of investments by others.

Restructuring of the ESI introduces new barriers which inhibit investment in these public benefits. For example, plans to commercialise SOEs and promote a competitive environment, tend to result in increased costs. Unbundling activities tend to remove the ability of utilities to evenly distribute the costs of public benefit programmes.

Conversely, restructuring the ESI can introduce renewable energy technologies in a manner that was not possible with the old vertically integrated monopolies that almost always favoured large investments in coal-fired power stations as well as nuclear technology. There is always a need to put in place programmes that encourage public benefits.

Eskom has and continues to play a significant and important role in financing electrification and South Africa managed to achieve an unprecedented record by doubling the population with access to electricity from 33% to almost 66% in just six years. Eskom has also started investing in the demand-side management (DSM) as well as energy efficiency programmes.

7.10.6 Security of supply

Previously, Eskom has made sure that there are always acceptable levels of security of supply (albeit at a significant cost due to a huge over-investment in the 1980s and 1990s).

According to one respondent:

> *"In a competitive market, security of supply is the responsibility of the system operator, in the short term. It will be the responsibility of the system operator to maintain a balance between supply and demand on a real-time basis. In the long term, an efficient market should be able to send the correct signals for investors to react to new opportunities on the generation side."*

Another respondent said:

> *"The use of capacity payments, linked to loss-of-load probability, may be used as another price signal to investors as reserve margins diminish. However, this does not work all the time. For example, in the UK, it was simply exploited by big power suppliers for short-term price advantage."*

While transitioning to a more competitive ESI, it is very important to devise an integrated resource plan in order to determine an indicative plan for generation as well as demand-side; and this would normally be done by the system operator. This plan will need to be updated and published regularly to assist investors and other stakeholders to better understand future needs of the ESI.

7.11 Electricity trading in South Africa

The South African government approved a pilot project with a company which was then called Amatola Green Power (Amatola). The aim of the pilot was to demonstrate a power exchange market for trading green energy in South Africa. During the pilot phase, Amatola managed to successfully trade green power after securing Power Purchase Agreements (PPAs) with green energy generators and off-take agreements with some customers. In 2008, a permanent green power trading market was approved by government after a review of the pilot conducted by Amatola.

In early 2009, following an application and various public hearings, the NERSA granted a five-year license to trade in green energy to Amatola making it the first private sector electricity trading company in South Africa which operated based on the “Willing Buyer-Willing Seller” model. In 2014, Amatola’s trading license was extended by the NERSA for a further fifteen years after having gone through a rigorous process where certain terms and conditions had to be complied with.

In 2012, the Nelson Mandela Bay Municipality in Port Elizabeth adopted a forward thinking and progressive green economy strategy which resulted in Amatola signing a twenty-year Wheeling Agreement with the municipality. This was very critical for Amatola as it made it possible for the company to buy green power from IPPs and selling it directly to consumers. As a result of this transaction, the municipality was able to reduce its carbon footprint by 10% which in turn reduced customers’ carbon footprint and stimulated the “green economy”.

In 2016, Amatola was bought by a group of South African investors and the company was renamed to PowerX. In 2018, PowerX applied to the NERSA for an additional six generators and 29 customers to be included in its license. This seems to be an

indication that independent electricity trading is slowly gaining popularity as the ESI is being reformed. This will also make PowerX a model for an open electricity market in a post-Eskom era.

The business model adopted by PowerX involves buying a minimum of 100 kW of clean power from generators. This could be wind, hydro or rooftop solar. It offers inflation-linked long-term agreements which are suitable for most investors. Consumers who are within the municipal supply area pay based on tariffs that were approved by the NERSA, however they get a discount for entering into long-term off-take agreements. PowerX has indicated that it generates sufficient revenues which make the discounts affordable by the company while still maximising shareholder returns.

In 2017, Eskom announced that it now had surplus power in its system and this has left co-generators who previously had short-term or medium-term supply agreements with the utility in a position where there is now a risk of having stranded assets. This is good news for PowerX as it puts the company in a strong negotiating position where co-generators can be offered some income, instead of sitting idle without generating any income. Simultaneously, municipalities face increasing network defection and have realised that customers switch to renewable energy sources, particularly those with generating plants that smaller than 1 MW, who are exempted from obtaining generation licenses. Instead of losing all revenues from such customers, the PowerX model offers municipalities the ability to still make money from them by allowing PowerX to use the distribution network for wheeling the power between the seller and the buyer.

The license that PowerX holds allows the company to trade anywhere in South Africa. Presently, it operates mainly in Nelson Mandela Bay (Port Elizabeth), Umjindi Local Municipality (Barberton) as well as Mandeni Local Municipality (near Durban). PowerX is in the process of negotiating agreements with the Makana Local Municipality (Grahamstown), Mbombela Municipality (Nelspruit) and the Tshwane metro to provide green energy to the industrial area of Rosslyn where car manufacturers such as BMW are required to operate within restrictions of environmental legislation.

This trading model has been successfully implemented in other countries and the NERSA is processing applications from other companies who are also interested in obtaining trading licenses which may not necessarily be focussing on green power.

7.12 Conclusion

Electricity markets are vulnerable to the exercise of market power because of a number of issues such as lack of electricity storage capacity, availability of transmission lines, inelastic demand and security of supply as well as the associated varying marginal costs of different types of generators.

There is a general agreement amongst stakeholders that South Africa should move towards having a full wholesale competition where generation will be separated from transmission while simultaneously unbundling generation into different companies which will compete (without anyone being large enough to exercise market power).

One of the most critical issues when introducing competition is to decide on the best suitable market structure. The NERSA had previously studied a few market scenarios and modelled studies that show the best structure for generation clusters, the need for open access to the transmission network, using an independent transmission company; and the setting up of various electricity trading mechanisms. This will require an agreement with the Competition Commission as well as government. Simultaneously, Eskom and municipal distributors must be urged to implement the required reform.

The study has shown that even though there are new players in the market there is still no real competition in terms of power supply and to a large extent Eskom remains a ‘monopoly’. South African electricity customers still have no ability to choose their preferred supplier unlike in some developed countries. Politicians tend to make decisions that benefit them and their interests instead of benefiting the customer.

CHAPTER 8: CONCLUSION & RECOMMENDATIONS

This study was concerned with the introduction of Independent Power Producers in the South African electricity supply industry. The purpose of this chapter is to provide concluding remarks of the study based on the findings discussed in Chapters 5, 6 and 7, which answer the research questions outlined in Chapter 1. This chapter also discusses some recommendations that could be considered for future research.

8.1 Conclusion

For decades, the South African electricity supply industry has been monopolised by Eskom. The industry has been through various phases of overinvestment in generation capacity to underinvestment (resulting in load-shedding), and went back to the overinvestment phase with the addition of new capacity; and since November 2018 is now experiencing power shortages which are attributed mainly to lack of maintenance and lower coal stock piles at various fossil power stations. Eskom, has been accused of inefficiencies and financial mismanagement, with the Government being called upon to bail out the utility. In recent times, the electricity consumers have been subjected to above-inflation tariff increases. Eskom has been downgraded by various rating agencies, making it expensive and difficult for the utility to raise new debt. South Africa has committed to responding to challenges relating to climate change by reducing its reliance on coal for electricity production, resulting in changes that made renewable energy technologies to contribute significantly in the country's energy mix.

All of these factors have raised serious questions about the way Eskom is operated and the manner in which the ESI is structured. It is in this context that the Government has considered reforming the ESI, hence the introduction of Independent Power Producers. This study has focused on the impact of IPPs entering the South African electricity supply industry, market entry barriers experienced by new players and has also attempted to answer the question about having a competitive electricity market.

Given Eskom's competitive advantage (as a result of it being a monopoly) and core competencies in coal-fired power stations, IPPs have been considered to be the correct vehicle to contribute to increasing the country's renewable energy capacity. In

order to accomplish the 10 000 GWh renewable energy target, the government has shown commitment to strengthen competition in the ESI, even though there has been some resistance from Eskom. Currently, IPPs are not participating in a level playing field because they have to sell their power to Eskom as the only buyer. This results in Eskom having a conflict of interest as the utility acts as a competitor to IPPs as well as the single buyer of power, simultaneously. Once established, the ISMO will be the contractor of IPPs. This is a critical step to limiting the market power of Eskom and creating a conducive environment for renewable energy IPPs.

