Promoting renewable energy in South Africa through the inclusion of market-based instruments in South Africa's legal and policy framework with particular reference to the feed-in tariff

by

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Abstract

The thesis considers the problem of climate change and identifies that the use of fossil fuels to generate energy since the Industrial Revolution has been a significant factor fuelling the emission of greenhouse gases and the consequent increase in global temperatures. Due to continuing economic growth, greenhouse gas emissions show no signs of abating. The thesis argues that promoting renewable energy would contribute to displacing fossil fuel-generated energy and a consequent decrease in greenhouse gas emissions or, at least, the rate at which such emissions are increasing. However, a significant barrier to the uptake of renewable energy is that it generally has higher initial costs than conventional fossil fuel-generated energy. In recognition of this barrier, a number of market-based instruments have been introduced internationally to support the uptake of renewable energy. Through a discussion of the literature, the thesis identifies that the renewable energy feed-in tariff has thus far been the most effective instrument in promoting renewable energy. It considers international examples of the feed-in tariff with a focus on Germany, which is largely considered to have had the most success with the feed-in tariff. In South Africa, which has a coal-based economy, renewable energy has only started to gain importance relatively recently. The thesis traces the development of renewable energy policy in South Africa through a consideration of the relevant legislation and policy documents as well as the market-based instruments that have been introduced to promote renewable energy. Even though the South African government has chosen to implement renewables tendering in respect of specific quantities of renewable energy, the thesis – in light of the numerous advantages of the feed-in tariff and its effectiveness internationally – argues in favour of a feed-in tariff and examines the elements of a feed-in tariff framework in the South African context.

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List of abbreviations, acronyms and units

°C	Degrees Celsius
AMD	Acid mine drainage
AR4	Fourth Assessment Report
AR5	Fifth Assessment Report
AWG-DP	Ad Hoc working Group on the Durban Platform for Enhanced Action
AWG-LCA	Ad Hoc Working Group on Long-Term Cooperative Action under the Convention
BAU	Business as usual
BBBEE	Broad-based black economic empowerment
BEE	Black economic empowerment
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Germany)
BMWi	Federal Ministry of Economics and Technology (Germany)
BTA	Border tax adjustment
c/kWh	Cents per kilowatt hour
CCGT	Combined cycle gas turbine
CCS	Carbon capture and storage
CDM	Clean development mechanism
CEF	Central Energy Fund
CER	Certified emission reduction
CERC	Central Electricity Regulatory Commission (India)

CHP	Combined heat and power
CMP	Conference of the Parties serving as the Meeting of the Parties
CO_2	Carbon dioxide
CO_2e/CO_2eq	Carbon dioxide equivalent
COP	Conference of the Parties
CSP	Concentrated solar power
DNI	Direct normal irradiation
DNO	Distribution network operator
DSM	Demand side management
EEG	Erneuerbare-Energien-Gesetz (Act on Granting Priority to Renewable Energy Sources or Renewable Energy Sources Act)
EU	European Union
EU ETS	European Union Emissions Trading Scheme
EWP	White Paper on the Energy Policy of the Republic of South Africa
FBE	Free basic electricity
FIT	Feed-in tariff
GBI	Generation-based incentive
gCO_2eq/kWh	Grams of carbon dioxide equivalent per kilowatt hour
GDP	Gross domestic product
GECs	Green electricity certificates
GHG	Greenhouse gas
GW	Gigawatt

GWC	Growth without constraints
GWh	Gigawatt hour
GWP	Global warming potential
IB	Issuing body
IEP	Integrated Energy Plan
INR	Indian Rupee
IPAP 2	Industrial Policy Action Plan 2
IPP	Independent power producer
IREDA	Indian Renewable Energy Development Agency
JNNSM	Jawaharlal Nehru National Solar Mission
kW	Kilowatt
kWh	Kilowatt hour
kWh/m_2	Kilowatt hour per square meter
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent power producer
IRP	Integrated Resource Plan
IRP 1	Integrated Resource Plan 1
IRP 2	Integrated Resource Plan 2
IRP 2010-2030	Integrated Resource Plan 2010-2030
ISMO	Independent System and Market Operator
ISMO Bill	Independent System and Market Operator Bill
LTMS	Long Term Mitigation Scenarios: Strategic Options for South Africa

MBI	Market-based instrument
MDG	Millennium Development Goal
MMS	Mandated market share
MNRE	Ministry for New and Renewable Energy (India)
Mt	Mega tonnes
Mtoe	Million tonnes of oil equivalent
MW	Megawatt
MWh	Megawatt hour
NAMAs	Nationally appropriate mitigation actions
NDP	National Development Plan
NDRC	National Development and Reform Commission (China)
NEB	National Energy Bureau (China)
NEC	National Energy Commission (China)
NEMA	National Environmental Management Act 107 of 1998
NEMAQA	National Environmental Management: Air Quality Act 39 of 2004
NERSA	National Energy Regulator of South Africa
NPC	National Planning Commission
OCGT	Open cycle gas turbine
OECD	Organisation for Economic Co-operation and Development
PPA	Power purchase agreement
ppm	Parts per million
PPPF Act	Preferential Procurement Policy Framework Act 5 of 2000
PV	Photovoltaic

QELROs	Quantified emission limitation and reduction objectives
RBS	Required by science
RE	Renewable energy
RECS	Renewable Energy Certificate System
REFIT	Renewable energy feed-in tariff
REFSO	Renewable Energy Finance and Subsidy Office
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
REPA	Renewable Energy Purchasing Agency
RES-E	Electricity generated from renewable energy sources
RET	Renewable energy technology
REWP	White Paper on the Renewable Energy Policy of the Republic of South Africa
RMB	Chinese Yuan Renminbi
RO	Renewable obligation
RPO	Renewable purchase obligation
RPS	Renewable portfolio standard
SANEDI	South African National Energy Development Institute
SANTREC	South African National Tradable Renewable Energy Certificate Team
SARI	South African Renewables Initiative
SBI	Subsidiary Body for Implementation
SBSTA	Subsidiary Body for Scientific and Technological Advice
SEPB	State Environment Protection Bureau (China)

SERC	State Electricity Regulatory Commission (India and China)
StrEG	Stromeinspeisegesetz (Act on Renewable Electricity Fed into the Grid)
SWH	Solar water heater
tcf	Trillion cubic feet
tCO_2	Tonnes of carbon dioxide
tCO_2/capita	Tonnes of carbon dioxide per capita
tCO_2eq	Tonnes of carbon dioxide equivalent
TW	Terawatt
TWh	Terawatt hour
TREC	Tradable Renewable Energy Certificate
TRECSA	Tradable Renewable Energy Certificate South Africa
TSO	Transmission system operator
UK	United Kingdom
UNFCCC	United Nations Framework Convention on Climate Change
USA	United States of America
VAT	Value added tax

Chapter 1

Introduction

1.1 Background information and problem statement

Global climate change has been recognised as 'unequivocal'.[1] Many of the changes observed, including warming of the atmosphere and ocean, diminished amounts of snow and ice, rising sea levels and increased concentrations of greenhouse gas emissions, 'are unprecedented over decades to millennia'.[2] The rising temperatures are due to a the drastic increase in global levels of greenhouse gas emissions since 1750 due to 'human activities'[3] and have resulted in an increase in global temperatures of more than half a degree Celsius since before the Industrial Revolution.[4]

Greenhouse gas (GHG) levels and, consequently, global temperatures remain on the increase, which has led to worldwide consensus that GHG emission levels must be stabilised. This consensus is evidenced in the adoption of the United Nations Framework Convention on Climate Change[5] (UNFCCC), which has as its ultimate objective the 'stabilization of greenhouse gas concentrations [so as to] ...

[1] L Alexander, S Allen, NL Bindoff, FM Bréon, J Church, U Cubasch, S Emori, P Forster, P Friedlingstein, N Gillett, J Gregory, D Hartmann, E Jansen, B Kirtman, R Knutti, K Kumar Kanikicharla, P Lemke, J Marotzke, V Masson-Delmotte, G Meehl, I Mokhov, S Piao, GK Plattner, Q Dahe, V Ramaswamy, D Randall, M Rhein, M Rojas, C Sabine, D Shindell, TF Stocker, L Talley, D Vaughan, SP Xie 'Summary for Policymakers' *Climate Change 2013: The Physical Science Basis* (Contribution of Working Group I to the Fifth Assessment Report) available at http://www.ipcc.ch/report/ar5/wg1/#.UnfApBAw81c [accessed 27 September 2013] SPM-3.

[2] Ibid.

[3] R Alley, T Berntsen, NL Bindoff, Z Chen, A Chidthaisong, P Friedlingstein, J Gregory, G Hegerl, M Heimann, B Hewitson, B Hoskins, Fortunat Joos, Jean Jouzel, Vladimir Kattsov, Ulrike Lohmann, Martin Manning, Taroh Matsuno, Mario Molina, N Nicholls, J Overpeck, D Qin, G Raga, V Ramaswamy, J Ren, M Rusticucci, S Solomon, R Somerville, TF Stocker, P Stott, RJ Stouffer, P Whetton, RA Wood, D Wratt 'Summary for Policymakers' in B Metz, OR Davidson, PR Bosch and LA Meyer (eds) *Climate Change 2007: Mitigation* (Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change) 2.

[4] 'Executive Summary' *Stern Review: The Economics of Climate Change* 2006 available at http://news.bbc.co.uk/1/shared/bsp/hi/pdfs/30_10_06_exec_sum.pdf [last accessed 19 August 2012] iii.

[5] United Nations Framework Convention on Climate Change (1992) 31 *ILM* 849 ('UNFCCC').

prevent dangerous anthropogenic interference with the climate system'.[6] The Kyoto Protocol to the UNFCCC[7] was subsequently adopted and came into effect in 2005. The Kyoto Protocol gives effect to the ultimate objective of the UNFCCC and required that the (developed country) parties included in Annex I to the UNFCCC reduce their overall emissions of specific GHG emissions by five per cent below 1990 levels between 2008 and 2012[8] (the first commitment period). In 2011, the parties agreed to a second commitment period, which began at the start of 2013. No overall emission reduction target for the second commitment period has been agreed.[9]

The primary GHG contributing to climate change is carbon dioxide, which has been identified as 'the most important anthropogenic greenhouse gas'[10] and is produced primarily through the combustion of fossil fuels in order to generate energy.

The GHG emissions of developing countries are relatively low compared to developed countries due to the fact that they have yet to reach their social and development goals.[11] However, this situation is changing as developing countries such as China, India and South Africa rapidly industrialise and consume ever-increasing amounts of energy.

South Africa generates most of its energy from coal[12] and thus has a very carbon-intensive economy. South Africa is ranked in the top 20 GHG emitters in the world (in terms of absolute emissions).[13] South Africa is also one of the most energy-intensive economies in the world[14] and consumes about half of the electricity

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[6] Ibid, Article 2.
[7] Kyoto Protocol to the United Nations Framework Convention on Climate Change (1998) 37 *ILM* 22 ('Kyoto Protocol').
[8] Ibid, Article 3(1).
[9] This is discussed further in Chapter 2 below.
[10] Alley et al 'Summary for Policymakers' (AR4) (n3) 2.
[11] UNFCCC (n5), Preamble.
[12] See International Energy Agency *Share of total primary energy supply in 2009* available at http://www.iea.org/stats/pdf_graphs/ZATPESPI.pdf [accessed 23 July 2012].
[13] This is based on an analysis of the latest energy indicators of the International Energy Agency (IEA). See IEA *Share of total primary energy supply in 2009* (n12).
[14] Department of Environmental Affairs and Tourism *A National Climate Change Response Strategy for South Africa* (September 2004) available at http://unfccc.int/files/meetings/seminar/application/pdf/sem_sup3_south_africa.pdf [accessed 26 April 2008] 8.

produced in Africa.[15] Due to the fact that the energy sector accounts for 79 per cent of South Africa's total GHG emissions,[16] it is clear that the energy sector holds the greatest potential for the reduction of GHGs.

While reducing the use of fossil fuels to generate energy (internationally and in South Africa) would reduce GHG levels, it will not be possible to simply curtail energy usage. Furthermore, as developing countries attempt to attain higher levels of socio-economic development and increase their energy generation and consumption, their GHG emissions are rising rapidly. This can be seen in the fact that China has recently overtaken the United States of America as the world's largest emitter of greenhouse gases.[17]

Energy demand is also increasing in South Africa. For instance, the South African government plans to increase electricity capacity by 45 637 megawatts (MW) to reach a total of 89 532 MW in 2030 in terms of the Integrated Resource Plan for Electricity 2010-2030[18] (IRP 2010-2030).

It is therefore necessary that reliance be placed on other sources of energy, such as renewable energy. As discussed in Chapter 3, South Africa has significant potential for wind and solar energy. For the reasons discussed in Chapter 3 nuclear energy is not considered to be a renewable source of energy.

There are a number of benefits associated with renewable energy, including that it could provide a sustainable source of energy and increase security of supply (discussed further in Chapter 3). A transition to energy produced from renewable

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[15] United Nations Industrial Development Organisation *Clean Development Mechanism (CDM) Investor Guide: South Africa* (2003) available at http://www.unido.org/index.php?id=o71852 [accessed 29 April 2008] 11.

[16] Department of Environmental Affairs *South Africa's Second National Communication under the United Nations Framework Convention on Climate Change* 2011 available at http://unfccc.int/resource/docs/natc/zafnc02.pdf [accessed 24 November 2011] 181.

[17] See International Energy Agency *Key World Energy Statistics 2010* available at http://www.iea.org/textbase/nppdf/free/2010/key_stats_2010.pdf [accessed 2 November 2010].

[18] See Department of Energy *Electricity Regulation Act No. 4 of 2006: Electricity Regulations on the Integrated Resource Plan 2010-2030* GNR. 400 in *Government Gazette* No. 34263 dated 6 May 2011, 17. It should be noted that an Update to the IRP 2010-2030 has recently been published, and is discussed further in Chapter 6. However, since the IRP 2010-2030 'remains the official government plan for new generation capacity until replaced by a full iteration', the focus remains on the IRP 2010-2030.

sources would also assist in addressing the problem of climate change,[19] due to the fact that far lower levels of GHG emissions are associated with energy generated from renewable sources than energy generated from fossil fuels.

However, there are also barriers to renewable energy, a significant one being the higher initial costs associated with it. While the generation of electricity from conventional (fossil fuel) sources such as coal may be 'cheaper', the lower costs do not take account of the external impacts of such energy sources on the environment and on society, including climate change.[20] As discussed in Chapter 4, the exclusion of such costs from energy prices leads to resources not being allocated efficiently and a consequent market failure.[21] Significantly, it has been recognised that climate change is 'the greatest and widest-ranging market failure ever seen'.[22]

It has been recognised that market-based instruments (MBIs) can address this market failure by including environmental and social costs in the market prices of goods and services so that external costs are internalised, which is necessary 'for the optimal allocation of resources'.[23] A number of MBIs have been introduced internationally to promote renewable energy, including the feed-in tariff, the renewable obligation and renewables tendering. As discussed in Chapter 4, the feed-in tariff has been the most effective in promoting renewable energy worldwide.

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[19] See for instance S Singer (editor in chief) *The Energy Report: 100% Renewable Energy by 2050* (WWF International, Ecofys and OMA) available at assets.panda.org/downloads/the_energy_report_lowres_111110.pdf [accessed 9 March 2011] 11.

[20] See R Spalding-Fecher and DK Matibe 'Electricity and externalities in South Africa' 2003 (31) *Energy Policy* 721-734, 722, which refers to the South African context.