IPPs have been introduced in the South African ESI largely through the Government's Renewable Energy Independent Power Producers Procurement Programme. The South African experience presents many important lessons for successfully implementing renewable energy programs in other developing countries. For example, the REIPPPP has shown that there is considerable willingness amongst private sponsors and financiers to invest in renewable energy, provided there is a clearly designed and transparent implementation process, with transactions showing reasonable levels of profitability and Government willing to mitigate key risks.

8.1.1 Impact of IPPs

This study has found that IPPs have had various impacts on the ESI, particularly since the inception of the REIPPPP. One of the notable and significant impacts of introducing the IPPs in South African electricity supply industry has been the reduction of renewable energy costs, specifically for wind technologies as well as solar PV. As discussed in Chapter 4, the cost of new solar PV and onshore wind is now almost 40% cheaper than the cost of new baseload fossil power stations. Solar PV and wind prices have fallen to as low as 62 c/kWh from between 69 c/kWh and 95 c/kWh in the fourth bidding window of the REIPPPP. This is a significant reduction from the costs seen during the first bidding window that took place in 2011, when the tariff for solar PV was 365 c/kWh, while that of wind was 151 c/kWh for a 20-year PPA. There is a strong argument for transitioning to an energy mix comprised mainly of solar PV and wind and supported by other technologies which will be able to respond when there is no sufficient wind or sun. According to the CSIR study discussed in Chapter 4, when combining the 62 c/kWh from solar PV and wind, with other "flexible" technologies e.g.

gas, which are said to be costing around 200 c/kWh, the result is a “mixed-cost” of about 90 c/kWh. This is definitely lower than a cost of 103 c/kWh for baseload coal and between 117 c/kWh and 130 c/kWh for nuclear power.

Regardless of the success of the REIPPPP, the ad-hoc manner in which IPPs are introduced in the market presents a few risks. In order for the process to be sustainable, there will need to be a creation of institutional capability within a formal institution such as the Independent System and Market Operator. There were also some programme design weaknesses and there is evidence that there was an overestimation of the size as well as the readiness of the local renewable energy industry. For example, the level of competitiveness, particularly during the first bidding round, was very limited, with bid prices being very close to the maximum price that were indicated in the RFP.

Eskom seems to view the introduction of IPPs as a threat to its business since the utility took a decision in 2016 not to sign any more IPP agreements. However, this decision was rescinded as a result of pressure from IPP companies and a statement by the president of the country in February 2017 where he categorically announced that IPP agreements will be signed. This resulted in a statement by Eskom in March 2017 where the power utility proclaimed that it plans to shut down four of its coal-fired power stations to accommodate renewable IPPs. This will result in a total of 7 600 MW (from Hendrina, Kriel, Camden and Komati Power Stations) being removed from the grid. The decision, which is expected to be implemented over a few years is a significant one since it will expedite the industry reform process. This is another indication that the South African ESI is slowly opening up, threatening Eskom’s dominance in the process.

The requirement of the REIPPPP to have South African ownership and management control in bidding companies, as well as the need to create jobs for South Africans, together accounted for forty-five percent of the non-price value of bids. However, according to global experience, this kind of focus has the potential of being misdirected. For example, it may be necessary to insist on local ownership, but this is not tantamount to capacity building which is more focused on developing critical skills e.g. operational, technical and management skills in companies and local labour

supply. Therefore, in order to ensure the achievement of industrial capacity building, it is important for policymakers to emphasise, in an organised manner, on simple policy weaknesses that affect the trade and industrial policy, development of infrastructure, as well as skills transfer. If not, these requirements become somewhat more than just extra costs for foreign operators and ultimately the consumer.

Given the fact that Eskom is still a monopoly, albeit at a slightly reduced extent since the introduction of IPPs, there is a need to regulate access in terms of price, volume and quality. This regulatory function is different from the regulation of competition as it is more concerned about the regulation of specific operators and not necessarily the whole market or sector.

The REFITs were officially discontinued by NERSA and later replace by the REIPPPP which gave project developers an opportunity to generate profits due to the programme structure being linked to the “REFIT-like” tariff caps, especially in the first bidding round. The main change in design made in 2011 was to alter the REIPPPP from being a once-off tender to being a number of bidding rounds. The various bid rounds had a major impact in terms of creating confidence in the programme amongst the different stakeholders, including investors and operators; and resulted in increased levels of competitiveness as the number of participants in the tendering process increased. Overall, there was an increase of about 49% in the number of bidders from Round 1 to Round 2, and another 18% increase in Round 3. This change contributed significantly to the sharp cost reduction in subsequent bidding rounds.

The fact that PowerX has been granted a license to trade in green energy by the NERSA is a clear indication that the market is opening up and the private sector is ready to introduce competition in the ESI. This makes PowerX the first private sector electricity trading company in South Africa which operates based on the “Willing Buyer-Willing Seller” model. In 2018, PowerX applied to the NERSA for an additional six generators and 29 customers to be included in its license. This seems to be an indication that independent electricity trading is slowly gaining popularity as the ESI is being reformed. This will also make PowerX a model for an open electricity market in a post-Eskom era.

In 2017, Eskom announced that it now had surplus power in its system and this has left co-generators who previously had short-term or medium-term supply agreements with the utility in a position where there is now a risk of having stranded assets. This is good news for PowerX as it puts the company in a strong negotiating position where co-generators can be offered some income, instead of sitting idle without generating any income. Simultaneously, municipalities face increasing network defection and have realised that customers switch to renewable energy sources, particularly those with generating plants that smaller than 1 MW, who are exempted from obtaining generation licenses.

Instead of losing all revenues from such customers, the PowerX model offers municipalities the ability to still make money from them by allowing PowerX to use the distribution network for wheeling the power between the seller and the buyer. This trading model has been successfully implemented in other countries and the NERSA is processing applications from other companies who are also interested in obtaining trading licenses which may not necessarily be focussing on green power. This is another indication that the days of Eskom monopolising the South African ESI may soon be coming to end.

There have been challenges at various educational levels of the South African renewable energy sector, however the large-scale introduction of IPPs through the REIPPPP has resulted in the development of innovative capacity in South Africa. This capacity is important as it is required in the installation, operation, maintenance of the different technologies. It has also contributed, albeit to a smaller degree, to the development of solutions such as water-saving technologies for concentrating solar power.

Generally, REIPPPP targeted economy-wide jobs, benefits of local content as well as local community development, more than BEE. According to the outcomes of the economic development criteria of the REIPPPP, the wind, concentrated solar power (CSP) as well as solar PV in the various bidding rounds, are expected to contribute almost 35 000 operations jobs and about 20 000 construction jobs. If these numbers are realised, they will signify a substantial achievement.

As a result of the REIPPPP, South Africa has attracted more investment through IPPs in four years as compared to what has been achieved in the past twenty years by other countries in Sub-Saharan Africa. There has been a reduction in bid tariffs throughout the programme and projects that have been awarded in recent times are considered to be among the cheapest grid-connected renewable energy projects in the world. The South African REIPPPP is regarded as one of the top ten renewable energy programmes in the world and it offers important lessons which other developing countries can learn from in terms of establishing and implementing competitive tenders for grid-connected renewable energy IPPs.

8.1.2 Market entry barriers

In August 2016, Eskom shocked the South African ESI including IPP investors when it announced that due to the over-supply of electricity at that time, which is to some extent credited to the coming on-line of two coal power stations i.e. Medupi and Kusile; and inadequate funds, the country will no longer need IPPs. This was seen by many as an anti-competitive behaviour by Eskom and also against government policy which is in support of IPPs. A few weeks after Eskom's announcement, Eskom's stance was cemented by the power utility's refusal to sign an agreement with an IPP called Redstone, regardless of the agreement being approved by government. The decision by Eskom resulted in delays and uncertainty in the market which increased talks of a need to restructure the ESI so that Eskom is not both player and referee.

Even though the REIPPPP's criteria were easily measurable, different developers had some concerns specifically about the requirements for local content and local community shareholding. The bankability of projects was negatively affected to some extent by the fact that projects needed to have some ownership by South Africans in addition to other requirements of black ownership and local content. Most developers found it challenging to satisfy these requirements and therefore posed additional perceived risk for the projects. It was thought that these criteria would not be able to realise the intended objectives. The local content requirements mostly increased the EPC costs which is viewed as contradicting the objective of reducing the overall cost of renewable energy as produced and supplied by IPPs.