[21] See AD Owen 'Renewable Energy: Externality costs as market barriers' 2006 (34) *Energy Policy* 632-642, 633-634 and JN Blignaut and NA King 'The Externality Cost of Coal Combustion in South Africa' (paper presented at the first annual conference of the Forum for Economics and Environment) 2002, Cape Town available at http://www.elaw.org/system/files/Economic%20costs%20of%20coal%20combustion%20in%20RSA.pdf [accessed 6 June 2011].

[22] *Stern Review: The Economics of Climate Change* (n4) i.

[23] K Brick and M Visser 'Green Certificate Trading' 2009 Energy Research Centre, University of Cape Town available at http://www.erc.uct.ac.za/Research/publications/09Brick-Visser_Green_certificate_trading.pdf [accessed 7 July 2011] 2. See also National Treasury: Tax Policy Chief Directorate *Draft Policy Paper: A Framework for Considering Market-Based Instruments to Support Environmental Fiscal Reform in South Africa* (April 2006) available at http://www.treasury.gov.za/public%20comments/Draft%20Environmental%20Fiscal%20Reform%20Policy%20Paper%206%20April%202006.pdf [accessed 10 May 2009] 22.

The South African government did not place much emphasis on renewable energy until the end of the last decade.[24] However, more recently renewable energy has gained increased prominence and the promotion of renewable energy has been identified by government as a component in its strategy to reduce the country's GHG emissions and move to a low-carbon society.[25] In terms of the IRP 2010-2030 electricity generated from renewable energy sources (RES-E) will account for 21 per cent of total electricity capacity[26] and 9 per cent of total electricity supply by 2030.[27]

South Africa's environmental regulatory framework consists primarily of traditional command-and-control instruments. However, government has started to consider the inclusion of MBIs, which was evidenced by the publication of the Draft Policy Paper: A Framework for Considering Market-Based Instruments to Support Environmental Fiscal Reform in South Africa in 2006.[28]

Several MBIs have been implemented subsequently, including some that are specifically intended to promote renewable energy, such as a rebate for solar water heaters,[29] a levy on electricity generated from non-renewable sources,[30] as well as the renewable energy feed-in tariff,[31] which was introduced in 2009 but replaced by a tendering programme for renewable energy, the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP),[32] in 2011. In addition, government is considering the introduction of further MBIs including a carbon tax and emissions trading.[33] These are all considered in Chapter 7.

The issues outlined above are considered in the following chapters (as set out in more detail in the chapter overview) and conclusions are drawn in the final chapter.

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[24] For instance, the Department of Energy established a target of '10 000 GWh [gigawatt hours] ... renewable energy contribution to final energy consumption by 2013', which amounted to only four per cent of projected energy demand in 2013. Department of Minerals and Energy *White Paper on the Renewable Energy Policy of the Republic of South Africa* GNR 513 in *Government Gazette* No. 26169 dated 14 May 2004, 25.
[25] See Department of Environmental Affairs *National Climate Change Response Green Paper 2010* GN 1083 in *Government Gazette* No. 33801 dated 28 November 2010, especially from 14-18.
[26] IRP 2010-2030 (n18) Table 4, 17.
[27] Ibid, Figure 3, 18. See also Figure 5 at 30. The distinction between electricity *capacity* and electricity *supply* is explained in Chapter 3.
[28] MBI Policy Paper (n23).
[29] Discussed at 7.4.2.1.
[30] Discussed at 7.4.2.4.
[31] Discussed at 7.3.
[32] Discussed at 7.4.1.1.
[33] These are discussed at 7.5.1 and 7.5.3 respectively.

1.2 Research objectives

The research will (a) describe and discuss the primary market-based instruments that have been implemented internationally to promote renewable energy in order to identify which have been the most effective in promoting renewable energy; and (b) in light of these findings, discuss the legislative and policy developments that would be necessary for the successful implementation of such instruments in South Africa.

1.3 Research methodology

The primary mode of research has been by desktop study. Reference has been made to policy papers and authoritative studies on climate change and renewable energy, which have been obtained from internet sources including government websites and the websites of research institutes, such as the University of Cape Town's Energy Research Centre. Reference is also made to academic articles, books and chapters in books, which have been sourced from journal databases, the University of Cape Town's library as well as through internet searches. Legislation, regulations and policy documents, accessed via legal databases such as Sabinet and Jutastat, are analysed. Where reference is made to the policies of other jurisdictions, information on such jurisdictions has been sourced primarily from government websites. Use has also been made of media articles, either in hard-copy or online, where these provide the most up-to-date information.

This research reflects the law and policy developments up to and including 30 September 2013, except in certain circumstances where more recent policy developments or the publication of further reports or academic articles appeared especially pertinent.

1.4 Chapter overview

Chapter 2 sets out in more detail the problem of climate change including from the international perspective as well as the impacts of climate change in South Africa. It also highlights the link between climate change and energy generation.

Chapter 3 contains a detailed discussion of energy generally as well as renewable energy in particular, including with regard to the benefits of, and barriers to, renewable energy. The chapter also considers South Africa’s energy profile, barriers to renewable energy and the potential for renewable energy in South Africa.

Chapter 4 introduces the concept of market-based instruments and sets out the rationale for their implementation. It briefly outlines a number of MBIs that have been implemented internationally to promote the uptake of renewable energy and considers their effectiveness in this regard.

Due to the recognition, in Chapter 4, that the renewable energy feed-in tariff has been the most successful instrument in promoting renewable energy worldwide, Chapter 5 considers the implementation of the feed-in tariff internationally. As expanded on in Chapters 4 and 5, the German feed-in tariff is considered as a ‘best practice’ example. Chapter 5 also discusses the feed-in tariffs that have been implemented in Spain, India and China, with the object of identifying the elements that should be included in any future FIT policy in South Africa.

Chapter 6 sets out the legislation and polices in South Africa that are relevant to climate change and renewable energy, including the White Paper on the Energy Policy of the Republic of South Africa,[34] the White Paper on the Renewable Energy Policy of the Republic of South Africa,[35] the Long Term Mitigation Scenarios: Strategic Options for South Africa[36] and the Integrated Resource Plan for Electricity 2010-2030.[37]

Thereafter Chapter 7 describes the MBIs that have been introduced in South Africa to promote renewable energy, including the rebate for solar water heaters, the

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[34] GN 3007 in *Government Gazette* No. 19606 dated 17 December 1998.
[35] GNR 513 in *Government Gazette* No. 26169 dated 14 May 2004.
[36] Scenario Building Team *Long Term Mitigation Scenarios: Strategic Options for South Africa* (Technical Summary, Department of Environmental Affairs and Tourism) 2007.
[37] IRP 2010-2030 (n18).

levy on electricity produced from non-renewable sources and the REIPPPP. Even though it has been replaced by the REIPPPP, Chapter 7 also describes the former renewable energy feed-in tariff.

Based on the experiences of the jurisdictions considered in Chapter 5, Chapter 8 considers the implementation of a FIT policy in South Africa; and identifies and examines the elements of a feed-in tariff framework in the South African context.

Chapter 9 contains a summary of the key recommendations and conclusions.

Chapter 2

Climate change[1]

2.1 Introduction

Greenhouse gases (GHGs), including carbon dioxide, methane and nitrous oxide, occur naturally in the Earth's atmosphere and play an important role. GHGs have a heat-trapping effect and are thus responsible for warming of the global surface air temperature. Without this natural 'greenhouse effect' the average air temperature would be well below freezing.[2]

However, the Industrial Revolution saw a drastic increase in energy demand, which was met primarily by coal[3] and which resulted in an associated increase in GHG emissions, especially carbon dioxide. The increased levels of GHGs have resulted in an increase in average global temperatures. This is referred to as 'climate change', which has been described as

> 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'.[4]

Warming of the climate system, or climate change, has been recognised as 'unequivocal'[5] and it is estimated that from 1850-1900 to 2003-2012 temperatures

[1] Parts of this chapter draw on the author's minor dissertation submitted in partial fulfilment of her LLM degree: L du Toit 'Towards an Effective Climate Change Regime in South Africa: Policy and Legal Developments' 2010 (Faculty of Law, University of Cape Town) available at http://uctscholar.uct.ac.za/R/?func=dbin-jump-full&object_id=10493&local_base=GEN01.

[2] JP Holdren and KR Smith 'Energy, the Environment, and Health' in United Nations Development Programme, United Nations Department of Economic and Social Affairs and World Energy Council 2000 *World Energy Assessment: Energy and the Challenge of Sustainability*, 86. See also G Alexander and G Boyle 'Introducing Renewable Energy' in G Boyle (ed) *Renewable Energy: Power for a Sustainable Future* (2ed) 2004, 10.

[3] See for example H Winkler (ed) *Energy Policies for Sustainable Development in South Africa: Options for the Future* 2006 (Energy Research Centre, University of Cape Town) 1-2.

[4] United Nations Framework Convention on Climate Change (1992) 31 *ILM* 849, Article 1(2).

[5] R Alley, T Berntsen, NL Bindoff, Z Chen, A Chidthaisong, P Friedlingstein, J Gregory, G Hegerl, M Heimann, B Hewitson, B Hoskins, Fortunat Joos, Jean Jouzel, Vladimir Kattsov, Ulrike Lohmann, Martin Manning, Taroh Matsuno, Mario Molina, N Nicholls, J Overpeck, D Qin, G Raga, V Ramaswamy, J Ren, M Rusticucci, S Solomon, R Somerville, TF Stocker, P Stott, RJ Stouffer, P Whetton, RA Wood, D Wratt 'Summary for Policymakers' in B Metz, OR Davidson, PR Bosch and LA

increased by 0.78 degrees Celsius (°C).[6] This has already had impacts on the environment and on human well-being. Direct observations of climate change include increased global average air and ocean temperatures, rising sea levels, melting of snow and ice (including the ice sheets of Antarctica and Greenland), widespread changes in amounts of precipitation, extreme weather events and extreme temperatures.[7]

Furthermore, severe impacts are projected to take place in the future and are anticipated to become more severe the warmer the world becomes. Indeed, an increase of two to three degrees Celsius could have numerous dire consequences including the reduction of water supplies, decreased crop yields and the possible extinction of 15-40 per cent of species.[8] And increases of five to six degrees Celsius will 'take us into territory unknown to human experience and involve radical changes in the world around us'.[9] Importantly, it is the poorest and most vulnerable countries that will suffer the most, largely because they do not have resources sufficient to deal effectively with the adverse effects of climate change such as droughts and flooding.[10] These are also the countries that have contributed the least to climate change.[11]

Developed countries are recognised as being responsible for the majority of greenhouse gases emitted since the Industrial Revolution.[12] Under international

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Meyer (eds) *Climate Change 2007: Mitigation* (Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change) 5 and L Alexander, S Allen, NL Bindoff, FM Bréon, J Church, U Cubasch, S Emori, P Forster, P Friedlingstein, N Gillett, J Gregory, D Hartmann, E Jansen, B Kirtman, R Knutti, K Kumar Kanikicharla, P Lemke, J Marotzke, V Masson-Delmotte, G Meehl, I Mokhov, S Piao, GK Plattner, Q Dahe, V Ramaswamy, D Randall, M Rhein, M Rojas, C Sabine, D Shindell, TF Stocker, L Talley, D Vaughan, SP Xie 'Summary for Policymakers' *Climate Change 2013: The Physical Science Basis* (Contribution of Working Group I to the Fifth Assessment Report) available at http://www.ipcc.ch/report/ar5/wg1/#.UnfApBAw81c [accessed 27 September 2013] 3.

[6] Alexander et al 'Summary for Policymakers' (AR5) (n5) 3.

[7] Alley et al 'Summary for Policymakers' (AR4) (n5) 5-9.

[8] 'Executive Summary' *Stern Review: The Economics of Climate Change* 2006 available at http://news.bbc.co.uk/1/shared/bsp/hi/pdfs/30_10_06_exec_sum.pdf [last accessed 19 August 2012] vi.

[9] Ibid, ix.

[10] Ibid, vii and xxii.

[11] J Dugard, AL St. Clair and S Gloppen 'Introduction' in J Dugard, AL St. Clair and S Gloppen (eds) *Climate Talk: Rights, Poverty and Justice* 2013, 2.

[12] International Energy Agency *CO_2 Emissions from Fuel Combustion: Highlights* 2011 available at http://www.iea.org/co2highlights/CO2highlights.pdf [accessed 11 October 2012] 27.

pressure developed countries have sought to decrease their GHG emissions,[13] with the result that in 2009 the carbon emissions of developed countries were 6 per cent lower than in 1990. On the other hand, the carbon emissions of developing countries (especially India and China) have been increasing rapidly as these countries develop. In 2009 the carbon emissions of developing countries were 132 per cent higher than in 1990.[14]

While developed countries are historically responsible for the majority of emissions, climate change and its adverse affects have been recognised as a 'common concern of humankind'.[15] This is because the impacts of climate change are transboundary and will not just be felt by developed countries. It is thus imperative that developing countries, including South Africa, also take action to respond to climate change.

There is a close relation between climate change and energy generation, which is discussed in detail in Chapter 3. The next section discusses the physical basis of climate change with reference to the Fourth Assessment Report and Fifth Assessment Report of the Intergovernmental Panel on Climate Change (in 2.2.1). The following section deals briefly with the 'economics of climate change' with reference to the Stern Review: The Economics of Climate Change (in 2.2.2). This chapter goes on to consider international policy responses to climate change (in 2.2.3). Climate change in the South African context is discussed in 2.3.

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[13] As carbon dioxide is the most prevalent greenhouse gas, the terms 'greenhouse gas emissions', 'carbon emissions' and 'carbon dioxide emissions' are used interchangeably.
[14] IEA *CO_2 Emissions from Fuel Combustion* (n12) 27.
[15] UNFCCC (n4) Preamble.

2.2 The international context

2.2.1 The physical basis of climate change

The Intergovernmental Panel on Climate Change (IPCC)[16] published its Fourth Assessment Report (AR4) in 2007. The IPCC's Assessment Reports are authoritative and are regarded as 'the definitive source of information on climate change'.[17] The IPCC is busy preparing the Fifth Assessment Report (AR5), and a summary for policymakers for the first part of the AR5 (The Physical Science Basis) was recently approved and published.[18] The information below is based as far as possible on the latest report published under the AR5 and is supplemented by information from the AR4 .

The AR5 reports that carbon dioxide levels have increased from about 280 parts per million (ppm) (in the atmosphere) since pre-industrial times to about 391 ppm in 2011, which is 'unprecedented in at least the last 800,000 years'.[19] Furthermore, carbon dioxide 'concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions'.[20]

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[16] The IPCC is an intergovernmental, scientific body on climate change that was established by the United Nations Environment Programme and the World Meteorological Organisation; and is responsible for reviewing the latest 'scientific, technical and socio-economic information produced worldwide' relating to climate change with the object of presenting the public with a clear understanding of 'the current state of climate change', including through its Assessment Reports. See IPCC *Organization* available at http://www.ipcc.ch/organization/organization.htm.

[17] P Birnie, A Boyle and C Redgwell *International Law and the Environment* (3ed) 2009, 337. Indeed, the work of the IPCC is implicitly approved of, and relied upon, in the Kyoto Protocol. See for instance article 3(4) of the Kyoto Protocol to the United Nations Framework Convention on Climate Change (1998) 37 *ILM* 22. It should be noted that the *Stern Review: The Economics of Climate Change* (n8) also deals with the physical basis and impacts of climate change.

[18] Alexander et al 'Summary for Policymakers' (AR5) (n5).

[19] Ibid, 7. See also Alley et al 'Summary for Policymakers' (AR4) (n5) 2.