After focussing on access to energy for the past two decades, South Africa's policymakers are now faced with a somewhat new challenge. Building capacity and sharing experiences as well as best practices with other countries will assist South Africa in making sensible decisions. It may be challenging to tackle political will, especially when it is mostly influenced by lobby groups with power within the country. For as long as Eskom enjoys market dominance, independent power producers will always find it challenging to enter and participate in the South African ESI. However, the signing of 27 new power purchase agreement with different IPPs may be an indication of a positive trend.

Limited availability of advisory services has proven to be a barrier in entering the South African ESI. Due to the huge demands made on the country's consulting industry, some consulting companies were allowed to provide their advisory services to private bidders and the government as well as financiers, provided they formed sufficient internal barriers inside the consulting company to minimise possible conflicts of interest.

The fact that the South African commercial banking sector is somewhat sophisticated and risk-averse made it difficult to support all the objectives of the REIPPPP e.g. one of the objectives was to allow small and medium-sized South African companies to also participate in the country's emerging renewable energy industry. In an attempt to aggressively achieve this objective, the government launched the Small-scale Projects IPP Tender which was targeting smaller projects of up to 5 MW. However, the South African commercial banking system did not have the motivation to support these small projects. Smaller sponsors without bargaining power to negotiate inexpensive contracts for maintenance, operations and supply, faced the possibility of high equity requirements as well as high debt margins. For most South African commercial banks, these types of sponsor risks meant that most small projects were just not commercially viable.

In terms of other advisory services such as legal firms and technical consultants (and also growing social and economic development advisors), South Africa has a relatively broad selection of these services available to assist with designing and implementing a competitive bidding system. These services were critical for the successful

implementation of the REIPPPP, but they were stretched to the limit because of the size of the programme.

8.1.3 Competition in the ESI

Electricity markets are vulnerable to the exercise of market power because of a number of issues such as, lack of electricity storage capacity, availability of transmission lines, inelastic demand and security of supply as well as the associated varying costs of different types of power producers. The extent of market power is likely to change over time depending on changes in congestion on the transmission network and varying load levels.

In order to have effective competition in the ESI, all participants must be guaranteed a access to the distribution and transmission networks, without any discrimination. Additionally, there should not be any power generator with market power. The easiest manner to achieve these goals is to reform the electricity supply industry and this is normally one of the first steps in the restructuring process. The old vertically integrated monopoly industries are vertically structured i.e. distribution and transmission are separate from generation, which are then managed as separate, independent companies. There is also horizontal unbundling, where generation is divided into several companies which will compete with one another (without any one company having market power) and/or the new power generators are allowed to participate in the market. Every power generator may then deliver their power to consumers using the transmission and distribution system (wholesale competition). This is normally the practice in most countries that are reforming their electricity industries. It is important to ensure that no one generator can regularly manipulate the price setting area in the market.

Electricity generation and sales are competitive functions, and currently both of these functions are under monopolistic control, therefore it might be fitting that the Competition Commission takes a more pro-active approach in advocating for a shift towards competition. The Competition Commission's task would be to make sure that a competitive status of the ESI is preserved if; generation is unbundled into competing companies; there is guaranteed open-access to the transmission network; electricity

trading instruments are put in place; and retail competition is instituted. The Competition Commission and Tribunal will have to monitor and manage any signs of abusing market power or proposed mergers that are likely to discourage competition.

Any agreement between the Competition Commission and the NERSA would need to make provision for giving the NERSA the responsibility of monitoring market power issues and referring them to the Competition Commission will be responsible for taking action against those who abuse market power. The NERSA is in a better position and also more prepared to detect any form of anti-competitive behaviour within ESI, due to the challenges and trading mechanisms of the market.

Due to the fact that Eskom has a competitive advantage and the necessary skills, knowledge and experience in coal-fired power generation, IPPs are deemed to be more capable of contributing to the country's renewable energy targets. In order to achieve the target of 10 000 GWh, the South African government has undertaken to strengthen competition in the electricity supply industry. Currently, the playing fields are not level as IPPs (through the REIPPPP) are required to sell their power to Eskom as the monopolistic buyer. This highlights an existing issue of conflict of interest as Eskom is 'competing' with IPPs while simultaneously playing the role of single buyer of their electricity.

Due to escalating concerns over market power, different actions have been taken by policymakers in order to address the issue of market power. Some of the actions include improvement of transmission capacity, limiting bids from generators, and improving the responsiveness of power demand to changes in prices. Another way of responding to market power is by structurally reforming the generation market. Even though there have been some attempts of structural separation in South Africa, there is still room for addressing concentration in generation markets.

As far as the transmission network is concerned, it is very important for policymakers to determine how the transmission congestion should be reflected in the network access charge which will be charged to power generators and consumers. Normally, the price charged for accessing the transmission network depends only on the loss factor or time-averaged congestion. While this approach offers some locational signals to the different generating entities or end-users, it does not offer real-time incentives

for these entities to alter their demand and supply in order to indicate real-time congestion changes in the system.

As discussed in Chapter 7, there were 28 qualifying bids during Round 1 of the REIPPPP, however investors tended to bid for lesser power capacity than what was actually being offered. Lesser capacities were made available in Round 2 and Round 3 and this resulted in a substantial increase in competition, both in terms of the number of bids received as well as the number of bids that satisfied and exceeded the qualification challenges. As a result, there was a significant reduction in prices.

In most countries, IPPs and/or importers have been the vehicle used to introduce competition in the electricity market, as is the case with South Africa. Normally, these IPPs have to guarantee future electricity sales by making use of a power purchase agreement with the dominating entity. Most financiers insist on these PPAs so that they can secure an income stream that is predictable enough to be able to service debt. South Africa's REIPPPP has also adopted a similar modus operandi which has also been used by other developing countries. This approach comes with a few compromises as it has no full wholesale competition because the dominant utility (Eskom) will ordinarily have a lot of market power as it controls the existing generation capacity as well as the transmission network. There is also a threat that the government and Eskom could be stranded with costly power purchase agreements that will not be competitive in the future i.e. PPAs are likely to have a fixed price over the duration of the contract. However, prices could be reduced as the market becomes fully competitive.

As IPPs are being introduced in the South African ESI, to make the market competitive, there needs to be some economic regulation that will create a conducive environment to move towards reducing monopolistic behaviour in the market. This involves the setting-up of the legal environment that creates competition. It can be achieved by designing the 'rules of engagement' applicable to the market as well as penalties for those companies displaying anti-competitive behaviour; and making provision for third-party access to infrastructure owned by Eskom.

Economic regulation should focus on the efficiency as well as the performance of the market. Concerned about operational and procedural issues, this economic regulation

brings together two levels of intervention. On the sectoral level, the aim is to ensure that there is effective competition and sufficient sanctions to deal with anticompetitive behaviour. This type of regulation is mostly focused on regulation of the market structure in general and, more particularly, on mergers and acquisitions as well as market power. However, due to the existence of large natural monopolies such as Eskom, the regulation process must also focus on economic and technical regulation of third-party access.

There is a general agreement amongst stakeholders that South Africa should move towards having a full wholesale competition where generation will be separated from transmission while simultaneously unbundling generation into different companies which will compete (without anyone being large enough to exercise market power).

When the restructuring process has reached a mature stage, the supply of power normally gets separated from the operations and ownership of the distribution network and various suppliers would compete to sell power to their customers, making it possible for customers to choose who supplies them with electricity. Choice of supplier for larger customers would be introduced at the same pace as wholesale competition. This will then be extended to smaller consumers at a later stage.

One of the most critical issues when introducing competition is to decide on the best suitable market structure. The NERSA had previously studied a few market scenarios and modelled studies that show the best structure for generation clusters, the need for open access to the transmission network, using an independent transmission company; and the setting up of various power trading instruments. This will require an agreement with the Competition Commission as well as government.

The study has shown that even though there are new players in the market there is still no real competition in terms of power supply and to a large extent Eskom remains a ‘monopoly’. South African electricity customers still have no ability to choose their preferred supplier unlike in some developed countries.

Theoretical findings:

According to the theory of public choice, a change of policy such as allowing participation of IPPs in the electricity market, will introduce efficiency in the system. (Ostrom and Ostrom 1971; Hantke-Domas 2003; Kirchner 2007). This study has shown that, this has not been the case in South Africa. What the theory of public choice did not highlight is the condition required for the statement to hold i.e. there needs to be a restructure of the market before introducing IPPs for the statement to hold.

Furthermore, the theory of economic regulation and to some extent the theory of public choice, indicate that the introduction of IPPs in the electricity supply industry is supposed to give customers the ability to choose their preferred supplier where customer choice can be based on price and (or) quality of supply (Posner 2007).

In the case of South Africa, IPPs were introduced without restructuring the electricity market with Eskom remaining the major supplier or electricity. IPPs were introduced through the REIPPPP which forced all IPPs to supply their power directly to Eskom which will be sold by Eskom to the end-user, without the benefits of reduced prices as a result of operational efficiency that comes with IPPs. The introduction of IPPs has neither improved the efficiency in the market nor has it resulted in customers having a choice of who supplies them with electricity. In fact, the efficiency seems to have deteriorated even further, even though this further deterioration may not necessarily be attributed to the introduction of IPPs. The theory of public choice does not take into account the fact that IPPs could be introduced without restructuring the market first (as is the case in South Africa); and in this instance, efficiencies may not necessarily improve. In this regard, the study makes a significant contribution to the theory of public choice and the theory of economic regulation.

Empirical findings:

The study makes a further contribution towards the theory of economic regulation, which according to Posner (2007) is all about regulators and the decisions they make; and how those decisions affect the public. The contribution to the theory is founded on empirical evidence of this study as well as practices of various experts in the South African ESI. The introduction of IPPs in developed countries like the United Kingdom

and Germany has resulted in the creation of a competitive market which in turn caused a significant reduction in electricity prices as market participants had to improve their efficiencies (Geerli et al. 1999). This phenomenon was not observed in South Africa according to Geerli et al. (1999), which is a developing country. There has not been any competition in the South African ESI since the introduction of IPPs, except during the bidding stages of the REIPPPP where the different bidders were selected based on different prices offered (as one of the selection criteria) for the power they will supply. Additionally, average electricity prices in South Africa have increased by almost 374% between 2007 and 2018; and have been increasing each year, which contradicts the reduction which was observed in developed countries. Therefore, this study shows that the impact of introducing IPPs on electricity prices in developed countries is different from observations made in developing countries such as South Africa. This knowledge will be generalizable to other developing countries, particular where IPPs are introduced prior to restructuring the electricity market.

Methodological findings:

The IPPs interviewed for this study are all operating for the first time in the South African market and had limited understanding of the country and its political landscape, which has a direct influence in the manner in which IPPs are introduced and how they will ultimately conduct business in the South African ESI. Therefore, the researcher is highly likely to be one of the first to interview these IPPs for the purposes of establishing their impact in the electricity supply industry and also understanding some of the barriers they encountered in the process; in the context of a developing country.

8.2 Recommendations for further research

The need for government to achieve its social objectives and the abundance of coal deposits available in South Africa means that Eskom will continue to play a prominent role in the country's electricity supply industry for many years to come. This means that the government needs to establish the best reporting model for Eskom. This study has showed that regardless of various proposed changes in the market, Eskom continues to feature in every proposal, in one way or the other e.g. as a generator, transmitter or distributor of electricity or even as a player in all of these roles combined.

Therefore, the way Eskom is managed and the manner in which it carries out its mandate is critical to achieving and maintaining a reliable and quality supply of electricity.

Currently, Eskom reports to the Department of Public Enterprises as its sole shareholder, but the Department of Energy is responsible for policymaking which Eskom needs to align to. For example, the IEP and IRP are documents that plan the future energy needs for the country and are developed by the DoE, whereas Eskom reports to the DPE. This may cause confusion and at times tension, which may have dire consequences if not addressed e.g. the DoE supported the investment into new nuclear power stations which was not supported by the DPE and this caused policy uncertainty which in turn affects foreign direct investment. Therefore, it is hereby recommended that future research should look at determining the best reporting model or structure for Eskom as an entity reporting to government. The model or structure should be in a manner that will still assist government in achieving its social objectives while simultaneously addressing and planning for future electricity needs for the country.

Although IPPs have been introduced in the South African ESI through the REIPPPP and are contributing to the supply of power, much of this can be attributed to the role played by the South African government. The REIPPPP cannot be driven by government in perpetuity, in a sustainable manner. Therefore, there needs to be further research that studies how the REIPPPP can be implemented and managed solely by the private sector without much government involvement. This will ensure there is true competition in the market without any one player being so dominant to a point where it can dictate the pace and success of the programme.

As discussed in Chapter 1 of this study, South Africa is interconnected with other countries in the SADC region through high voltage transmission lines, making cross-border electricity trading possible. The study has established amongst other things, the impact of introducing IPPs (through the REIPPPP) in the ESI, which has been largely positive. Although other SADC countries have also started introducing IPPs, this has not, according to Bazilian et al. (2012), been done systematically, but rather more sporadically. It is recommended that future research should also look at how

IPPs can be systematically introduced in the different SADC countries, with the aim of ultimately having these IPPs participating on a permanent basis in the various trading mechanisms used in the Southern African Power Pool. This will not only achieve one of SADC's objectives, which is regional integration, but it will also reduce the regions reliance on coal for electricity generation, thereby contributing positively to the Paris Agreement.

As the South African ESI is being reformed, the future role of municipalities when it comes to electricity supply needs to be established i.e. should municipalities continue supplying electricity or should they focus solely on distribution. Some areas in the country are supplied by Eskom while others are being supplied by municipalities. Municipalities buy bulk electricity from Eskom and on-sells it to customers for consumption, after adding a mark-up on the price paid to Eskom. The fundamental question is, should municipalities continue supplying electricity which they buy from Eskom, anyway? or should Eskom and IPPs be allowed to supply all customers directly without municipalities acting as the "middle man"? It is recommended that further research should be conducted which will establish the best supply structure in the South African ESI. Determining the most appropriate supply structure will result in reduced prices and improved efficiencies, as has been seen in other countries and observed by Erdogdu (2011).

REFERENCES

Africa, S. (2013) Integrated resource plan for electricity 2010-2030 (Update report), In Energy (ed.), Pretoria.

Akumu, A. O., Oduor, A. G. and Ngoo, L. M. (2009, 23-25 Sept. 2009) 'Economic and operational effects of introducing Independent Power Producers into the Kenyan power system', In *AFRICON, 2009. AFRICON '09.*, pp. 1-6.

Amundsen, E. S. and Bergman, L. (2002) Will Cross-Ownership Re-Establish Market Power in the Nordic Power Market?, *Energy Journal,* 23(2), p. 73.

Amundsen, E. S. and Bergman, L. (2012) Green certificates and market power on the Nordic power market, *Energy Journal,* 33(2), pp. 101-117.

An, B., Weibin, L., Aiming, Z. and Wei, Z. (2015) China's market-orientated reforms in the energy and environmental sectors, *Pacific Energy Summit*, National Bureau of Asian Research

Angen, M. (2000) Evaluating interpretive inquiry: Reviewing the validity debate and opening the dialogue, *Qualitative Health Research,* 10(3), pp. 378-395.

Armstrong, M. and Sappington, D. E. (2007) Recent developments in the theory of regulation, *Handbook of industrial organization,* 3(11), pp. 1557-1700.

Azapagic, A. (1999) Life cycle assessment and its application to process selection, design and optimisation, *Chemical engineering journal,* 73(1), pp. 1-21.

Bacon, R. and Besant-Jones, J. (2001) Global electric power reform, privatization, and liberalization of the electric power industry in developing countries 1, *Annual Review of Energy and the Environment,* 26(1), pp. 331-359.

Bacon, W. R. and Besant-Jones, J. (2001) Global electric power reform, privatization and liberalization of the electric power industry in developing countries, *Annual review of energy and the environment,* 26(1), pp. 331-359.

Bajpai, P., Punna, S. K. and Singh, S. N. (2008) Swarm intelligence-based strategic bidding in competitive electricity markets, *IET Generation, Transmission & Distribution,* 2(2), pp. 175-184.

Baker, L. (2011) *Governing electricity in South Africa: wind, coal and power struggles*, University of East Anglia.

Bask, M., Lundgren, J. and Rudholm, N. (2011) Market power in the expanding Nordic power market, *Applied Economics,* 43(9), pp. 1035-1043.

Baumol, W., Panzar, J. and Willig, R. (1982) Contestable markets and the theory of market structure, *Nueva York, Harcourt Brace Javanovich, Inc*.