[20] Alexander et al 'Summary for Policymakers' (AR5) (n5) SPM-7. Electricity (and heat) generation is directly linked to the generation of CO_2 emissions; and in 2009 the global electricity and heat generation sector was responsible for 41 per cent of global CO_2 emissions, due to its heavy reliance on coal. See IEA *CO_2 Emissions from Fuel Combustion* (n12) 9. See also Department of Minerals and Energy, Eskom and Energy Research Institute (University of Cape Town) *Energy Outlook for South Africa: 2000* 2002 available at http://www.info.gov.za/view/DownloadFileAction?id=124706 [accessed 13 November 2010] which notes that coal is 'the most polluting source of energy for electricity generation' (at xiii).

While other GHGs including methane and nitrous oxide have also increased since pre-industrial times, carbon dioxide has increased the most and currently accounts for 64 per cent of global GHG emissions.[21] The increase in carbon dioxide emissions over the last 10 000 years is illustrated in Figure 2.1. The inset panel shows carbon dioxide levels since 1750.

Figure 2.1 Carbon dioxide levels over the last 10 000 years and since 1750 (inset panel)[22]

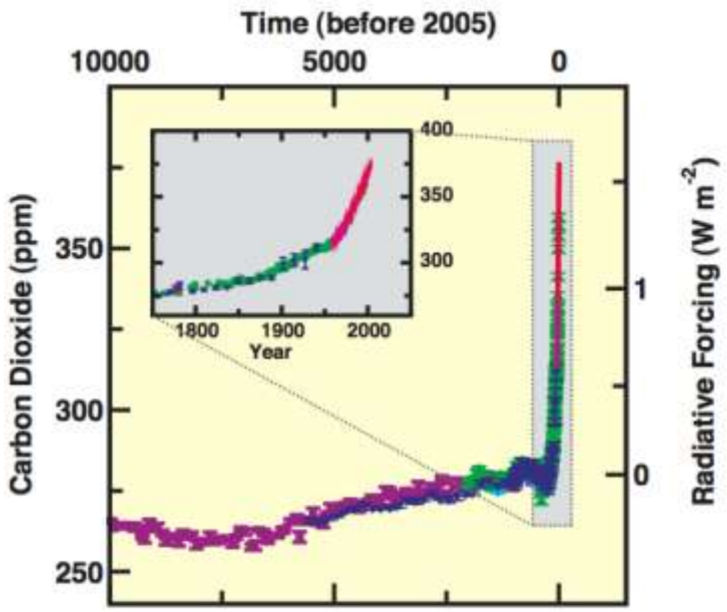

Figure 2.1 clearly show that carbon dioxide levels were relatively stable for the approximately 10 000 years prior to 1750 and that they have spiked drastically since 1750.

As mentioned above, it is estimated that from 1850-1900 to 2003-2012 temperatures have increased by 0.78 degrees Celsius (°C).[23] The AR5 states that it

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[21] World Meteorological Organization and Global Atmosphere Watch *WMO Greenhouse Gas Bulletin: The State of Greenhouse Gases in the Atmosphere Based on Global Observations through 2010* (No. 7, 21 November 2011) available at http://www.wmo.int/pages/prog/arep/gaw/ghg/documents/GHGbulletin_7_en.pdf [accessed 25 November 2011].
[22] Figure 2.1 was obtained from Alley et al 'Summary for Policymakers' (AR4) (n5) 3.
[23] Alexander et al 'Summary for Policymakers' (AR5) (n5) SPM-3.

is '*extremely likely* that human influence has been the dominant cause of the observed warming since the mid-20th century'.[24]

Further increases in GHG levels would lead to further warming and induce further impacts that would 'very likely' be more severe than those already observed.[25] It is thus crucial that GHG emissions be stabilised. Stabilising GHG emissions requires that such emissions peak and thereafter decline. The lower the stabilisation level that is desired, the earlier this peak and decline should occur.[26]

The concern internationally has been to ensure that the global temperature increase does not exceed two degrees Celsius above pre-industrial levels (the 2°C target),[27] and the AR4 considers different stabilisation levels in relation to this target. Stabilising GHG emissions at 450ppm carbon dioxide equivalent (CO_2e)[28] would make it 'likely' to 'very likely' that the global temperature increase will not exceed

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[24] Ibid, SPM-12. '*Extremely likely*' indicates a certainty level of 95-100%. Alexander et al 'Summary for Policymakers' (AR5) SPM-2.
[25] Alley et al 'Summary for Policymakers' (AR4) (n5) 13. Very likely' indicates a chance that is greater than 90 per cent. At 4, footnote 6.
[26] Ibid, 15.
[27] See for example GA Meehl, TF Stocker, WD Collins, P Friedlingstein, AT Gaye, JM Gregory, A Kitoh, R Knutti, JM Murphy, A Noda, SCB Raper, IG Watterson, AJ Weaver and ZC Zhao 'Global Climate Projections' in S Solomon, D Qin, M Manning, Z Chen, M Marquis, KB Averyt, M Tignor and HL Miller (eds) *Climate Change 2007: The Physical Science Basis* (Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change); BS Fisher, N Nakicenovic, K Alfsen, J Corfee Morlot, F de la Chesnaye, J Hourcade, K Jiang, M Kainuma, E La Rovere, A Matysek, A Rana, K Riahi, R Richels, S Rose, D van Vuuren, R Warren 'Issues related to mitigation in the long-term context' in B Metz, OR Davidson, PR Bosch, R Dave, LA Meyer (eds) *Climate Change 2007: Mitigation* (Contribution of Working Group III to the Fourth Assessment Report of the Inter-governmental Panel on Climate Change); and *Stern Review: The Economics of Climate Change* (n8) xvii. This 2°C target has been largely accepted by the international community. See for example, the United Nations Framework Convention on Climate Change 'Copenhagen Accord' (Decision 2/CP.15) available at http://unfccc.int/resource/docs/2009/cop15/eng/11a01.pdf#page=4 [last accessed 20 September 2012] and subsequent decisions of the Conference of the Parties under the UNFCCC; as well as M Den Elzen and N Höhne 'Sharing the Reduction Effort to Limit Global Warming to 2°C' 2010 (10) *Climate Policy* 247-260 and M Meinshausen, N Meinshausen, W Hare, SCB Raper, K Frieler, R Knutti, DJ Frame and MR Allen 'Greenhouse Gas Emission Targets for Limiting Global Warming to 2°C' 2009 (458) *Nature* 1158-1162. However, more recently attention has been paid to increasing the ambition level to ensure that the global temperature increase does not exceed 1.5°C. See for example the latest decisions of the COP under the UNFCCC, some of which are discussed in 2.2.3 below.
[28] It should be noted that different greenhouse gases have different potentials to warm the climate, or global warming potentials (GWPs). For example, methane has a higher potential to warm the climate than CO_2 and thus has a higher GWP. The other greenhouse gases may be converted to their 'carbon dioxide equivalent', or CO_2e, by multiplying the relevant quantity of emissions of that greenhouse gas by its GWP. See US Environmental Protection Agency 'CO_2 Equivalent' *Glossary of Climate Change Terms* available at http://www.epa.gov/climatechange/glossary.html#C [last accessed 22 November 2012].

2°C.[29] Stabilising emissions at 450ppm CO_2e will require developed countries to reduce their emissions by 25-40 per cent below 1990 levels by 2020 and to reduce their emissions by 80 to 95 per cent below 1990 levels by 2050.[30] Mitigation efforts (i.e. efforts to reduce GHG emissions) over the next twenty to thirty years have important implications for the prospects of achieving lower stabilisation levels.[31]

2.2.2 The economics of climate change

The Stern Review on the Economics of Climate Change (the Stern Review) was prepared by Sir Nicholas Stern for the British government in 2006.[32] It is described as the 'most comprehensive review ever carried out on the economics of climate change'.[33]

While the Stern Review considers that stabilising global GHG emissions at 450ppm CO_2e is unlikely to be achieved, it notes that stabilisation at 550ppm CO_2e is still feasible even though this level 'is already associated with significant risks'.[34] The Stern Review estimates that stabilising emissions at 500-550 ppm CO_2e will cost about one per cent of global GDP by 2050,[35] which is low in relation to the costs

[29] 'Likely' to 'very likely' indicates a 67 to 100 per cent chance that the global temperature increase will not exceed 2°C. However, stabilising emissions between 450 ppm CO_2e and 550ppm CO_2e would result in only a 'medium likelihood' of keeping the temperature increase to below 2°C. A 'medium likelihood' reflects a 33 to 67 per cent chance that the increase in global temperature will exceed 2°C. See SH Schneider, S Semenov, A Patwardhan, I Burton, CHD Magadza, M Oppenheimer, AB Pittock, A Rahman, JB Smith, A Suarez and F Yamin 'Assessing key vulnerabilities and the risk from climate change' in ML Parry, OF Canziani, JP Palutikof, PJ van der Linden and CE Hanson (eds) *Climate Change 2007: Impacts, Adaptation and Vulnerability* (Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change) Figure 19.1 at 801.

[30] On the other hand, stabilising emissions at 550ppm CO_2e will require developed countries to reduce their emissions by 10 to 30 per cent below 1990 levels by 2020; and by 40 to 90 per cent below 1990 levels by 2050. S Gupta, DA Tirpak, N Burger, J Gupta, N Hohne, AI Boncheva, GM Kanoan, C Kolstad, JA Kruger, A Michaelowa, S Murase, J Pershing, T Saijo and A Sari 'Policies, Instruments and Co-operative Agreements' in B Metz, OR Davidson, PR Bosch and LA Meyer (eds) *Climate Change 2007: Mitigation* (Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change) Box 13.7 at 776. One of the reasons that such drastic emission reductions are required to stabilise GHG emissions is due to the lag in the climate system, and the AR5 notes that '[m]ost aspects of climate change will persist for many centuries even if emissions of CO_2 are stopped'. Alexander et al 'Summary for Policymakers' (AR5) (n5) SPM-19.

[31] Alley et al 'Summary for Policymakers' (AR4) (n5) 15.

[32] *Stern Review: The Economics of Climate Change* (n8) .

[33] See HM Treasury http://webarchive.nationalarchives.gov.uk/+/http:/www.hm-treasury.gov.uk/press_stern_06.htm.

[34] *Stern Review: The Economics of Climate Change* (n8) xv.

[35] Ibid, xiii.

and risks of failing to respond to climate change.[36] Indeed, it projects that extreme weather alone could cost about 0.5 to one per cent of global GDP by 2050, which will increase further if global warming continues.[37]

The Stern Review endorses taking early action to mitigate climate change and argues that mitigation 'must be viewed as an investment, a cost incurred now and in the coming few decades to avoid the risks of very severe consequences in the future'.[38] Tackling climate change does not require that the development aspirations of either developed or developing countries be capped.[39] Indeed, transitioning to a low-carbon economy presents opportunities, and the Stern Review notes that '[m]arkets for low-carbon energy products [could]… be worth at least $500bn per year by 2050'.[40] On the other hand, delay in mitigating GHG emissions will result in more climate change as well as higher mitigation and adaptation costs.[41]

2.2.3 Legal and policy responses to climate change

2.2.3.1 United Nations Framework Convention on Climate Change

a) Introduction

Concern regarding climate change at the international level culminated in the adoption of the United Nations Framework Convention on Climate Change (the UNFCCC) in 1992. The UNFCCC came into effect in 1994 and there are currently 195 parties to the UNFCCC. South Africa ratified the UNFCCC in 1997.[42]

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[36] Ibid, xvi.
[37] Ibid, viii.
[38] Ibid, i.
[39] Ibid, ii.
[40] Ibid, xvi.
[41] Ibid, xv and xxvii.
[42] United Nations Framework Convention on Climate Change *Status of Ratification of the Convention* available at http://unfccc.int/essential_background/convention/status_of_ratification/items/2631.php [last accessed 4 November 2013].

The UNFCCC acknowledges that climate change is a ‘common concern of humankind’[43] and has as its ultimate objective

> ‘to achieve … stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.[44] Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner’.[45]

The UNFCCC requires that parties to the UNFCCC take various actions, which are to be guided by various principles including: the principle of intergenerational equity, by requiring that member Parties ‘should protect the climate system for the benefit of present and future generations, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities’,[46] thereby also giving effect to the principle of common but differentiated responsibilities; as well as the precautionary principle, in requiring that ‘[w]here there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures’.[47] The UNFCCC also promotes sustainable development and ‘sustainable economic growth and development in all Parties’.[48]

As noted above, energy generation and consumption has been a key contributor to climate change and since 1850, 70 per cent of all carbon emissions have been generated by North America and Europe due to ‘energy production’.[49]

b) Commitments

The UNFCCC sets out the commitments of all Parties to the Convention, having regard to their common but differentiated responsibilities and specific priorities and

[43] UNFCCC (n4) Preamble.
[44] ‘Climate system’ is defined as ‘the totality of the atmosphere, hydrosphere, biosphere and geosphere and their interactions. UNFCCC (n4) Article 1(3).
[45] Ibid, Article 2.
[46] Ibid, Article 3(1).
[47] Ibid, Article 3(3).
[48] Ibid, Article 3(4) and 3(5).
[49] *Stern Review: The Economics of Climate Change* (n8) xi.

circumstances including: the development and publication of 'national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol', in accordance with Article 12;[50] the development of plans regarding measures to mitigate climate change and promote 'adequate adaptation';[51] the development and transfer of technologies to reduce greenhouse gas emissions, including in the energy sector[52] and promoting education, training and public awareness on climate change.[53] These commitments are imposed on all country Parties and therefore also apply to developing country Parties, including South Africa.

However, the UNFCCC makes a distinction between developed and developing countries and further obligations are imposed on developed country Parties.[54] This distinction between developed and developing countries is made due to the recognition that developed countries are responsible for the

> 'largest share of historical and current global emissions of greenhouse gases … [and] that per capita emissions in developing countries are still relatively low and that the share of global emissions originating in developing countries will grow to meet their social and development needs'.[55]

The UNFCCC accordingly requires developed country Parties to take the lead in responding to climate change.[56]

Of specific relevance to South Africa, the UNFCCC recognises 'the special difficulties of those countries, especially developing countries, whose economies are

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[50] Article 12 relates to the communication of information regarding implementation. UNFCCC (n4) Article 4(1)(a).
[51] Ibid, Article 4(1)(b).
[52] Ibid, Article 4(1)(c).
[53] Ibid, Article 4(1)(i).
[54] See Article 4(2)(a), Article 4(3), (4) and (5). The UNFCCC generally uses the term 'developed country Parties' to refer to those parties that are included in Annex I to the UNFCCC; while the term 'developing country Parties' refers to those parties that are not included in Annex I.
[55] Ibid, Preamble.
[56] Ibid, Article 3(1). The UNFCCC also states that '[t]he specific needs and special circumstances of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change, and of those Parties, especially developing country Parties, that would have to bear a disproportionate or abnormal burden under the Convention, should be given full consideration'. Article 3(2).

particularly dependent on fossil fuel production, use and exportation, as a consequence of action taken on limiting greenhouse gas emissions'.[57]

c) Miscellaneous

The UNFCCC established the Conference of the Parties (COP),[58] the Subsidiary Body for Scientific and Technological Advice (SBSTA)[59] and the Subsidiary Body for Implementation (SBI)[60] as well as a financial mechanism.[61] The COP has been meeting since 1995. It has not established a body dealing specifically with energy.

2.2.3.2 Kyoto Protocol to the United Nations Framework Convention on Climate Change

a) Introduction

The Kyoto Protocol to the United Nations Framework Convention on Climate Change (the Kyoto Protocol) was drafted 'in pursuit of the ultimate objective of the [UNFCCC]'.[62] It provides more specificity regarding the mitigation of GHG emissions by establishing emission reduction targets. It also establishes three 'flexible mechanisms' to assist in achieving the emission reduction targets (discussed further below). South Africa acceded to the Kyoto Protocol in 2002[63] and it came into effect on 16 February 2005.