Baumol, W. J. (1986) Contestable markets: an uprising in the theory of industry structure, *Microtheory: applications and origins*, pp. 40-54.

Bayer, E. (2015) *Report on the German power system*, Agora Energiewende, Berlin.

Bazilian, M., Nussbaumer, P., Rogner, H.-H., Brew-Hammond, A., Foster, V., Pachauri, S., Williams, E., Howells, M., Niyongabo, P., Musaba, L., Gallachóir, B. Ó., Radka, M. and Kammen, D. M. (2012) Energy access scenarios to 2030 for the power sector in sub-Saharan Africa, *Utilities Policy,* 20(1), pp. 1-16.

Beard, T. R., Kaserman, D. L. and Mayo, J. W. (2003) A GRAPHICAL EXPOSITION OF THE ECONOMIC THEORY OF REGULATION, *Economic Inquiry,* 41(4), pp. 592-606.

Becker, G. S. (1983) A theory of competition among pressure groups for political influence, *The Quarterly Journal of Economics*, pp. 371-400.

Bessemer, T., Richet, N. and Conil-Lacoste, J.-F. (2004) *Competitive electricity markets: Opportunity or Threat? - A customer perspective*, Accenture, Paris.

Bethune, J. J. (1997) The Limits of Public Choice: A Sociological Critique of the Economic Theory of Politics, *Southern Economic Journal,* 64(1), pp. 331-332.

Bhuiya, A., Chowdhury, N. and Huq, M. (2004, 2-5 May 2004) 'Optimum market strategy for an independent power producer', In *Electrical and Computer Engineering, 2004. Canadian Conference on*, pp. 1937-1942 Vol.1934.

Bjørndal, M. and Jörnsten, K. (2007) Benefits from coordinating congestion management—The Nordic power market, *Energy policy,* 35(3), pp. 1978-1991.

Boussougouth, J. (2008, January 2008) *Africa's energy hope: Turning to the private Sector,* last accessed 13 February, 2016, from http://www.geni.org/globalenergy/library/technical-articles/transmission/energy-biz-insider/africas-energy-hope/Financial_Front_Africa.pdf.

Boussougouth, J. (2009) *Strategic Analysis of Independent Power Producers in Southern Africa.* Unpublished Thesis, University of Stellenbosch, Cape Town.

Braun, V. and Clarke, V. (2006) Using thematic analysis in psychology, *Qualitative Research in Psychology,* 3(2), pp. 77-101.

Brewer, A. (1978) Contributions to the Critique of Economic Theory (Book Review), *Economic Journal,* 88(350), pp. 354-355.

Brunekreeft, G. and Twelemann, S. (2005) Regulation, Competition and Investment in the German Electricity Market: RegTP or REGTP, *Energy Journal*, pp. 99-126.

Buchanan, J. M. (1972) *Toward analysis of closed behavioral systems*, Routledge, London.

Buchanan, J. M. and Tollison, R. D. (1984) *The Theory of public choice--II*, University of Michigan Press.

Buchanan, J. M. and Tullock, G. (1962) *The Calculus of Consent: Logical Foundations of Constitutional Democracy (Ann Arbor Paperbacks)*, University of Michigan, Ann Arbor.

Bucksteeg, M., Trepper, K. and Weber, C. (2015) Impacts of renewables generation and demand patterns on net transfer capacity: implications for effectiveness of market splitting in Germany, *IET Generation, Transmission & Distribution,* 9(12), pp. 1510-1518.

Burton, N. (1993, 27 Apr 1993) 'A city view [electricity privatisation]', In *Electricity Privatisation - Opportunities and Constraints, IEE Colloquium on*, pp. 3/1-3/5.

Carlsson, L. (1999) International Power Trade - The Nordic Power Pool, *Public policy for the private sector*, pp. 1-4.

Caudill, S. B., Im, B.-G. and Kaserman, D. L. (1993) Modeling Regulatory Behavior: The Economic Theory of Regulation Versus Alternative Theories and Simple Rules of Thumb, *Journal of Regulatory Economics,* 5(3), pp. 251-262.

Cemil Ozbugday, F. and Nillesen, P. H. L. (2013) Efficiency and prices of regulation-exempt consumer-owned natural monopolies: A first look at electricity distributors in New Zealand, *Annals of Public & Cooperative Economics,* 84(4), pp. 361-381.

Charmaz, K. (2006) Constructing grounded theory: A practical guide through qualitative research, *SagePublications Ltd, London*.

Ciglmayr, S. (2013) *Development of a renewable energy power supply outlook 2015 for the republic of South Africa.* University of Stellenbosch, Stellenbosch.

CSIR (2016) *Cost comparison for new electricity generation in South Africa*, CSIR, Pretoria.

Daly, J. and Lumley, J. (2002) Bias in qualitative research designs, *Australian and New Zealand Journal of Public Health,* 26(4), pp. 299-300.

De Alessi, L. (1974) An economic analysis of government ownership and regulation: Theory and the evidence from the electric power industry, *Public Choice,* 19, pp. 1-42.

de Oliveira, A., Woodhouse, E. J., Losekaan, L. and Araujo, F. V. S. (2005) *The IPP experience in the Brazilian electricity market*, Stanford University, Stanford.

Deloitte (2015) *European energy market reform - Country profile: Germany*, Deloitte, Zurich.

Deloitte (2017) *An overview of electricity consumption and pricing in South Africa*, Deloitte Consulting, Johannesburg.

Demsetz, H. (1968) Why regulate utilities?, *The Journal of Law and Economics,* 11(1), pp. 55-65.

Dihwa, S. (2017) *Southern African Power Pool annula report 2017*, SAPP Coordination Centre, Zimbabwe.

Djankov, S., La Porta, R., Lopez-de-Silanes, F. and Shleifer, A. (2002) The regulation of entry, *Quarterly journal of Economics*, pp. 1-37.

DoE (2016) Integrated Energy Plan, In Energy, D. o. (ed.), Department of Energy, Pretoria.

Dong, J. and Li, X. (2006) 'Regulatory mechanisms of gas for power generation in electricity markets in China', In *Power Systems Conference and Exposition, 2006. PSCE'06. 2006 IEEE PES*, IEEE, pp. 1802-1806.

Dubin, R. (1978) Theory development, New York: Free Press

Easton, G. (2002) Marketing: a critical realist approach, *Journal of Business Research,* 55(2), pp. 103-109.

Eaton, B. C. and Ware, R. (1987) A theory of market structure with sequential entry, *RAND Journal of Economics (RAND Journal of Economics),* 18(1), pp. 1-16.

Eberhad, A. and Gratwick, K. (2005a) *The Egyptian IPP experience*, Stanford University, Stanford.

Eberhad, A. and Gratwick, K. (2005b) *The Kenyan IPP experience*, Stanford University, Stanford.

Eberhad, A. and Gratwick, K. (2008) *IPPs in Sub-Saharan Africa: determinants of success*, Stanford University, Stanford.

Eberhard, A., Kolker, J. and Leigland, J. (2014) *South Africa's Renewable Energy IPP Procurment Programme: Success factors and lessons*, World Bank Group, Washington.

Eberhard, A. and Naude, R. (2017) *The South African renewable energy IPP procurement programme*, Graduate School of Business - University of Cape Town, Cape Town.

Eberhard, A. A. (2001) *Competition and regulation in the electricity supply industry in South Africa*, University of Cape Town, Cape Town.

Emmons-Iii, W. M. (1997) Implications of ownership, regulation, and market structure for performance, *Review of Economics & Statistics,* 79(1), pp. 279-289.

Engelen, B. (2007) Thinking Things Through: The Value and Limitations of James Buchanan's Public Choice Theory, *Review of Political Economy,* 19(2), pp. 165-180.

Erdogdu, E. (2011) What happened to efficiency in electricity industries after reforms?, *Energy policy,* 39(10), pp. 6551-6560.

Erdogdu, E. (2013) *Essays on electricity market reforms: A cross-country applied approach.* Unpublished Thesis, University of Cambridge, Cambridge.

Estache, A. and Wren-Lewis, L. (2009) Toward a theory of regulation for developing countries: Following jean-jacques laffont's lead, *Journal of Economic Literature,* 47(3).

Evans, L., Guthrie, G. and Videbeck, S. (2008) Assessing the integration of electricity markets using principal component analysis: Network and market structure effects, *Contemporary Economic Policy,* 26(1), pp. 145-161.