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[57] Ibid, Preamble.
[58] Ibid, Article 7.
[59] Ibid, Article 9.
[60] Ibid, Article 10.
[61] Ibid, Article 11.
[62] Kyoto Protocol to the United Nations Framework Convention on Climate Change (1998) 37 *ILM* 22, Preamble.
[63] United Nations Framework Convention on Climate Change *Status of Ratification of the Kyoto Protocol* available at http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php [last accessed 5 November 2013].

b) Commitments

The Kyoto Protocol requires that developed country Parties[64]

> 'ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts, calculated pursuant to their quantified emission limitation and reduction commitments inscribed in Annex B … with a view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012 [the first commitment period]'.[65]

Different emission reduction targets were assigned to the various developed country Parties. Thus, by the end of 2012 the European Union was required to reduce its emissions by 8 per cent and Japan was required to reduce its emissions by 6 per cent, while Iceland was entitled to increase its emissions by 10 per cent.[66] The overall emission reduction target of 5 per cent was in stark contrast to the emission reduction ranges presented in the IPCC's AR4, which requires that the emissions of developed countries be reduced by 25-40 per cent below 1990 levels by 2020 in order to stabilise emissions at 450ppm CO_2e.[67]

Under the Kyoto Protocol, certain commitments apply to all country Parties, but while taking into account their 'common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances', including: the formulation of programmes 'to improve the quality of local emission factors, activity data and/or models';[68] the development, publication and updating of programmes containing measures to mitigate climate change and adapt to climate

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[64] Contrary to the UNFCCC, the Kyoto Protocol uses the term 'Party included in Annex I' to refer to the developed country Parties included in Annex I to the UNFCCC. For the sake of consistency, reference will continue to be made to 'developed country Parties' and 'developing country Parties', despite the different terminology of the Kyoto Protocol.

[65] Kyoto Protocol (n62) Article 3. The greenhouse gases included in Annex A are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluorides.

[66] Ibid, Annex B.

[67] Alternatively, the AR4 requires that emissions be reduced by 10 to 30 per cent below 1990 levels by 2020 in order to stabilise emissions at 550ppm CO_2e. Gupta et al 'Policies, Instruments and Co-operative Agreements' (AR4) (n30) Box 13.7, 776.

[68] Kyoto Protocol (62) Article 10(a).

change[69] and the promotion of the development and transfer of environmentally sound technologies and processes relevant to climate change.[70]

Importantly, developed country Parties are also required to implement and/or expand policies and measures including: enhancing energy efficiency; research on, and the promotion of, 'new and renewable forms of energy' as well as the promotion of fiscal incentives.[71]

The Kyoto Protocol also makes provision for 'new and additional financial resources' by developed country Parties and other Parties included in Annex II (to the UNFCCC) 'to meet the agreed full costs incurred by developing country Parties in advancing the implementation of existing commitments',[72] as well as the provision of other financial resources.[73]

c) Flexible mechanisms

The Kyoto Protocol establishes three 'flexible mechanisms' to assist developed country Parties in achieving their emission reduction commitments, namely joint implementation between developed country Parties,[74] emissions trading[75] and the clean development mechanism (CDM).[76]

The CDM holds the most significance for South Africa as this is the only flexible mechanism in which developing country Parties may participate. The CDM allows developed country Parties to implement project activities in developing country Parties that result in emission reductions, which must be certified by a designated operational entity.[77] Its purpose is twofold, namely to assist developing country Parties to achieve sustainable development and to contribute to the ultimate

[69] Ibid, Article 10(b).
[70] Ibid, Article 10(c).
[71] Ibid, Article 2(1)(a).
[72] Ibid, Article 11(2)(a).
[73] Ibid, Article 11(2)(b) and 11(3).
[74] Ibid, Article 6.
[75] Ibid, Article 17.
[76] Ibid, Article 12.
[77] Certain conditions must be present before emission reductions may be certified, namely voluntary participation by both Parties; real, measurable, and long-term benefits relating to climate change mitigation and '[r]eductions in emissions that are additional to any that would occur in the absence of the certified project activity'. Ibid, Article 12(5).

objective of the UNFCCC, and to assist developed country Parties in complying with their emission reduction commitments under Article 3 of the Kyoto Protocol.[78] Very few CDM projects have been implemented in South Africa[79] and the CDM market is dominated by a few developing countries, primarily China, India and Brazil.

The creation of these flexible (or carbon trading) mechanisms has led to the development of a huge carbon market which, in 2011, was estimated to have a value of US$ 176 billion (€ 126 billion).[80] This is evidence of the great reliance that developed countries are placing on carbon trading to achieve compliance with their emission reduction commitments.

d) Miscellaneous

The COP under the UNFCCC acts as the meeting of the Parties to the Kyoto Protocol[81] and for the purposes of the Kyoto Protocol is referred to as the Conference of the Parties serving as the Meeting of the Parties (CMP). The CMP began meeting in 2005.

2.2.3.3 Further developments in international climate change policy

While much can be said regarding the issues and tensions that have arisen at the various COPs and CMPs, only the milestones are highlighted below. As noted above, this research reflects the law and policy developments as at 30 September 2013.

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[78] Ibid, Article 12(2).

[79] Some of the reasons for the low implementation of CDM projects in South Africa are discussed *inter alia* in G Little, T Maxwell and M Sutherland 'Accelerating the Implementation of the Clean Development Mechanism in South Africa' 2007 (10) *South African Journal of Economic and Management Sciences* 395-411; L du Toit 'Promoting Clean Development Mechanism Implementation in South Africa: Law and policy' 2009 (24) *Southern African Public Law* (formerly *SA Publiek Reg/Public Law*) 33-55; and J Fay, F Kapfudzaruwa, L Na and S Matheson 'A Comparative Policy Analysis of the Clean Development Mechanism in South Africa and China' 2012 (4) *Climate and Development* 40-53.

[80] A Kossoy and P Guigon *State and Trends of the Carbon Market 2012* 2012 (World Bank) available at http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/State_and_Trends_2012_Web_Optimized_19035_Cvr&Txt_LR.pdf [accessed 25 October 2012] 9.

[81] Kyoto Protocol (n62) Article 13(1).

a) Bali (2007)

Due to the expiry of the first commitment period under the Kyoto Protocol at the end of 2012, much emphasis in the international negotiations has been placed on reaching agreement on action post-2012. The 13th COP (and 3rd CMP) in Bali was a high point in the international climate change negotiations in that it put negotiations back on track. Indeed, the 'Bali Action Plan' was adopted, which was concerned with urgently enhancing the implementation of the UNFCCC,[82] and *inter alia* saw the establishment of the 'Ad Hoc Working Group on Long-term Cooperative Action under the Convention' (AWG-LCA) to ensure that a decision regarding action post-2012 would be adopted at the 15th COP in 2009.[83]

b) Copenhagen (2009)

The 15th COP under the UNFCCC and 5th CMP under the Kyoto Protocol met in Copenhagen at the end of 2009, where negotiations on action after 2012 were to be concluded. The process was highly contentious and did not result in a binding agreement. Instead, some of the Parties drafted the 'Copenhagen Accord',[84] which was merely 'noted' by the COP.[85]

Even though agreement was reached on the provision of new and additional financial resources[86] and the establishment of the Green Climate Fund,[87] the Copenhagen Accord did not establish a time-frame regarding when emissions should peak and thereafter decline and did not contain any emission reduction targets. Instead, developed country Parties were required to submit emission

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[82] UNFCCC 'Bali Action Plan' (Decision 1/CP.13) available at http://unfccc.int/resource/docs/2007/cop13/eng/06a01.pdf#page=3 [last accessed 21 September 2012] Preamble.

[83] Ibid, Articles 1 and 2.

[84] UNFCCC 'Copenhagen Accord' (Decision 2/CP.15) available at http://unfccc.int/resource/docs/2009/cop15/eng/11a01.pdf#page=4 [last accessed 20 September 2012].

[85] See UNFCCC Executive Secretary 'Notification to Parties: Clarification relating to the Notification of 18 January 2010' (25 January 2010) available at http://unfccc.int/files/parties_and_observers/notifications/application/pdf/100125_noti_clarification.pdf [accessed 2 February 2010].

[86] Copenhagen Accord (n84) Article 8.

[87] Ibid, Article 10.

reduction targets for 2020[88] and developing country Parties were required to submit their mitigation actions to the secretariat.[89] While the Copenhagen Accord made provision for the strengthening of the two degree target,[90] it was projected that the pledged mitigation targets[91] would result in temperature increases of more than 3°C by 2100.[92]

c) Cancun (2010)

The 16th COP under the UNFCCC and the 6th CMP under the Kyoto Protocol met in Cancun, Mexico at the end of 2010. Despite low expectations, several agreements (the Cancun Agreements) were adopted.

The Parties affirmed that climate change is one of the greatest challenges of our time[93] and reiterated the need to reduce the global temperature increase to two degrees Celsius, while also recognising the possibility of strengthening this target to 1.5 degrees Celsius.[94]

The Parties called for enhanced action on adaptation *inter alia* to reduce the vulnerability and build the resilience of developing country Parties,[95] and agreed to establish the Cancun Adaptation Framework[96] as well as an Adaptation Committee.[97] The Parties also called for enhanced action on mitigation and urged developed country Parties to increase the level of their ambition to a level consistent

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[88] Ibid, Article 4.
[89] Ibid, Article 5.
[90] Ibid, Article 12.
[91] See UNFCCC 'Appendix I – Quantified economy-wide emissions targets for 2020' available at http://unfccc.int/home/items/5264.php [last accessed 21 September 2012] and UNFCCC 'Appendix II – National appropriate mitigation actions of developing country Parties' available at http://unfccc.int/home/items/5265.php [last accessed 21 September 2012].
[92] See Climate Interactive *Scoreboard Science and Data* available at http://climateinteractive.org/scoreboard/scoreboard-science-and-data [accessed 5 February 2010] and Climate Action Tracker *Ambition of only two developed countries sufficiently stringent for 2°C* available at http://www.climateactiontracker.org/ [last accessed 21 September 2012].
[93] UNFCCC 'The Cancun Agreements: Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention' (Decision 1/CP.16) available at http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf#page=2 [accessed 24 May 2014] Article 1.
[94] Ibid, Article 4.
[95] Ibid, Article 11.
[96] Ibid, Article 13.
[97] To 'promote the implementation of enhanced action on adaptation in a coherent manner under the Convention'. Ibid, Article 20.

with the AR4 of the IPCC.[98] The Parties agreed that developing country Parties should take nationally appropriate mitigation actions (NAMAs) in order to achieve a deviation in emissions compared to 'business as usual' emissions in 2020.[99] The Parties also agreed to establish the Green Climate Fund[100] and a Technology Mechanism.[101]

In comparison to the 15th COP (and 5th CMP) in Copenhagen, the 16th COP (and 6th CMP) in Cancun was a positive step forward and the Cancun Agreements were described as a 'significant achievement for the UN climate process'.[102] While it was largely acknowledged that the outcome 'was a relatively small step in combating climate change',[103] for example, no agreement was reached on a second commitment period under the Kyoto Protocol, on balance the outcome was viewed positively and confidence was restored in the UNFCCC process.[104]

d) Durban (2011)

An important outcome of the 17th COP (and 7th CMP) held in Durban, South Africa was the establishment of the 'Ad Hoc Working Group on the Durban Platform for Enhanced Action' (AWG-DP), which was tasked with 'launch[ing] a process to develop a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties',[105] to be implemented from 2020.

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[98] Ibid, Article 37. See also UNFCCC 'The Cancun Agreements: Outcome of the work of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol at its fifteenth session' (Decision 1/CMP.6) available at http://unfccc.int/resource/docs/2010/cmp6/eng/12a01.pdf#page=3 [accessed 24 May 2014] Article 4.

[99] UNFCCC 'The Cancun Agreements: Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention' (Decision 1/CP.16) available at http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf#page=2 [accessed 24 May 2014] Article 48.

[100] Ibid, Article 102.

[101] Ibid, Article 117.

[102] UNFCCC *Milestones on the road to 2012: The Cancun Agreements* available at http://unfccc.int/key_steps/cancun_agreements/items/6132.php [accessed 24 May 2014].

[103] IISD Reporting Services *Earth Negotiations Bulletin* 'Summary of the Cancun Climate Change Conference: 29 November – 11 December 2010' (13 December 2010) Vol. 12 No. 498 available at http://www.iisd.ca/download/pdf/enb12498e.pdf [accessed 24 May 2014] 1.

[104] Ibid, 1 and 29.

[105] UNFCCC 'Establishment of an Ad Hoc Working Group on the Durban Platform for Enhanced Action' (Decision 1/CP.17) available at http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf#page=2 [last accessed 21 September 2012] Article 2.

The Parties reiterated the two degree target as well as the possibility of raising the level of ambition to 1.5 degrees Celsius.[106] Significantly, the Parties agreed on a second commitment period under the Kyoto Protocol, beginning in 2013 and ending either at the end of 2017, or at the end of 2020.[107] Parties also agreed that further emission reduction targets, which would be converted into quantified emission limitation or reduction objectives (QELROs), would be presented and adopted at the eighth session of the CMP (which took place at the end of 2012)[108] and which would apply in respect of the second commitment period under the Kyoto Protocol.

e) Doha (2012)

The 18th COP under the UNFCCC and 8th CMP under the Kyoto Protocol met in Doha, Qatar at the end of 2012. Here it was decided that the second commitment period under the Kyoto Protocol will expire at the end of 2020.[109]

Developed country Parties also submitted their new emission reduction targets for the second commitment period, which had the effect of amending the Kyoto Protocol.[110] However, these emission reduction targets[111] are still in contrast to the emission reductions called for by the IPCC's AR4[112] and developed country Parties were urged to increase the ambition of their emission reduction targets to be more in line with the ranges presented in the AR4.[113] Developing country Parties were still

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[106] Developed country Parties were also urged to increase the ambition of their emission reduction targets to be in line with the ranges included in the IPCC's AR4. UNFCCC 'Outcome of the work of the Ad Hoc Working Group on Long-Term Cooperative Action under the Convention' (Decision 2/CP.17) available at http://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf#page=2 [last accessed 21 September 2012] Part II A. Preamble.

[107] UNFCCC 'Outcome of the work of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol at its sixteenth session' (Decision 1/CMP.7) available at http://unfccc.int/resource/docs/2011/cmp7/eng/10a01.pdf#page=2 [last accessed 22 September 2012] Article 1.

[108] Ibid, Article 6.

[109] UNFCCC 'Amendment to the Kyoto Protocol pursuant to its Article 3, paragraph 9 (the Doha Amendment)' (Decision 1/CMP. 8) available at http://unfccc.int/resource/docs/2012/cmp8/eng/13a01.pdf#page=2.

[110] Ibid, Annex I.

[111] These range from about 5 per cent to 24 per cent below 1990 levels by 2020. See UNFCCC 'The Doha Amendment' (n109) Annex I.

[112] Of between 25 and 40 per cent lower than 1990 levels by 2020. Gupta et al 'Policies, Instruments and Co-operative Agreements' (AR4) (n30) Box 13.7 at 776.

[113] United Nations Framework Convention on Climate Change 'Agreed outcome pursuant to the Bali Action Plan' (Decision 1/CP.18) available at http://unfccc.int/resource/docs/2012/cop18/eng/08a01.pdf#page=3 [accessed 2 February 2013] Article

not required to reduce their emissions, but were invited to adopt NAMAs.[114] The Parties also agreed that 'a protocol, another legal agreement or an agreed outcome with legal force under the Convention' will be adopted at the 21st COP under the UNFCCC to be held in 2015[115] and will come into force in 2020.

f) Discussion

International cooperation on climate change has not been easy to achieve, perhaps due to its 'intimate connection with economic growth'.[116] In particular, pressure on (certain) developing countries to take on more responsibility is increasing,[117] and much tension has arisen between developed and developing countries including China and India, which are growing rapidly and are becoming prominent players in the climate change arena, as reflected in Figure 2.2.

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7. The Parties also noted '*with grave concern* the significant gap between the aggregate effect of Parties' mitigation pledges in terms of global annual emissions of greenhouse gases by 2020 and aggregate emission pathways consistent with having a likely chance of holding the increase in global average temperature below 2 °C or 1.5 °C above pre-industrial levels'. United Nations Framework Convention on Climate Change 'Advancing the Durban Platform' (Decision 2/CP.18) available at http://unfccc.int/resource/docs/2012/cop18/eng/08a01.pdf#page=19 [accessed 2 February 2013] Preamble.

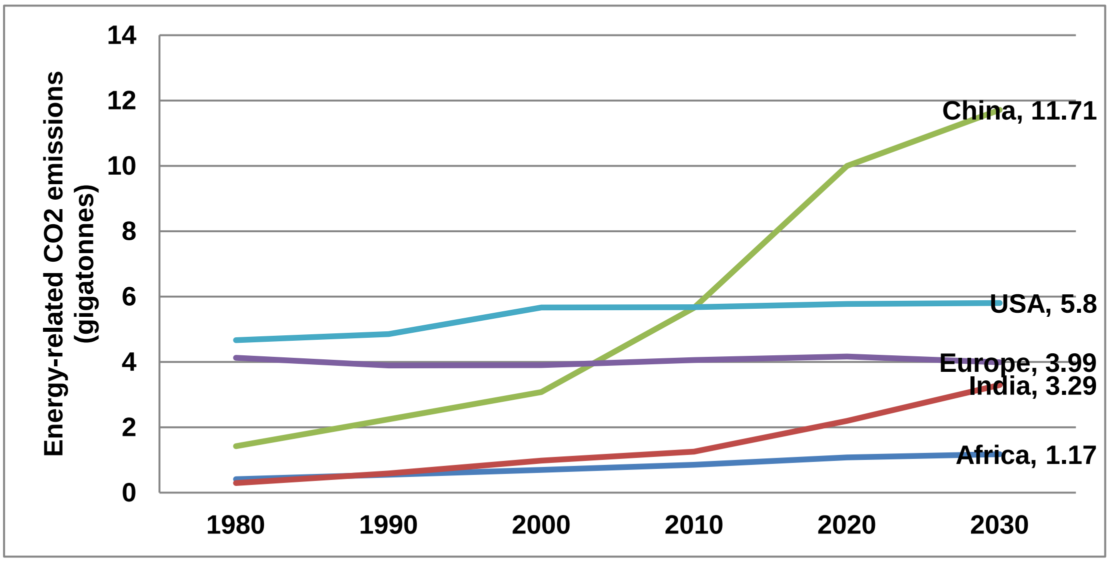
[114] UNFCCC 'Agreed outcome pursuant to the Bali Action Plan' (n113) Article 16.

[115] UNFCCC 'Advancing the Durban Platform' (n113) Article 4.

[116] Birnie, Boyle and Redgwell *International Law and the Environment* (n17) 335.

[117] Ibid, 374 and 376 and J Depledge 'Crafting the Copenhagen Consensus' 2008 (17:2) *Review of Economic Community and International and Environmental Law* 154-165, 157-158.

Figure 2.2 Current and projected energy-related carbon dioxide emissions until 2030[118]



The result has been that developed countries have been unwilling to take on more stringent emission reduction targets unless large developing countries such as China, India and Brazil also take on more responsibility.[119] Thus, the United States of America has refused to commit to reducing its emissions at all and several developed countries, namely Canada, Japan and the Russian Federation, have withdrawn from a second commitment period under the Kyoto Protocol.

However, developing countries have thus far resisted binding emission reduction targets on the basis that they should not be required to reduce their development-related emissions, due to the historical responsibility of developed countries and due to the right of developing countries to develop so as to meet their social and development needs.

g) South Africa's position in the climate change negotiations

In the international climate change negotiations, South Africa has aligned itself with the African Group as well as the Group of 77 and China (the G77 and China), made up of developing countries. The African Group is concerned primarily with

[118] Statistics obtained from the 'Reference Scenario' in International Energy Agency *World Energy Outlook 2008* available at http://www.worldenergyoutlook.org/media/weowebsite/2008-1994/WEO2008.pdf [accessed 11 March 2011] Table 16.2.
[119] See for example Birnie, Boyle and Redgwell *International Law and the Environment* (n17) 374.

adaptation. On the other hand, South Africa is also concerned with mitigation issues and therefore its interests are not fully aligned with those of the African Group.[120]

At the 15th COP (and 5th CMP) in Copenhagen in 2009 South Africa aligned itself with Brazil, India and China, forming the BASIC group.[121] The BASIC countries, all large developing countries, have comparatively high levels of GHG emissions. The BASIC group, together with President Obama of the United States of America, played a key role in the drafting of the Copenhagen Accord, which as noted above was not formally adopted by the COP. It was reported that criticism was levelled at South Africa following the COP 15 due to concern that South Africa's agenda would diverge from the agenda of the rest of the G77 and China.[122] The BASIC group continues to play an important role in the climate change negotiations since Copenhagen and it holds regular meetings and has issued joint statements at subsequent COP and CMP meetings.

South Africa has called for stronger action to be taken by developed country Parties and has argued that they must achieve the upper range of emission reductions indicated by the IPCC in its AR4, namely emission reductions of at least 40 per cent below 1990 levels by 2020 and at least 80 to 95 per cent below 1990 levels by 2050. South Africa argues that '[a]t less ambitious stabilisation levels, the additional impacts are unacceptable to Africa'.[123] South Africa has also noted that while attention has been focused on the mitigation actions that should be taken by developing countries, there has been 'slow progress on mitigation commitments by developed countries'.[124]

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[120] See L du Toit and A Gilder 'Country Profile: South Africa' 2010 (4) *Carbon and Climate Law Review* 386-391, 391.
[121] Ibid, 390-391.
[122] Stockholm Environment Institute *Together Alone? Brazil, South Africa, India, China (BASIC) and the Climate Change Conundrum* (Policy Brief) available at http://www.sei-international.org/mediamanager/documents/Publications/SEI-PolicyBrief-Olsson-BASIC-ClimateChangeConundrum.pdf [accessed 24 May 2014].
[123] UNFCCC 'Paper No. 36: South Africa' *Ideas and proposals of the elements contained in paragraph 1 of the Bali Action Plan* (Ad Hoc Working Group on Long-Term Cooperative Action under the Convention, Sixth session, Bonn, 1-12 June 2009) available at http://unfccc.int/resource/docs/2009/awglca6/eng/misc04p02.pdf [accessed 24 May 2014] 96.
[124] UNFCCC 'Paper No. 4: South Africa' *Views on an indicative roadmap* (Ad Hoc Working Group on Long-Term Cooperative Action under the Convention, Tenth session, Bonn, 1-11 June 2010) available at http://unfccc.int/resource/docs/2010/awglca10/eng/misc03.pdf [accessed 24 May 2014] 9.

2.3 The South African context

2.3.1 Vulnerabilities and impacts

Developing countries, particularly African countries, are likely to bear the brunt of climate change due to their increased vulnerability, which will exacerbate the impacts of climate change.[125] South Africa is no exception and vulnerabilities currently experienced by South Africa include a high incidence of diseases such as tuberculosis and HIV/AIDS, water scarcity,[126] lack of access to services such as clean water and sanitation,[127] a high incidence of informal settlements in vulnerable locations[128] and poor storm water drainage systems in urban settlements.[129]

Climate change impacts that have been observed in South Africa include increased surface air temperatures,[130] an increase in the temperatures of the seas surrounding South Africa,[131] sea level rise of approximately 2 millimetres per year,[132] changes in rainfall patterns,[133] impacts on crop production,[134] an increase in the intensity and frequency of storms in South Africa,[135] shifts in wind patterns[136] and an increase in the frequency of fire in the Fynbos biome.[137]

Impacts projected for the future include further warming of between 1 and 3 degrees Celsius by 2050 and warming of between 3 and 7 degrees Celsius thereafter.[138] It has been noted that '[w]ith such temperature increases, life as we

[125] Dugard, St. Clair and S Gloppen 'Introduction' (n11) 1.
[126] Department of Environmental Affairs *National Climate Change Response White Paper* GN 757 in *Government Gazette* No.34695 dated 19 October 2011, 18.
[127] Department of Environmental Affairs *National Climate Change Response Green Paper 2010* GN 1083 in *Government Gazette* No 33801 dated 25 November 2010, 29.
[128] Ibid, 27.
[129] National Climate Change Response White Paper (n126), 24.
[130] Department of Environmental Affairs *South Africa's Second National Communication under the United Nations Framework Convention on Climate Change* 2011 available at http://unfccc.int/resource/docs/natc/zafnc02.pdf [accessed 24 November 2011] x.
[131] Ibid, 131-132.
[132] Ibid, 132.
[133] Ibid, x.
[134] Ibid, 95.
[135] Ibid, 132.
[136] Ibid.
[137] Ibid, 116.
[138] Ibid, x.

know it will change completely',[139] and changes projected include decreased water availability, extreme weather events, floods and droughts, impacts on the coast and coastal infrastructure due to sea-level rise, and '[m]ass extinctions of endemic plant and animal species'.[140] Water will play a primary role in the future as water is 'arguably the primary medium through which climate change impacts will be felt by people, the economy, and natural ecosystems'.[141]

However, the adverse impacts of climate change will not affect everyone equally and poor people in South Africa will be hardest hit. South Africa's Second National Communication under the UNFCCC notes that at least one third of the South African population is highly vulnerable to the adverse impacts of climate change due to 'low levels of endogenous resilience, adaptation, and coping skills'.[142]

2.3.2 South Africa's contribution to climate change

While South Africa is very vulnerable to climate change and its adverse impacts, South Africa is also a comparatively significant contributor to climate change, due to the high levels of GHGs emitted by 'its energy-intensive, fossil-fuel powered economy'.[143] South Africa is ranked in the top 20 carbon emitters in the world[144] and it has been argued that South Africa 'straddles the "carbon divide" between industrial and developing economies'.[145]

South Africa has a very high level of per capita emissions (emissions per person) compared to other developing countries. For example, South Africa has a level of 7.27 tonnes of carbon dioxide per capita (t CO_2/capita), compared to 1.41 t CO_2/capita in India, 5.92 t CO_2/capita in China and 0.28 t CO_2/capita in Kenya.[146]

[139] National Climate Change Response White Paper (n126) 12.
[140] Ibid, 12.
[141] South Africa's Second National Communication (n130) xii.
[142] Ibid, xi.
[143] National Climate Change Response White Paper (n126) 11.
[144] This is based on an analysis of the latest energy indicators of the International Energy Agency (IEA). See International Energy Agency *Key World Energy Statistics 2013* 2013 available at http://www.iea.org/publications/freepublications/publication/KeyWorld2013_FINAL_WEB.pdf [accessed 2 October 2013].
[145] J Johannessen 'Climate change, poverty and climate justice in South African media: The case of COP17' in J Dugard, AL St. Clair and S Gloppen (eds) *Climate Talk: Rights, Poverty and Justice* 2013, 98.
[146] IEA *Key World Energy Statistics 2013* (n144) 53 and 57.

This is comparable to the per capita emissions of some developed countries such as New Zealand with 6.87 t CO_2/capita, Norway with 7.69 t CO_2/capita and the United Kingdom with 7.06 t CO_2/capita.[147]

Carbon dioxide is South Africa's most prevalent greenhouse gas and accounted for 79 per cent of all greenhouse gas emissions in the country in 2000.[148] This is because South Africa generates most of its energy from coal, which releases carbon dioxide when combusted.[149] Indeed, coal accounts for close to 70 per cent of South Africa's total primary energy supply and more than 90 per cent of electricity generation.[150]

The energy sector is the largest generator of GHG emissions and accounts for 79 per cent of South Africa's total GHG emissions.[151] Significantly Eskom is by far the largest emitter of carbon emissions in South Africa[152] and is reported to be the second highest carbon dioxide producing company in the world.[153] There is thus a strong link between energy generation and the country's carbon emissions. This represents an opportunity to use alternative energy sources, including renewable energy, to reduce carbon emissions. These issues are considered more fully in Chapter 3.

Apart from producing GHG emissions, generating electricity from coal results in air pollution in the area of the power station, as well as respiratory disease around the area of opencast coal mines due to dust.[154] Coal-fired power stations also

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147 Ibid, 55 and 57.

148 South Africa's Second National Communication (n130) 31.

149 Each kilogram of coal burnt produces 1.54 kilograms of carbon dioxide. See DME, Eskom and Energy Research Institute *Energy Outlook for South Africa* (n20) 61.

150 See International Energy Agency *Share of total primary energy supply in 2009* available at http://www.iea.org/stats/pdf_graphs/ZATPESPI.pdf [accessed 23 July 2012] and Eskom *Integrated Report 2011* available at http://financialresults.co.za/2011/eskom_ar2011/downloads/eskom-ar2011.pdf [accessed 15 January 2013] 13.

151 South Africa's Second National Communication (n130) 181.

152 See Incite Sustainability *CDP South Africa JSE 100 Report 2011: Partnering for a low carbon future* available at https://www.cdproject.net/CDPResults/CDP-2011-South-Africa-JSE-100-Report.pdf [accessed 20 November 2012] 25.

153 AB Rumsey and ND King 'Climate Change: Impacts, Adaptation, and Mitigation; Threats and Opportunities' in HA Strydom and ND King (eds) 2009 *Fuggle & Rabie's Environmental Management in South Africa* (2ed) 1064.

154 DME, Eskom and Energy Research Institute *Energy Outlook for South Africa* (n20) 38. See also R Spalding-Fecher and DK Matibe 'Electricity and Externalities in South Africa' 2003 (31) *Energy Policy* 721-734, 724 and D Sparks 'Energy and the Environment' in H Winkler (ed) *Energy Policies for Sustainable Development in South Africa: Options for the Future* 2006 (Energy Research Centre, University of Cape Town) 92.

release sulphur emissions which may cause acidic deposition, which may have several negative impacts including affecting human health, corroding materials, reducing crop yields and causing 'eutrophication in fresh water bodies'.[155] In this regard, it is significant that the Highveld Priority Area, which was declared under the National Environmental Management: Air Quality Act in 2007,[156] occupies roughly the same geographical area as the area where most of Eskom's coal-fired power plants are located.[157]

Furthermore, coal and biomass are used in many low-income households as an energy source. This has severe impacts on human health and respiratory disease is the 'second highest cause of infant mortality' in South Africa.[158]

Mining may also have significant impacts on South Africa's already scarce water resources. For example, Gauteng's water supply currently faces severe threats from acid mine drainage (AMD) and the Minister of Water Affairs has declared the implementation of immediate and short-term interventions in the Witwatersrand Goldfields as an emergency government waterworks in terms of the National Water Act.[159]

There is thus a clear need to move to a cleaner energy supply, including through the generation of energy from renewable sources. Aside from environmental and health reasons, there are also policy reasons. For example, failing to move away from coal-generated energy may result in the situation that, when a carbon price emerges from international climate change negotiations and developed countries accordingly move away from carbon-intensive products, South Africa 'will end up with stranded assets in the form of dirty coal-burning generators'.[160]

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[155] Spalding-Fecher and Matibe 'Electricity and externalities in South Africa' (n154) 726.
[156] Act 39 of 2004. Department of Environmental Affairs and Tourism *National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004): Declaration of the Highveld as a Priority Area in terms of Section 18(1) of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)* GN 1123 in *Government Gazette* No. 30518 dated 23 November 2007.
[157] See DEAT *Declaration of the Highveld as a Priority Area* (n156) and Eskom *Integrated Report 2011* (n150) 5.
[158] Winkler *Energy Policies for Sustainable Development in South Africa* (n3) 34.
[159] In terms of GN 830 in *Government Gazette* no 35786 dated 12 October 2012. This was done in terms of section 110(2)(a) of the National Water Act 36 of 1998.
[160] S Devarajan, DS Go, S Robinson, and K Thierfelder *Tax Policy to Reduce Carbon Emissions in South Africa* 2009 (Policy Research Working Paper 4933) (Washington, D.C.: The World Bank) 2.