Evered, R. and Louis, M. R. (1981) Alternative perspectives in the organizational sciences:“inquiry from the inside” and “inquiry from the outside”, *Academy of management review,* 6(3), pp. 385-395.

Fike, R. and Gwartney, J. (2015) Public Choice, Market Failure, and Government Failure in Principles Textbooks, *Journal of Economic Education,* 46(2), pp. 207-218.

Fiorio, C. V., Florio, M. and Doronzo, R. (2007) 'The electricity industry reform paradigm in the European Union: testing the impact on consumers', In *Consumers and Utility Reforms in the European Union Conference*.

Flatabo, N., Doorman, G., Grande, O., Randen, H. and Wangensteen, I. (2003) Experience with the Nord Pool design and implementation, *IEEE Transactions on power systems,* 18(2), pp. 541-547.

Fytche, E. L. (1991, 17-20 Sep 1991) 'Economic efficiency, independent power producers and wheeling', In *AC and DC Power Transmission, 1991., International Conference on Electricity*, pp. 73-78.

Gabriel, S. (2014) *An electricity market for Germany's energy transition*, Federal Ministry for Economic Affairs and Energy, Berlin.

Geerli, Chen, L. and Yokoyama, R. (1999, Aug. 29 1999-Sept. 2 1999) 'Operation in deregulated power systems with independent power producers', In *Electric Power Engineering, 1999. PowerTech Budapest 99. International Conference on*, p. 10.

Genoud, C. and Varone, F. (2002) Does Privatization Matter? Liberalization and regulation: The case of European electricity, *Public Management Review,* 4(2), pp. 231-256.

Golafshani, N. (2003) Understanding reliability and validity in qualitative research, *The qualitative report,* 8(4), pp. 597-607.

Green, E. J. and Porter, R. H. (1984) Noncooperative collusion under imperfect price information, *Econometrica: Journal of the Econometric Society*, pp. 87-100.

Green, R. (1999) The electricity contract market in England and Wales, *Journal of Industrial Economics,* 47(1), pp. 107-124.

Groenewald, B. B. J. and Woudstra, J. B. (2012, 15-16 Aug. 2012) 'Future IPP's can benefit from the Dutch system of net metering for its national electricity supply grid', In *Industrial and Commercial Use of Energy Conference (ICUE), 2012*, pp. 1-6.

Hansen, C. (2000) Regulatory change and competition in the South African electricity supply industry, *Development Southern Africa,* 17(3), pp. 339-356.

Hantke-Domas, M. (2003) The public interest theory of regulation: non-existence or misinterpretation?, *European Journal of Law and Economics,* 15(2), pp. 165-194.

Harris, J. F. (1993, 27 Apr 1993) 'The benefits of a competitive electricity market', In *Electricity Privatisation - Opportunities and Constraints, IEE Colloquium on*, pp. 2/1-2/3.

Hartzenberg, T. (2006) Competition Policy And Practice In South Africa: Promoting Competition For Development, *Northwestern Journal of International Law & Business,* 26(3), pp. 667-685.

Hattori, T. and Tsutsui, M. (2004) Economic impact of regulatory reforms in the electricity supply industry: a panel data analysis for OECD countries, *Energy Policy,* 32(6), pp. 823-832.

Healy, M. and Perry, C. (2000) Comprehensive criteria to judge validity and reliability of qualitative research within the realism paradigm, *Qualitative market research: An international journal,* 3(3), pp. 118-126.

Heath, J. R. (1993, 27 Apr 1993) 'Competition in supply [electricity supply]', In *Electricity Privatisation - Opportunities and Constraints, IEE Colloquium on*, pp. 6/1-6/3.

Herbst, L. and Lalk, J. (2015, 11-12 Nov. 2015) 'A review of the policy documents behind South Africa's Renewable Energy Independent Power Producer Procurement Programme: How its hits and misses impact society', In *2015 IEEE International Symposium on Technology and Society (ISTAS)*, pp. 1-6.

Hertog, J. (2010) Review of economic theories of regulation, Utrecht University, Utrecht.

Hjalmarsson, E. (2000) *Nord Pool: A power market without market power.* Unpublished Thesis, Goteborg University, Goteborg.

Hunt, S. D. and Morgan, R. M. (1995a) The comparative advantage theory of competition, *The Journal of Marketing*, pp. 1-15.

Hunt, S. D. and Morgan, R. M. (1995b) The resource-advantage theory of competition, *Journal of Management Inquiry,* 4(4), pp. 317-332.

IEA (2006) *China's power sector reforms. Where to next?*, International Energy Agency, Paris.

Intelligence, E. (2016, 24 March) *Renewable Energy Independent Power Producer Procurement Programme,* last accessed 27 July, 2017, from http://www.energyintelligence.co.za/reippp-all-you-need-to-know/.

IPP-Office (2017) *Independent Power Producers Procurement Programme - An overview*, IPP Office, Pretoria.

Jamasb, T. and Pollitt, M. (2000) Benchmarking and regulation: international electricity experience, *Utilities Policy,* 9(3), pp. 107-130.

Jamasb, T. and Pollitt, M. (2005) Electricity market reform in the European Union: review of progress toward liberalization & integration, *The Energy Journal*, pp. 11-41.

James, T. S. (2009) Whatever happened to Regulation theory? The Regulation approach and local government revisited, *Policy Studies,* 30(2), pp. 181-201.

Jennifer, F. and Eimear, M.-C. (2006) Demonstrating Rigor Using Thematic Analysis: A Hybrid Approach of Inductive and Deductive Coding and Theme Development, *International Journal of Qualitative Methods,* 5(1), pp. 80-92.

Johnson, C. (2000) Latin American Power: Accelerating Change Requires a New Business Model, *Journal of Project Finance,* 6(2), p. 33.

Johnson, M. (2015) Public Goods, Market Failure, and Voluntary Exchange, *History of Political Economy,* 47, pp. 174-198.

Johnson, P. and Duberley, J. (2000) *Understanding management research: An introduction to epistemology*, Sage Publications, London.

Joskow, P. L. (2008) Lessons Learned From Electricity Market Liberalization, *Energy Journal,* 2(1), pp. 9-42.

Joskow, P. L. and Noll, R. G. (1981) 'Regulation in theory and practice: An overview', In *Studies in public regulation*, The MIT Press, Massachusetts,

Karekezi, S. and Kimani, J. (2002) Status of power sector reform in Africa: impact on the poor, *Energy Policy,* 30(11–12), pp. 923-945.

Kirchner, C. (2007) 'Public Choice and New Institutional Economics', In *Public Economics and Public Choice*, Springer, Oxford,

Krauss, S. E. (2005) Research paradigms and meaning making: A primer, *The qualitative report,* 10(4), pp. 758-770.

Lacey, A. and Luff, D. (2001) *Trent Focus for research and development in primary health care: An introduction to qualitative data analysis*, Trent Focus, Sheffield.

Langenhoven, H. (2015, 13 January 2015) *Electricity disruptions threaten manufacturing output - Seifsa,* last accessed 15 February, 2016, from http://www.engineeringnews.co.za/print-version/electricity-disruptions-threaten-manufacturing-output-seifsa-2015-01-13.

Lee, A. S. (1991) Integrating positivist and interpretive approaches to organizational research, *Organization science,* 2(4), pp. 342-365.

Lin, A. C. (1998) Bridging positivist and interpretivist approaches to aqualitative methods, *Policy Studies Journal,* 26(1), pp. 162-180.

Littlechild, S. (2000) A review of UK electricity regulation, *CRI regulatory review,* 1(2), pp. 8-17.

Liu, A. and Hobbs, B. (2013) Tacit collusion games in pool-based electricity markets under transmission constraints, *Mathematical Programming,* 140(2), pp. 351-379.

Lu, C.-L., Chen, C.-L., Hwang, D.-S. and Cheng, Y.-T. (2008) Effects of wind energy supplied by independent power producers on the generation dispatch of electric power utilities, *International Journal of Electrical Power & Energy Systems,* 30(9), pp. 553-561.

Machaj, M. (2013) Sunk costs and contestable markets, *Quarterly Journal of Austrian Economics,* 16(4), pp. 479-502.

Malik, K., Cropper, M., Limonov, A. and Singh, A. (2015) The Impact of Electricity Sector Restructuring on Coal-fired Power Plants in India, *Energy Journal,* 36(4), pp. 287-312.

Marshall, M. N. (1996) Sampling for qualitative research, *Family Practice,* 13(6), pp. 522-525.

McCarthy, D. (2007) Interviewing in qualitative research, *Management in action,* 1(1), pp. 18-21.

McCrea, J. (1974) A critique of economic theory, *Journal of Economic Issues (Association for Evolutionary Economics),* 8(4), p. 949.

Menninger, D. (1984) The Political Economy of Deregulation: Interest Groups in the Deregulatory Process, *American Political Science Review,* 78(02), pp. 516-516.

Miles, M. B. and Huberman, M. A. (1994) *Qualitative data analysis,* 2nd ed., Sage Publications Ltd, London.

Mokhethi, K. E. (2010) *Electricity interdependence of members of the Southern African Development Community.* Unpublished Research, University of the Witwatersrand, Johannesburg.

Mueller, D. C. (2003) Public choice: an introduction, *The encyclopedia of public choice*, pp. 32-48.

Nagayama, H. (2009) Electric power sector reform liberalization models and electric power prices in developing countries: An empirical analysis using international panel data, *Energy Economics,* 31(3), pp. 463-472.

Nagayama, H. and Kashiwagi, T. (2007) Evaluating electricity sector reforms in Argentina: lessons for developing countries?, *Journal of Cleaner Production,* 15(2), pp. 115-130.

Nakashima, T. and Niimura, T. (1997, 25-28 May 1997) 'Multiple-impact assessment of independent power producers in a de-regulated environment', In *Electrical and Computer Engineering, 1997. Engineering Innovation: Voyage of Discovery. IEEE 1997 Canadian Conference on*, pp. 273-276 vol.271.

Nepal, R. and Jamasb, T. (2012) Reforming the power sector in transition: Do institutions matter?, *Energy Economics,* 34(5), pp. 1675-1682.

Neuendorf, K. A. (2002) *The content analysis guidebook*, Sage Publications, London.

Newbery, D. and Eberhard, A. A. (2008) *South African network infrastructure review: Electricity*, University of Cape Town, Cape Town.

Ngan, H. (2010) Electricity regulation and electricity market reforms in China, *Energy Policy,* 38(5), pp. 2142-2148.

Nhamo, G. and Mukonza, C. (2016) Policy, Institutional and Programme Readiness for Solar Energy Uptake in South Africa, *Africa Insight,* 45(4), pp. 69-90.

Norwich, B. (2007) Triangulation and theoretical understanding, *International Journal of Social Research Methodology,* 10(3), pp. 211-226.

Nunez-Luna, A. and Woodhouse, E. J. (2005) *The IPP investment experience in Argentina*, Stanford University, Stanford.

O'donoghue, T. (2006) *Planning your qualitative research project: An introduction to interpretivist research in education*, Routledge.

Odhiambo, N. M. (2009) Electricity consumption and economic growth in South Africa: A trivariate causality test, *Energy Economics,* 31(1), pp. 635-640.

Okada, K., Asano, H., Yokoyama, R. and Niimura, T. (1999) 'Reliability-based impact analysis of independent power producers for power system operations under deregulation', In *Electrical and Computer Engineering, 1999 IEEE Canadian Conference on*, IEEE, pp. 1325-1330.

Ostrom, V. and Ostrom, E. (1971) Public Choice: A Different Approach to the Study of Public Administration, *Public Administration Review,* 31(2), pp. 203-216.

Pegels, A. (2010) Renewable energy in South Africa: Potentials, barriers and options for support, *Energy policy,* 38(9), pp. 4945-4954.

Pieters, I. J., Lotz, M. and Brent, A. C. (2014) INVESTIGATING THE FINANCIAL CLOSE OF PROJECTS WITHIN THE SOUTH AFRICAN RENEWABLE ENERGY INDEPENDENT POWER PRODUCER PROCUREMENT PROGRAMME, *South African Journal of Industrial Engineering,* 25(3), pp. 57-68.

Posner, R. (2007) Theories of regulation, *The Bell journal of economics and management science,* 5(2), pp. 335-358.

Pratt, M. G. (2009) From the editors: For the lack of a boilerplate: Tips on writing up (and reviewing) qualitative research, *Academy of Management Journal,* 52(5), pp. 856-862.

Quiggin, J. (1987) Egoistic Rationality and Public Choice: A Critical Review of Theory and Evidence, *Economic Record,* 63(180), p. 10.

Rector, J. (2005) *The IPP investment experience in Malaysia*, Stanford University, Stanford.

Roth, W. and Mehta, J. (2002) The Rashomon Effect - Combining positivist and interpretivist approaches in the analysis of contested events, *Sociological methods & reserach,* 31(2), pp. 131-173.

Salvanes, K. G. and Tjotta, S. (1998) A Test for Natural Monopoly with Application to Norwegian Electricity Distribution, *Review of Industrial Organisation,* 13(1), pp. 669-685.

Savolainen, M. K. and Svento, R. (2012) Real-time pricing in the nordic power markets, *Energy economics,* 34(4), pp. 1131-1142.

Sen, A. and Jamasb, T. (2012) Diversity in Unity: An Empirical Analysis of Electricity Deregulation in Indian States, *Energy Journal,* 33(1), pp. 83-130.

Sewchurran, S. and Davidson, I. E. (2016, 20-23 Nov. 2016) 'Guiding principles for grid code compliance of large utility scale renewable power plant intergration onto south africa's transmission/distribution networks', In *2016 IEEE International Conference on Renewable Energy Research and Applications (ICRERA)*, pp. 528-537.

Shughart, W. F. (2004) Regulation and antitrust, *The encyclopedia of public choice,* 1, pp. 263-283.

Simmonds, G. (2002) Regulation of the UK electricity uindustry, *CRI industry brief,* 1(1), pp. 21- 28.

Skytte, K. (1999) The regulating power market on the Nordic power exchange Nord Pool: an econometric analysis, *Energy Economics,* 21(4), pp. 295-308.

Smith, M. (2008, October 10, 2009) *Eskom and the Southern African Power Pool,* last accessed October 11, 2009, 2009, from http://www.eskom.co.za/content/ES%200007SAfrPowPoolRev4~1.doc.

Smith, P. (2009) Survey research: two types of knowledge, *International Journal of Market Research,* 51(6), pp. 719-721.

Steiner, F. (2000) *Regulation, industry structure, and performance in the electricity supply industry*, OECD, Paris.

Stigler, G. J. (1971) The theory of economic regulation, *The Bell journal of economics and management science*, pp. 3-21.

Teljeur, E., Sheik, F., Kolobe, T. and da Costa, D. (2016) *Electricity supply industry restructuring - Options for the organisation of government assets*, Genesis Analytics, Johannesburg.

Tooraj, J. and Pollitt, M. G. (2005) *Electricity market reform in the European Union: Review of progress towards liberalisation and integration*, Center for Energy and Environmental policy Research, Massachusetts.

Turkson, J. and Wohlgemuth, N. (2001) Power sector reform and distributed generation in sub-Saharan Africa, *Energy Policy,* 29(2), pp. 135-145.

Valentic, V., Viskovic, A. and Franki, V. (2014, 13-16 May 2014) 'Market position simulation of an independent power producer on the South East Europe electricity market', In *Energy Conference (ENERGYCON), 2014 IEEE International*, pp. 508-513.

van Wegberg, M. and van Witteloostuijn, A. (1992) Credible Entry Threats into Contestable Markets: a Symmetric Multi-Market Model of Contestability, *Economica,* 59(236), pp. 437-452.

Van Witteloostuijn, A. and Boone, C. (2006) A resource-based theory of market structure and organizational form, *Academy of Management Review,* 31(2), pp. 409-426.

Wang, B., Li, J. and Wu, H. (2014) Review and Assessment of Chinese Energy Policy Since the Reform and Opening Up, *Emerging Markets Finance & Trade,* 50(5), pp. 143-158.

Watts, P. C. (2001) Heresy? The Case Against Deregulation of Electricity Generation, *The Electricity Journal,* 14(4), pp. 19-24.

Webb, M. (2015) *A review of South Africa's electicity sector*, Creamer Media, Johannesburg.

Whetten, D. A. (1989) What constitutes a theoretical contribution?, *Academy of management review,* 14(4), pp. 490-495.