Government has recognised the importance of actions in the energy sector to mitigate carbon emissions and in the short-term has identified increased investment in renewable energy as one of the most promising mitigation options.[161] The promotion of renewable energy, *inter alia* as a response to climate change, is considered more fully in Chapter 3.

Government's policy responses to climate change are first briefly outlined.

2.3.3 Policy responses to climate change

The Department of Environmental Affairs is the lead government department with regard to climate change and the Department of Energy is the lead government department with regard to energy policy. Government has acknowledged the severity of climate change and has ratified both the UNFCCC and the Kyoto Protocol.

While acknowledging that mitigating GHG emissions in South Africa will be costly and that this could significantly impact on trade and South Africa's economy,[162] government has also recognised that

> 'there will be significant short and long-term social and economic benefits, including improved international competitiveness that will result from a transition to a low-carbon economy. Furthermore … these costs will be far less than the costs of delay and inaction'.[163]

Taking action by reducing GHG emissions is also consistent with South Africa's obligation as a 'responsible global citizen'.[164] Government also considers that failing to respond to climate change would undermine the progress made in meeting South Africa's development goals as well as the Millennium Development Goals.[165] Importantly, government has explicitly accepted the findings of the IPCC and

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[161] National Climate Change Response White Paper (n126) 29.

[162] Department of Minerals and Energy *White Paper on the Renewable Energy Policy of the Republic of South Africa* GN 513 in *Government Gazette* No. 26169 dated 14 May 2004, 20.

[163] National Climate Change Response Green Paper (n127) 6. Also see JN Blignaut and NA King 'The Externality Cost of Coal Combustion in South Africa' (paper presented at the first annual conference of the Forum for Economics and Environment) 2002, Cape Town available at http://www.elaw.org/system/files/Economic%20costs%20of%20coal%20combustion%20in%20RSA.pdf [accessed 6 June 2011] 7.

[164] National Climate Change Response Green Paper (n127) 6.

[165] Ibid, 6.

supports the view that global temperature increases must not exceed two degrees Celsius.[166]

Government has accordingly published various policy documents on climate change including the Initial National Communication under the UNFCCC[167] (2000), the National Climate Change Response Strategy[168] (2004), the Long Term Mitigation Scenarios document[169] (2007), the National Climate Change Response White Paper[170] (2011) and the Second National Communication under the UNFCCC[171] (2011). These are all discussed in Chapter 6.

Furthermore, at the 15th COP under the UNFCCC in Copenhagen in 2009, President Zuma committed to reducing emissions in South Africa by 34 per cent below 'business as usual' levels by 2020 and by 42 per cent below 'business as usual' levels by 2025, subject to the receipt of support from developed countries.[172] These targets will require considerable changes to energy supply and demand over the next 20 years.[173]

As noted above, there is a strong link between energy generation and carbon emissions in South Africa. In this regard, a number of policy documents regarding energy have been published by Government, including the White Paper on the Energy Policy of the Republic of South Africa[174] (1998), the White Paper on the Renewable Energy Policy of the Republic of South Africa[175] (2004) and the

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166 National Climate Change Response White Paper (n126) 12.

167 *Initial National Communication under the United Nations Framework Convention on Climate Change* 2000 available at http://unfccc.int/resource/docs/natc/zafnc01.pdf [accessed 16 May 2008].

168 Department of Environmental Affairs and Tourism *A National Climate Change Response Strategy for South Africa* 2004 available at http://unfccc.int/files/meetings/seminar/application/pdf/sem_sup3_south_africa.pdf [accessed 10 April 2008].

169 Scenario Building Team *Long Term Mitigation Scenarios: Strategic Options for South Africa* (Technical Summary, Department of Environmental Affairs and Tourism) 2007.

170 National Climate Change Response White Paper (n126).

171 South Africa's Second National Communication (n130).

172 This commitment has subsequently been confirmed by Government. See National Climate Change Response White Paper (n126) 28.

173 M Goldblatt 'Comparison of Emissions Trading and Carbon Taxation in South Africa' 2010 (10) *Climate Policy* 511-526, 512.

174 Department of Minerals and Energy *White Paper on the Energy Policy of the Republic of South Africa* in GN 3007 in *Government Gazette* No. 19606 dated 17 December 1998. This is discussed in 6.4.1.

175 Renewable Energy White Paper (n162). This is discussed in 6.4.3.

Integrated Resource Plan for Electricity 2010-2030[176] (2011), which sees an increased role for renewable energy in the future. These are also discussed in Chapter 6.

2.4 Concluding remarks

This chapter has considered the scientific basis of climate change, as well as the physical impacts that have already occurred due to climate change at the international level and those that are projected for the future. This chapter has also dealt briefly with the economics of climate change and has highlighted the urgent need to mitigate GHG emissions. The international community has responded *inter alia* through the approval of the UNFCCC and the Kyoto Protocol.

At the domestic level, climate change poses considerable risks to South Africa due to South Africa's status as a developing country and its specific vulnerabilities. While South Africa is not currently obliged to reduce its emissions in terms of the UNFCCC and Kyoto Protocol, government has recognised the threats posed by climate change and has undertaken to reduce GHG emissions, subject to the receipt of support from developed countries.[177]

Due to the close link between climate change and energy generation, Chapter 3 deals with energy in more detail and, in particular, considers the benefits of promoting renewable energy as well as the barriers faced by renewable energy.

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[176] Department of Energy *Electricity Regulation Act No. 4 of 2006: Electricity Regulations on the Integrated Resource Plan 2010-2030* GNR. 400 in *Government Gazette* No. 34263 dated 6 May 2011. This is discussed in 6.4.6.
[177] National Climate Change Response White Paper (n126) 28.

Chapter 3

Energy and renewable energy

3.1 Introduction

Energy plays a crucial role in human life and development. Indeed,

> '[t]he accomplishments of civilisation have largely been achieved through the increasingly efficient and extensive harnessing of various forms of energy to extend human capabilities and ingenuity. Energy is similarly indispensable for continued human development and economic growth. Providing adequate, affordable energy is essential for eradicating poverty, improving human welfare, and raising living standards world-wide'.[1]

Renewable energy is recognised as having the potential to be 'a major contributor in protecting our climate, nature, and the environment as well as providing a wide range of environmental, economic and social benefits that will contribute towards long term global sustainability'.[2]

This chapter first considers the international energy context and sets out the global energy and electricity profiles. It goes on to deal with renewable energy and *inter alia* sets out sources of renewable energy, the benefits of renewable energy as well as the barriers to renewable energy. It then considers the national context and discusses the history of South Africa's energy sector, South Africa's energy supply, as well as the barriers to renewable energy and the potential for renewable energy in South Africa. The chapter also highlights some considerations regarding the creation of an enabling environment for renewable energy in South Africa.

It should be noted that the term *renewable energy* is used to refer to all energy generated from renewable energy sources, including energy generated from wood or

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[1] HH Rogner and A Popescu 'An Introduction to Energy' in United Nations Development Programme, United Nations Department of Economic and Social Affairs and World Energy Council *World Energy Assessment: Energy and the Challenge of Sustainability* 2000, 31.

[2] National Energy Regulator of South Africa (NERSA) *South Africa Renewable Energy Feed-in Tariff (REFIT): Regulatory Guidelines* in GN 382 of 2009 in *Government Gazette* 32122 dated 17 April 2009, 11.

other biomass in households for cooking and warmth. *Electricity generated from renewable energy sources* (or RES-E) is used to refer specifically to energy that has been generated from renewable energy sources and that has actually been converted into electricity and fed into a country's national electricity grid. The term *renewable energy* therefore encompasses RES-E. While this research is concerned more narrowly with RES-E, since RES-E is encompassed by the overarching category of renewable energy, renewable energy is also discussed generally to some extent.

3.2 The international context

3.2.1 Energy

While access to energy is not by itself sufficient for development, lack of access to energy can severely hamper development.[3] Indeed, it has been argued that '[n]o country has been able to raise per capita incomes from low levels without increasing its use of commercial energy'.[4]

In 2011 the world's energy supply was made up of 31.5 per cent of oil, 28.8 per cent of coal or peat, 21.3 per cent of gas, 5.1 per cent of nuclear energy, 10 per cent of biomass (biofuels and waste) and 2.3 per cent of hydropower,[5] which is represented in Figure 3.1. Most of the biomass contribution is traditional biomass that is used for cooking and heating in developing countries.[6]

[3] AKN Reddy 'Energy and Social Issues' in United Nations Development Programme, United Nations Department of Economic and Social Affairs and World Energy Council *World Energy Assessment: Energy and the Challenge of Sustainability* 2000, 44-45.
[4] D Anderson 'Energy and Economic Prosperity' in World Energy Assessment Overview' in United Nations Development Programme, United Nations Department of Economic and Social Affairs and World Energy Council *World Energy Assessment: Energy and the Challenge of Sustainability* 2000, 395.
[5] International Energy Agency *Key World Energy Statistics 2013* 2013 available at http://www.iea.org/publications/freepublications/publication/KeyWorld2013_FINAL_WEB.pdf [accessed 2 October 2013] 6.
[6] Intergovernmental Panel on Climate Change 'Summary for Policymakers' in O Edenhofer, R Pichs-Madruga, Y Sokona, K Seyboth, P Matschoss, S Kadner, T Zwickel, P Eickemeier, G Hansen, S Schlömer, C von Stechow (eds) *Special Report on Renewable Energy Sources and Climate Change Mitigation* 2011, 5.

Figure 3.1 Shares of energy sources in total global primary energy supply[7]

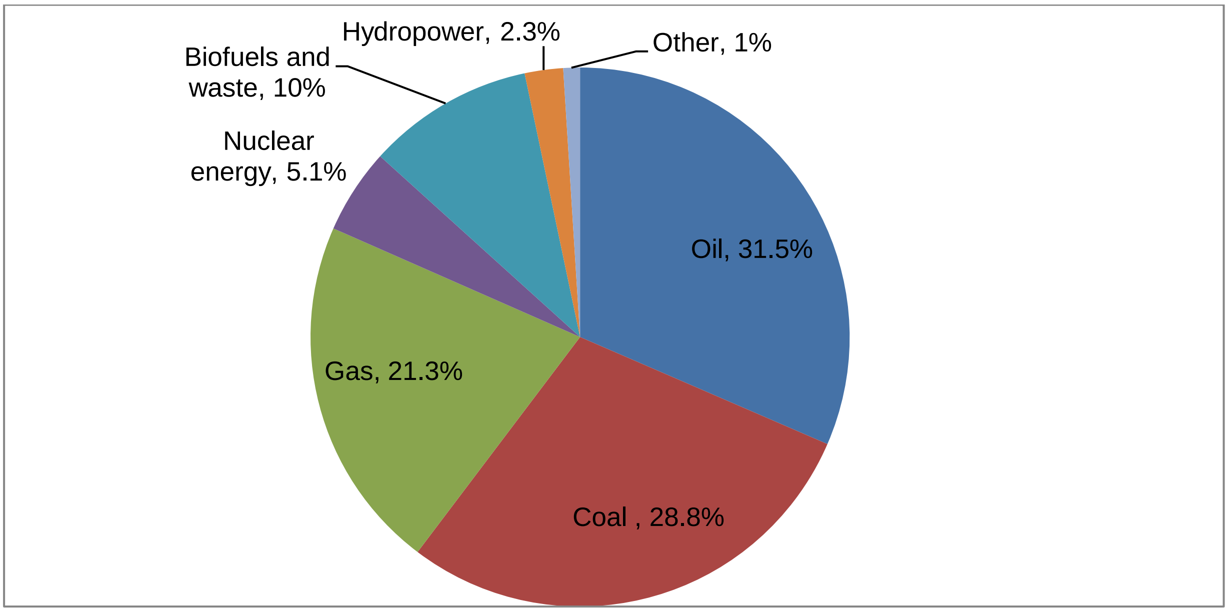

Figure 3.1 shows that the majority of the world's energy is generated from fossil fuels. As discussed in Chapter 2, energy generated through the combustion of fossil fuels is associated with a number of adverse environmental impacts including the emission of carbon dioxide, lead, sulphur and particulate matter into the atmosphere.[8] Furthermore, the indoor combustion of fossil fuels for energy is associated with increased sickness, including acute respiratory infection, chronic respiratory disease, tuberculosis, lung cancer, cardiovascular disease and adverse pregnancy outcomes.[9]

It is widely acknowledged that in improving energy access 'electrification is key',[10] and it has been argued that increased access to electricity and modern fuels can contribute to an enhanced quality of life.[11] Access to convenient and affordable

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[7] Data obtained from IEA *Key World Energy Statistics 2013* (n5) 6.
[8] 'World Energy Assessment Overview' in United Nations Development Programme, United Nations Department of Economic and Social Affairs and World Energy Council *World Energy Assessment: Energy and the Challenge of Sustainability* 2000, Table 3 at 10.
[9] JP Holdren and KR Smith 'Energy, the Environment, and Health' in United Nations Development Programme, United Nations Department of Economic and Social Affairs and World Energy Council *World Energy Assessment: Energy and the Challenge of Sustainability* 2000, 69.
[10] Y Deng, S Cornelissen and S Klaus 'The Ecofys Energy Scenario' in S Singer (editor in chief) *The Energy Report: 100% Renewable Energy by 2050* (WWF International, Ecofys and OMA) available at assets.panda.org/downloads/the_energy_report_lowres_111110.pdf [accessed 9 March 2011] 92.
[11] 'World Energy Assessment Overview' (n8) 7. See also J Nganga, M Wohlert, M Woods, C Becker-Birck, S Jackson and W Rickerson (study for the Heinrich Böll Stiftung and the World Future Council)

energy (such as electricity as opposed to firewood) can also 'contribute to a household's productivity and income-generating potential, [and therefore] its availability can become a lever for breaking out of a cycle of poverty'.[12]

In 2011, the global electricity supply was made up of 41.3 per cent of coal or peat, 21.9 per cent of natural gas, 15.8 per cent of hydro, 11.7 per cent of nuclear, 4.8 per cent of oil, with other sources including geothermal, solar, wind, biofuels and waste together contributing 4.5 per cent.[13] This is represented in Figure 3.2.

Figure 3.2 Shares of energy sources in total global electricity supply[14]

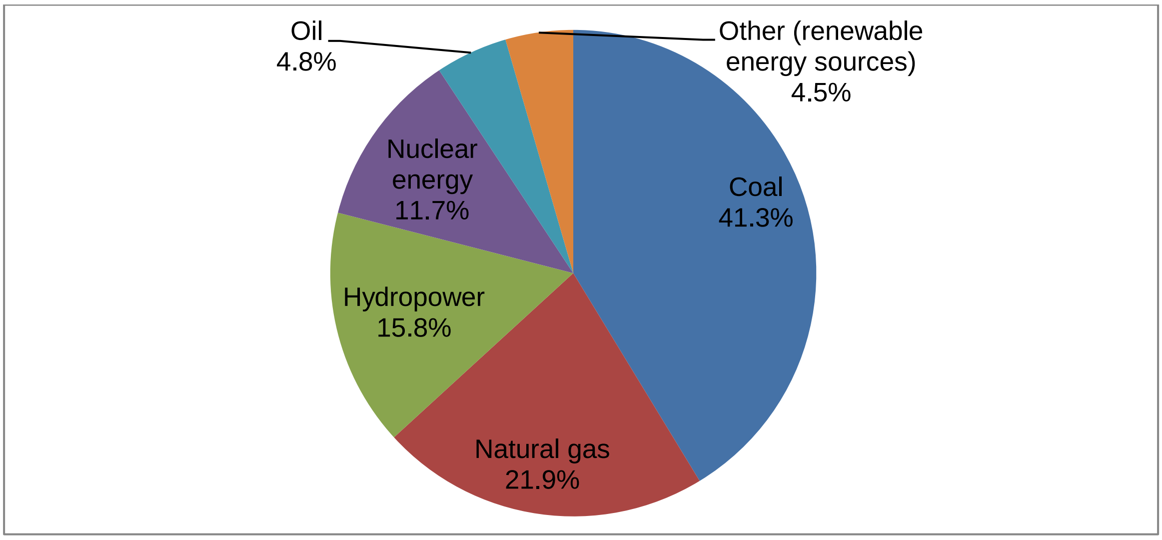

Figure 3.2 shows that fossil fuels also dominate the global electricity supply. It is also clear that while the traditional use of biomass is a relatively significant source of *energy* globally, the conversion of renewable energy sources into *electricity* (i.e. RES-E) remains very low.

Powering Africa through Feed-in Tariffs: Advancing Renewable Energy to Meet the Continent's Electricity Needs 2013 available at http://www.worldfuturecouncil.org/fileadmin/user_upload/PDF/Feed_in_Tariff/Powering_Africa_through_Feed-in_Tariffs.pdf [accessed 26 March 2013] 8. It should be noted that the International Energy Agency defines 'modern energy access' as 'a household having reliable and affordable access to clean cooking facilities, a first connection to electricity and then an increasing level of electricity consumption over time to reach the regional average'. International Energy Agency *World Energy Outlook* 2011 available at http://www.iea.org/publications/freepublications/publication/name,4007,en.html [accessed 29 May 2013] Box 13.1 at 473.

[12] 'World Energy Assessment Overview' (n8) 7.

[13] IEA *Key World Energy Statistics 2013* (n5) 24.

[14] Data obtained from IEA *Key World Energy Statistics 2013* (n5) 24.

It should be noted that there is a distinction between the installed energy or electricity *capacity* and *supply* of a country. The installed energy *capacity* represents the maximum amount of energy that could be generated from a specific technology and is expressed in kilowatts (kW), megawatts (MW), gigawatts (GW) or terawatts (TW). However, different energy technologies have different efficiencies and thus the actual energy that is generated or supplied from the various technologies differs from the capacity of a specific technology. Reference to a country's energy or electricity *supply* refers to the actual energy or electricity that has been generated and is expressed as kilowatt hour (kWh), megawatt hour (MWh), gigawatt hour (GWh) or terawatt hour (TWh).[15]

For example, South Africa has about 44.5 GW of installed capacity. As there are 8760 hours in a year, if South Africa's electricity facilities were capable of operating at 100 per cent capacity this would result in about 389 820 GWh, or 389.82 TWh (44.5 GW x 8760 hours) of electricity being produced per year. However, in 2010 South Africa generated only 260 TWh,[16] due to the fact that South Africa's energy facilities do not operate at 100 per cent capacity.

There is no binding convention that deals with energy or renewable energy. The Energy Charter Treaty,[17] which was signed in 1994 and entered into force in 1998, 'provides a multilateral framework for energy cooperation'.[18] With regard to renewable energy specifically, it calls upon Parties *inter alia* to 'have particular regard to Energy Efficiency, [and] to developing and using renewable energy sources',[19] in the context of promoting sustainable development and minimising adverse Environmental Impacts.[20] However, it has only been ratified by 52 countries

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15 See for example Wiki Answers *Convert GWh to MW?* available at http://wiki.answers.com/Q/Convert_GWh_to_MW [accessed 24 January 2013].

16 Department of Energy *Electricity Regulation Act No. 4 of 2006: Electricity Regulations on the Integrated Resource Plan 2010-2030* GNR. 400 in *Government Gazette* No. 34263 dated 6 May 2011, 7.

17 (1995) 34 *ILM* 360.

18 See *Energy Charter: 1994 Treaty* available at http://www.encharter.org/ [accessed 28 August 2013].

19 Energy Charter Treaty (n17) Article 19(1)(d).

20 The Energy Charter Treaty refers to 'Improving Energy Efficiency' as 'acting to maintain the same unit of output (of a good or service) without reducing the quality or performance of the output, while reducing the amount of energy required to produce that output'. Article 19(3)(c). 'Environmental Impact' is defined as 'any effect caused by a given activity on the environment, including human health and safety, flora, fauna, soil, air, water, climate, landscape and historical monuments or other physical structures or the interactions among these factors'. Article 19(3)(b). R Lyster and A

and therefore does not provide an internationally binding agreement for the regulation of energy or renewable energy. In this regard it has been argued that '[s]ince energy choices are closely associated with the sovereignty of states, they are reluctant to relinquish control in this area to international organisations'.[21] South Africa has not signed the Energy Charter Treaty.

In 2012 the United Nations Secretary-General launched the Sustainable Energy for All initiative. This initiative is concerned with ensuring universal access to modern energy services, improving energy efficiency and doubling the share of renewable energy by 2030.[22] However, this is a voluntary initiative and only about 80 governments of developing countries, including South Africa, have joined the initiative.[23]

3.2.2 Renewable energy

3.2.2.1 Sources of renewable energy

Renewable energy refers to energy that is derived from renewable, non-depletable energy sources and includes biomass energy, wind energy, solar energy, hydropower, marine energy and geothermal energy,[24] all of which are described below.

Bradbrook *Energy Law and the Environment* 2006 note that adherence to this Article by country Parties 'can be regarded as purely discretionary'. At 59.

[21] R Pereira and C Jourdain 'International and EU Climate Change Law' in KE Makuch and R Pereira *Environmental and Energy Law* 2012, 203.

[22] See United Nations Secretary-General *Sustainable Energy for All: Objectives* available at http://www.sustainableenergyforall.org/objectives [accessed 29 August 2013].

[23] See United Nations Secretary-General *Sustainable Energy for All: Country Actions* available at http://www.sustainableenergyforall.org/actions-commitments/country-level-actions [last accessed 14 January 2014]. Energy generally and renewable energy specifically are dealt with in various international (non-binding) publications or declarations including *A Framework for Action on Energy* and the Johannesburg Plan of Implementation. These, and other declarations, are discussed in Lyster and Bradbrook *Energy Law and the Environment* (n20) 66-76.

[24] WC Turkenburg 'Renewable Energy Technologies' in United Nations Development Programme, United Nations Department of Economic and Social Affairs and World Energy Council *World Energy Assessment: Energy and the Challenge of Sustainability* 2000, 220. For information on renewable energy generally see G Boyle (ed) *Renewable Energy: Power for a Sustainable Future* (2ed) 2004.

a) Biomass

Biomass energy refers to energy generated from all organic matter that comes from plants, trees and crops, organic waste streams, agricultural residues as well as crops that are specifically grown to produce energy.[25] Even though combustion is involved, biomass produces lower greenhouse gas (GHG) emissions than fossil fuels.[26] Landfill gas (or methane) is also included under biomass, and is produced when the organic components of landfill waste decompose.[27]

The traditional use of biomass is the largest source of renewable energy worldwide, especially in developing countries, where firewood is relied on predominantly for cooking and heating.[28] Biomass can only be considered 'renewable' if the organic matter used, such as plant matter, is actually replanted. If biomass is not produced sustainably 'its environmental and social impacts can be devastating'.[29]

Biomass has been controversial especially with regard to energy derived from food crops, for example, producing ethanol from sugar cane (as in Brazil), because it requires a significant amount of land and may compete with food production. Biomass energy has other potentially adverse impacts, including impacts on biodiversity, increased water use and impacts on groundwater and soil quality, *inter alia* due to the use of pesticides and fertilisers.[30]

An advantage of biomass is that it is not an intermittent energy source as its output can be controlled.[31] This means that if more energy or electricity is required, more biomass could be combusted to produce more power.

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[25] Ibid, 222.
[26] S Singer (editor in chief) *The Energy Report: 100% Renewable Energy by 2050* (WWF International, Ecofys and OMA) available at assets.panda.org/downloads/the_energy_report_lowres_111110.pdf [accessed 9 March 2011] 40.
[27] D Banks and J Schäffler *The Potential Contribution of Renewable Energy in South Africa* 2006 (draft update report) (prepared for Sustainable Energy & Climate Change Project and Earthlife Africa) available at http://www.nano.co.za/PotentialContributionOfRenewableEnergyInSAFeb06.pdf [accessed 18 January 2012] viii.
[28] Turkenburg 'Renewable Energy Technologies' (n24) 222.
[29] Singer *The Energy Report* (n26) 40.
[30] Turkenburg 'Renewable Energy Technologies' (n24) 225-226.
[31] IPCC *Special Report on Renewable Energy Sources and Climate Change Mitigation* (n6) Box SPM.1 at 4.

b) Wind energy

Wind energy is generated by harnessing the energy of moving air.[32] It is the largest 'new' renewable energy source and accounts for 0.2 per cent of energy supply worldwide.[33] Wind energy is growing rapidly, including in developing countries such as China and India.[34]

The technical potential of wind energy is considerable and (in 2000) was estimated to be 20 000 to 50 000 TWh per year.[35] This is significant if one considers that total (global) electricity generation in 2011 was 22 126 TWh.[36] The costs of wind energy have decreased substantially, and in some cases are even lower than the costs of coal-generated electricity (as reflected in Table 3.2 further below).

However, there are various negative aspects associated with wind energy including noise, visual impacts and impacts on bird life.[37] Yet impacts on bird life are reported to be small if turbines are located appropriately. In addition, acoustic devices could prevent birds from flying into the rotor blades.[38] Studies have also shown that it is rare for birds to collide with wind turbines (even when migrating in large numbers).[39] Indeed, it has been reported that significantly more birds are killed by other factors such as collisions with vehicles and building structures and by household cats.[40]

It is reported that noise and visual impacts are the most problematic[41] and there has been a 'not in my backyard' (NIMBY) attitude towards wind energy. However, it has been argued that the noise emitted by wind turbines is lower than 'home noise'

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[32] Ibid, Box SPM.1 at 5.
[33] Ibid, Figure SPM.2, at 6.
[34] M Edkins, A Marquard and H Winkler 'South Africa's Renewable Energy Policy Roadmaps' 2010 (Final Report for the United Nations Environment Programme Research Programme: *Enhancing information for renewable energy technology deployment in Brazil, China and South Africa*) available at http://www.erc.uct.ac.za/Research/publications/10Edkinesetal-Renewables_roadmaps.pdf [accessed 27 March 2011] 5.
[35] Turkenburg 'Renewable Energy Technologies' (n24) 230.
[36] IEA *Key World Energy Statistics 2013* (n5) 24.
[37] Turkenburg 'Renewable Energy Technologies' (n24) 233.
[38] Ibid.
[39] D Sparks 'Energy and the Environment' in H Winkler (ed) *Energy Policies for Sustainable Development in South Africa: Options for the Future* 2006 (Energy Research Centre, University of Cape Town) 95.
[40] D Taylor 'Wind Energy' in G Boyle (ed) *Renewable Energy: Power for a Sustainable Future* (2ed) 2004, 277.
[41] Turkenburg 'Renewable Energy Technologies' (n24) 233.

or 'office noise'.[42] An alternative would be to site wind turbines offshore. Furthermore, if wind turbines are located on farmlands, most of the land can still be used for agriculture.[43]

Another problem cited with regard to wind energy is that it is an intermittent source of energy, i.e. when there is no wind it will not be possible to generate any energy and alternative (non-intermittent) sources would be required to operate in conjunction. However, it would be possible to transform the energy into 'baseload power supply if combined with energy storage'.[44] Baseload power refers to the minimum amount of energy required by collective consumers in a 24-hour period.[45] Baseload plants should be able to operate continuously and 'produce energy at a constant rate'.[46]

c) Solar energy

Two important types of solar energy are solar photovoltaic energy (or solar PV) and concentrated solar power (or CSP).

Solar PV energy is generated through the direct conversion of sunlight into electricity through the use of solar cells.[47] Large areas of land are needed in order to capture the solar energy that is sufficient to meet energy needs.[48] The manufacture of silicon PV cells is not associated with significant environmental impacts since the main material of most PV cells is silicon, which 'is not intrinsically harmful'. However, small quanitities of toxic chemicals are used to manufacture some PV components.[49]

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[42] Taylor 'Wind Energy' (n40) 271. More specifically it has been argued that a car driving 350 meters away, at a speed of 64 kilometers per hour, emits a noise level of 55 decibels, while a heavy-duty truck emits 65 dB, compared to only 35-35 dB for a wind turbine. See Sparks 'Energy and the Environment' (n39) 95.

[43] Singer*The Energy Report* (n26) 33.

[44] Turkenburg 'Renewable Energy Technologies' (n24) 235.

[45] A Gets and R Mhlanga (for Greenpeace) *Powering the Future: Renewable Energy Roll-out in South Africa* 2013 available at http://www.greenpeace.org/africa/Global/africa/publications/climate/RenewableEnergyReport_PoweringTheFuture.pdf [accessed 26 March 2013] 15.

[46] S Raubenheimer 'Our Planet's Energy Picture' in *Enviroworks* (Special Edition: Climate Change) 2011 (Vol 2/11), 9.

[47] Turkenburg 'Renewable Energy Technologies' (n24) 235-236.

[48] Ibid, 236.

[49] G Boyle 'Solar Photovoltaics' G Boyle (ed) *Renewable Energy: Power for a Sustainable Future* (2ed) 2004, 95.

No waste products or GHG emissions are produced during the actual operation of solar panels.[50]

With respect to CSP (which is also known as solar thermal energy), solar radiation is captured and concentrated by a collector or concentrator, which is delivered to a receiver, which absorbs the concentrated sunlight and transfers the heat energy to a fluid. The fluid is then transported from the receiver to a power conversion system.[51] Within CSP there is a distinction between parabolic trough systems, power towers and parabolic dish systems.[52] CSP also requires a significant amount of land area per megawatt of capacity.[53] It is also possible to store energy for later use.[54]

The potential for solar energy is enormous, and it is estimated that the total power theoretically available from solar PV alone exceeds total energy consumption by approximately 1 500 times.[55] Like wind energy, solar energy is an intermittent energy source and this is a reason for resistance to this renewable energy technology (RET). However, as noted above, there is the potential for storage with regard to CSP.

d) Hydropower

With regard to hydropower, water is stored in a reservoir behind a dam and electricity is generated by harnessing ‘the energy of water moving from higher to lower elevations’.[56] The flow of water is regulated according to electricity demand.[57] After biomass, hydropower is the largest source of renewable energy internationally and is the largest source of RES-E. Hydropower accounts for 2.3 per cent of global energy and 15.8 per cent of global electricity.[58]

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[50] Sparks ‘Energy and the Environment’ (n39) 95.
[51] Turkenburg ‘Renewable Energy Technologies’ (n24) 244.
[52] Ibid, 245-246.
[53] Ibid, 247.
[54] Ibid, 246.
[55] Ibid, 236.
[56] IPCC *Special Report on Renewable Energy Sources and Climate Change Mitigation* (n6) Box SPM.1 at 4.
[57] Singer *The Energy Report* (n26) 38.
[58] IEA *Key World Energy Statistics 2013* (n5) 6 and 24.