Williams, J. and Mayaki, F. (1996, 18-20 Mar 1996) 'Private power generation from the perspective of a developing country: a case study of Honduras', In *Opportunities and Advances in International Electric Power Generation, International Conference on (Conf. Publ. No. 419)*, pp. 34-39.

Wilson, B. (1995) A model of the economic theory of regulation for undergraduates, *Journal of Economic Education,* 26(3), p. 218.

Winkler, H. (2005) Renewable energy policy in South Africa: policy options for renewable electricity, *Energy policy,* 33(1), pp. 27-38.

Wise, M. (2005) Competition Issues in the Electricity Sector, *OECD Journal of Competition Law & Policy,* 6(4), pp. 81-181.

Wolverton, M. L. (2009) Research Design, Hypothesis Testing, and Sampling, *Appraisal Journal,* 77(1), pp. 370-382.

Woo, C., Lloyd, D. and Tishler, A. (2003) Electricity market reform failures: UK, Norway, Alberta and California, *Energy policy,* 31(11), pp. 1103-1115.

Woodhouse, E. J. (2005) *The experience of Independent Power Producers in developing countries*, Stanford University, Stanford.

Woolf, F. and Halpern, J. (2001) *Integrating independent power producers into emerging wholesale power markets*, World Bank Publications.

Writer, S. (2014, 26 November 2014) *Privatise Eskom says DA, No says ANC,* last accessed 15 February, 2016, from http://businesstech.co.za/news/general/74516/privatise-eskom-says-da-no-says-anc/.

Xu, S. and Chen, W. (2006) The reform of electricity power sector in the PR of China, *Energy Policy,* 34(16), pp. 2455-2465.

APPENDIX A – ACTUAL RESEARCH INSTRUMENT

Interview questions

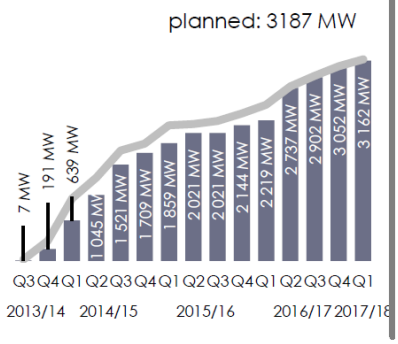
1. Describe the relationship between IPPs, Eskom and the municipalities as suppliers of electricity.
2. What is your view of the role of IPPs in the South African electricity supply industry?
3. How will IPPs threaten the existence of Eskom and its mandate as a state-owned company?
4. Why did Eskom decide to go against government policy by announcing that they will no longer procure power from IPPs when government on the other hand advocates for the participation of IPPs in South Africa?
5. How will the relationship between the Department of Energy, the Department of Public Enterprises and Eskom be affected by Eskom's decision to not procure power from IPPs?
6. What is your view of the REIPPPP and the bidding process used to select IPPs?
7. Describe the barriers of entry encountered by existing IPPs and explain which of these barriers can be minimised or eliminated to improve market entry for future IPPs.
8. Describe the challenges facing IPPs as they participate in the South African ESI.
9. Describe the demographics of existing IPPs in terms of ownership (foreign vs local), gender ownership, race, age of IPPs (how long have they been operating), types of technologies, production per technology type, capital investment, turnover, politically exposed persons (PEP), board representation.
10. Why do you think competition is needed in the South African ESI?

11. What is your view of customers (industrial, commercial and residential) having the ability to choose their preferred supplier of electricity?
12. Explain the single-buyer (wholesaler) model and how it can be implemented in South Africa.
13. Explain how competition in the electricity market will be affected by the transmission system being wholly-owned by Eskom.
14. Describe the types of power purchase agreements Eskom has with the different IPPs i.e. duration, pricing, etc.
15. How has the performance of current IPPs been in terms of honouring their contractual obligations and sustainability?
16. How has been the quality of supply and security of supply of the electricity supplied by IPPs?
17. How have electricity prices been affected by the introduction of IPPs?
18. What is your view on most IPPs focusing mainly on renewable energy and not on other types of energy such as coal and nuclear?
19. How is the electricity regulator (NERSA) supporting competition in the ESI?
20. Describe the plans by IPPs in terms of current and projected production of electricity for the next ten years?
21. How have customers been affected by the introduction of IPPs?
22. Describe the compliance or non-compliance of the IPP companies with the requirements of Broad-Based Black Economic Empowerment (BBBEE)?
23. How can IPPs influence policy direction in the South African electricity supply industry?

APPENDIX B – HIGHLIGHTS OF THE REIPPPP AS AT JUNE 2017 (IPP-OFFICE 2017)

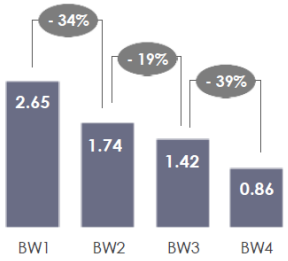
Successfully delivering clean energy timeously and cost effectively

megawatts operational (MW)



REIPPs have consistently contributed new capacity to the network since the end of 2013. As at June 2017, **98%** of IPPs scheduled[1] to be operational have started commercial operations. The average lead time for these 57 projects to complete construction has been 1.8 years.

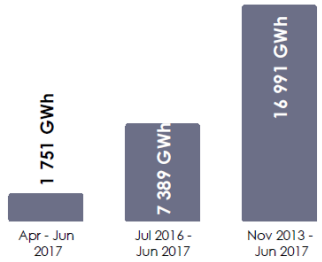
portfolio price trend[2] (R/kWh)



The REIPPPP is procuring energy at increasingly cost competitive rates.

Prices stated in April 2017 terms. Energy weighted average (R/kWh) considering average technology RFP submission price (published) per BW and projected, annual energy contribution per technology type.

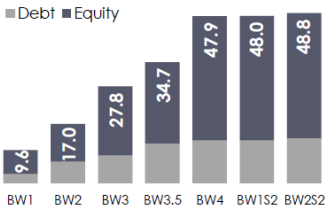
clean energy generated[3,6] (GWh)



Although production is only ramping up as IPPs become operational, **16 991 GWh**[6] have already been generated by the RE portfolio since inception to date - thereby offsetting **17.25 Mton CO_2** emissions[4,6].

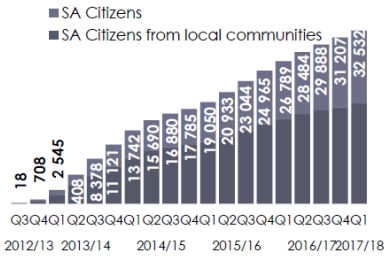
…and is supporting broader development objectives

Total foreign investment attracted of total investment (cumulative R201.8 billion)



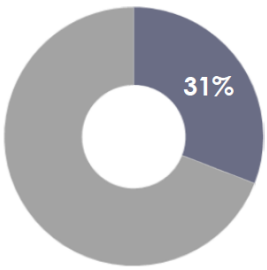
The total foreign equity and financing invested in REIPPs (BW1 - BW4, 1S2 & 2S2) reached R48.8 billion.

employment creation[3] (job years)[5]



Employment for South African citizens including people from communities local to the IPP operations.

equitable shareholding (%)[3]



For projects that have reached financial close, Black South Africans hold 31% of the shares across the complete supply chain and Local communities hold 11% equity in the IPPs.

Note 1. 58 sites have reached commercial operation date (COD) out of 59 that were planned by June 2017. 3 of 5 landfill gas sites (part of one project) were planned to reach COD by end June 2017 but only 2 sites have reached COD yet. **Note 2.** Contracted price (at which power is sold to Eskom) per IPP was weighted with consideration of the technologies and their relative, projected annual energy contribution (P50) (in April 2016 terms). BW3 estimated rate incorporates the peak tariff (270% of base rate) applicable to CSP. BW3.5 is not included as it is technology specific. **Note 3.** For actual achievements only data for projects that have completed financial close is reported - BW1, BW2, 16 of 17 BW3 projects and 1 of 2 BW3.5 projects. Projects which have not completed financial close – 1 BW3 project, 1 BW3.5 project, BW4, BW1S2 & BW2S2. **Note 4.** Carbon emission reductions reflect all energy generated inception to date. **Note 5.** Employment / Job creation measured in job years (equivalent of a full time employment opportunity for one person for one year). **Note 6.** Energy (and carbon emissions) figure understated. Latest quarterly figures not received from some IPPs. To be corrected next reporting period.