While there is a lot of potential for hydropower, it may have significant social and ecological impacts.[59] The establishment of reservoirs requires that large areas of land are flooded, which often results in the displacement of people. This is especially significant in rural areas where river surroundings are densely inhabited.[60] Worldwide, 40 to 80 million people have been displaced due to hydroelectric schemes.[61] The building of reservoirs also impacts on the natural river flow, which affects ecosystems and the people who rely on such water courses.[62]

However, there is a distinction between large- and small-scale hydropower; and small-scale hydropower is associated with 'fewer environmental and social impacts and [is] more readily considered as renewable'.[63] Large- and small-scale hydro have not been precisely defined. For example, in Switzerland, the upper limit of small-scale hydro is 10 MW compared to 5 MW in the United Kingdom and 30 MW in the United States of America.[64]

On the other hand, there are positive aspects associated with hydropower including that there is no release of carbon dioxide or other pollutants. There is also no risk of explosions or fires.[65] Furthermore, energy may be generated 'on demand',[66] and it is therefore not an intermittent source like wind and solar energy.

With regard to pumped water storage schemes, water is pumped up to a dam at off-peak times and is released when extra electricity is needed during peak times.[67] Pumped storage is 'at present the only practicable and economically viable way to store electrical energy in very large quantities [and] plays an increasing role in national – and even inter-national – power systems'.[68] This may provide a solution to the problem of the intermittency of certain renewable energy sources.[69]

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59 Turkenburg 'Renewable Energy Technologies' (n24) 251.
60 Ibid, 254.
61 Singer *The Energy Report* (26) 38.
62 Ibid.
63 Banks and Schäffler *The Potential Contribution of Renewable Energy in South Africa* (n27) 25.
64 J Ramage 'Hydroelectricity' in G Boyle (ed) *Renewable Energy: Power for a Sustainable Future* (2ed) 2004, 173.
65 Ibid, 177.
66 Singer*The Energy Report* (n26) 38.
67 See Department of Energy *Renewable Energy: Hydro-power* available at http://www.energy.gov.za/files/esources/renewables/r_hydro.html [accessed 27 January 2013].
68 Ramage 'Hydroelectricity' (n64) 185.
69 Ibid.

e) Geothermal energy

Geothermal energy has been used since Roman times to heat buildings and water.[70] Geothermal energy can be used directly, by harnessing the heat from below the Earth's crust[71] for space heating and cooling.[72] In addition, when temperatures are high enough geothermal energy can be used to generate electricity.[73] There is much potential for electricity generation from geothermal energy and unlike wind and solar energy, electricity generated from geothermal energy is not intermittent.[74] Geothermal energy is not yet a mature technology,[75] but capacity is increasing by about five per cent per year.[76]

f) Marine energy

Marine energy encompasses a number of RETs including tidal barrage energy, wave energy, tidal and marine current energy and ocean thermal energy conversion.[77] This technology is not yet mature. While marine energy could be a significant source of energy, it is diffuse and it is thus only economical to exploit marine energy when certain circumstances are present, such as where tidal ranges or currents are extreme.[78] There are few pollution issues associated with marine energy technologies, and the main issue relates to conflicts with other uses of the sea such as fishing, marine traffic and leisure activities.[79]

g) Nuclear energy

Nuclear energy is a controversial energy source, internationally and in South Africa, *inter alia* because issues of general safety and the safe disposal of hazardous waste have not yet been resolved. One only needs to consider the nuclear accident that

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70 Singer*The Energy Report* (n26) 34.
71 Ibid.
72 Turkenburg 'Renewable Energy Technologies' (n24) 256.
73 Singer*The Energy Report* (n26) 34.
74 Ibid.
75 Turkenburg 'Renewable Energy Technologies' (n24) 258.
76 Singer*The Energy Report* (n26) 34.
77 Turkenburg 'Renewable Energy Technologies' (n24) 258.
78 Ibid.
79 Ibid, 261.

occurred in Fukushima, Japan in early 2011. This ‘generated a worldwide impact’[80] and following on from this, various countries including Germany made the decision to decommission their nuclear power plants.[81]

While nuclear energy is a ‘cleaner’ source of energy than fossil fuel energy, emissions are emitted in mining for uranium.[82] In addition, since nuclear power relies on uranium reserves, which are limited,[83] it cannot be considered a ‘renewable’ energy source. Therefore, nuclear energy is not considered in this research.

3.2.2.2 Benefits of renewable energy

There are numerous benefits associated with renewable energy. The main benefits are discussed now.

a) A sustainable source of energy

In the first place, renewable energy has the potential to ‘meet many times the present world energy demand’.[84] While authors differ in their projections regarding how much renewable energy could contribute to future energy supply, some consider that renewable energy could fuel practically all of the world’s energy needs in the not too distant future.[85] Thus, relying on renewable energy, which is non-depletable, could provide the world with a sustainable source of energy, thus contributing to sustainability. It has been argued that ‘[e]nergy sustainability should

[80] L Mez and A Brunnengräber ‘On the Way to the Future – Renewable Energies’ in E Altrater and A Brunnengräber (eds) *After Cancun: Climate Governance or Climate Conflicts* 2011, 177.
[81] See for example J Baetz ‘Germany to go nuclear-free by 2022 and rely on renewable energy’ (31 May 2011) *Cape Times.*
[82] Raubenheimer ‘Our Planet’s Energy Picture’ (n46) 8.
[83] Mez and Brunnengräber ‘On the Way to the Future – Renewable Energies’ (n80) 178.
[84] Turkenburg ‘Renewable Energy Technologies’ (n24) 220. See also IPCC *Special Report on Renewable Energy Sources and Climate Change Mitigation* (n6) 7 and MA Delucchi and MZ Jacobson ‘Providing all Global Energy with Wind, Water, and Solar Power, Part II: Reliability, system and transmission costs, and policies’ 2011 (39) *Energy Policy* 1170-1190.
[85] See Singer *The Energy Report* (n26).

be the overarching and holistic concept governing the question of our energy future'.[86]

b) Reduced climate change impact

While GHG emissions are still produced with regard to the production of the components required for the various RETs, renewable energy is associated with far lower levels of greenhouse gas emissions than energy generated from fossil fuels. Indeed, '[n]o energy production or conversion technology is without risk or waste'.[87]

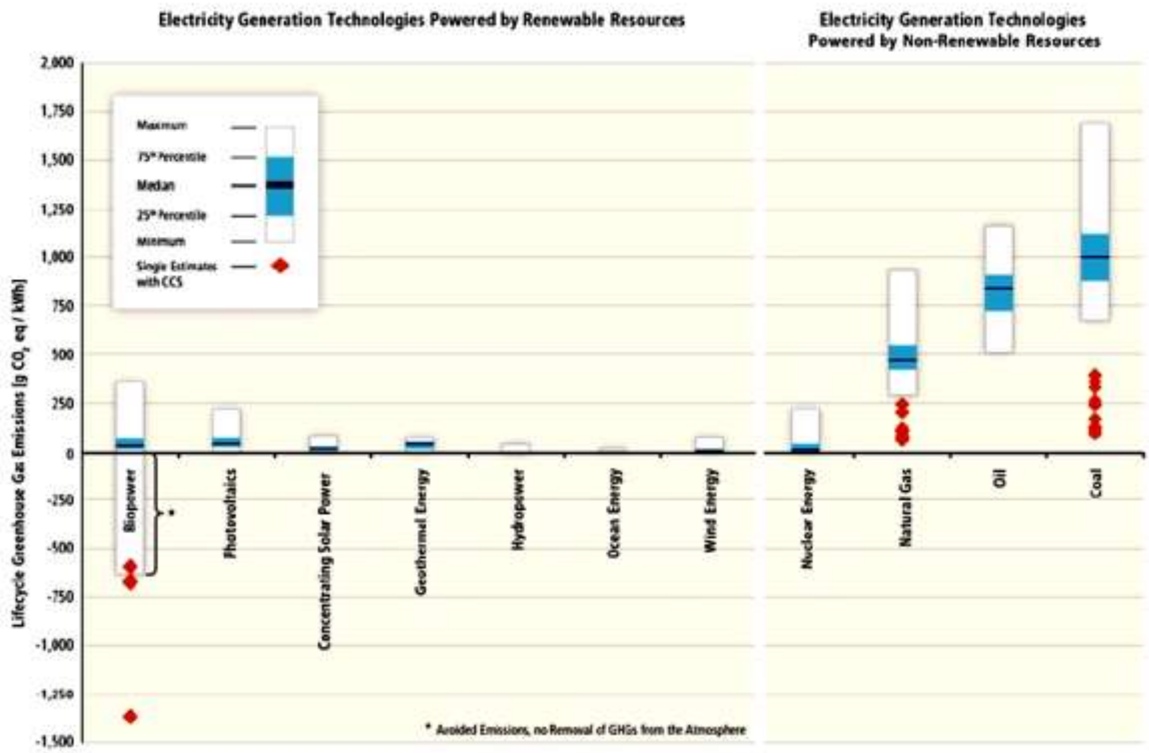
Figure 3.3 illustrates the 'median values' of carbon emissions for all renewable energy options during their lifecycles. Median values range from 4 to 46 grams of carbon dioxide equivalent per kilowatt hour (g CO_2eq/kWh) in the case of renewable energy options to 469 to 1001 g CO_2eq/kWh for fossil fuel options.[88]

[86] S Fakir and D Nicol *Investigation: Obstacles and Barriers to Renewable Energy in South Africa* 2008 (a study prepared for the National Environmental Advisory Forum, Department of Environmental Affairs and Tourism) available at http://www.environment.gov.za/Branches/COO/neaf_2005/Documents/Obstacles%20&%20barriers%20to%20renewable%20energy%20in%20SA.pdf [accessed 12 May 2011] 6. It has also been noted that renewable energy sources come much closer to the ideal of a sustainable energy source (than fossil fuels or nuclear energy). A sustainable energy source has been described as 'one that is not substantially depleted by continued use, does not entail significant pollutant emissions or other environmental problems, and does not involve the perpetuation of substantial health hazards or social injustices'. See G Alexander and G Boyle 'Introducing Renewable Energy' in G Boyle (ed) *Renewable Energy: Power for a Sustainable Future* (2ed) 2004.

[87] Rogner and Popescu 'An Introduction to Energy' (n1) 31.

[88] IPCC *Special Report on Renewable Energy Sources and Climate Change Mitigation* (n6) 16.

Figure 3.3 Lifecycle greenhouse gas emissions of various electricity generation technologies[89]



Therefore, replacing fossil fuel-generated energy with energy generated from renewable sources would assist in reducing GHG emission levels, or at the very least, the rate at which greenhouse gases are increasing. If GHG emissions are decreased by relying less on conventional energy sources and more on renewable energy sources, negative health and other social impacts associated with climate change due to the combustion of fossil fuels would also be reduced.

As discussed in Chapter 2, while developed countries are required to reduce their GHG emissions, pressure is growing internationally for certain developing countries to take on more responsibility. Another benefit of investing in renewable energy is that countries 'can ensure that they will have mature and competitive renewable energy industries in place before they are forced to transition away from fossil fuels'.[90]

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[89] Figure 3.3 obtained from IPCC *Special Report on Renewable Energy Sources and Climate Change Mitigation* (n6) 17.

[90] WE Mabee, J Mannion and T Carpenter 'Comparing the Feed-In Tariff Incentives for Renewable Electricity in Ontario and Germany' 2012 (40) *Energy Policy* 480-489, 481.

While there are other ways to reduce GHG emissions including through improving energy efficiency[91] and introducing carbon-reducing methods such as carbon capture and storage (CCS), in light of the numerous benefits of renewable energy the focus in this thesis is on renewable energy (specifically RES-E).

c) Energy security

Dependence on imported fuels means that countries are dependent on the availability of such fuels in the countries where they are produced, for example, oil from the Middle East, which may be influenced by the prevailing political situation, which also impacts on fuel prices. Increasing the role of renewable energy in a country's national energy supply would decrease the dependence on imported (volatile) fossil fuels,[92] thereby contributing to energy security. It has been argued that 'renewable energy options present perhaps the only truly long-term solution to humanity's energy supply dilemma'.[93]

d) Reduced water use

Generating electricity from renewable energy sources is far less water-intensive. Up to 3 cubic meters of water are used to generate 1 MWh of electricity from coal, while up to 6.5 cubic meters of water are used to generate 1 MWh of electricity from oil. On the other hand, no water is used to generate electricity from solar or wind energy.[94] This is significant for water-stressed South Africa.

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[91] See for example E Jochem 'Energy End-Use Efficiency' in United Nations Development Programme, United Nations Department of Economic and Social Affairs and World Energy Council *World Energy Assessment: Energy and the Challenge of Sustainability* 2000.

[92] UNEP Finance Initiative *Financing Renewable Energy in Developing Countries: Drivers and Barriers for Private Finance in Sub-Saharan Africa* (A study and survey by UNEP Finance Initiative on the views, experiences and policy needs of energy financiers) 2012 available at http://www.unepfi.org/fileadmin/documents/Financing_Renewable_Energy_in_subSaharan_Africa.pdf [accessed 18 January 2013] 18. See also H Winkler 'Renewable Energy Policy in South Africa: Policy options for renewable electricity' 2005 (33) *Energy Policy* 27-38, 28.

[93] Banks and Schäffler *The Potential Contribution of Renewable Energy in South Africa* (n27) 1.

[94] S de Villiers and M de Wit *H20-*CO_2 *– Energy Equations for South Africa: Present Status, Future Scenarios and Proposed Solutions* 2010 (AEON Report Series No. 2) 28.

e) Job creation

It is widely acknowledged that there is significant potential for job creation in the renewable energy sector,[95] which is especially important in the South African context of high levels of unemployment. In South Africa, employment per ton of coal mined has decreased by about five per cent per year from 1986 to 2006. This pattern appears worldwide and is expected to continue.[96] The White Paper on the Renewable Energy Policy of the Republic of South Africa[97] also acknowledges the higher job creation potential of renewable technologies, provided that they are manufactured locally.[98] The higher job creation potential of RETs is illustrated in Table 3.1.

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[95] Turkenburg 'Renewable Energy Technologies' (n24) 220-221.
[96] J Rutovitz (Greenpeace) *South African Energy Sector Jobs to 2030: How the Energy R(Evolution) will create sustainable green jobs* 2010 available at http://www.greenpeace.org/africa/Global/africa/publications/climate/south-african-energy-sector-jobs-to-2030.pdf [accessed 8 March 2011] 16-17.
[97] Department of Minerals and Energy *White Paper on the Renewable Energy Policy of the Republic of South Africa* GN 513 in *Government Gazette* No. 26169 dated 14 May 2004.
[98] Ibid, 57. For instance, it is projected that if an additional 62 TWh of electricity were to be added to the electricity supply, if investment was only made in coal capacity, 43 000 jobs would be created, compared to 57 000 jobs if reliance was only had on renewable energy technologies. G Prasad 'Social Issues' in H Winkler (ed) *Energy Policies for Sustainable Development in South Africa: Options for the Future* 2006 (Energy Research Centre, University of Cape Town) 71. See also N Pandor 'Opening address at the Commonwealth Parliamentary Association African Region Conference' (Nelspruit, Mpumalanga) 2010 available at http://www.info.gov.za/speech/DynamicAction?pageid=461&sid=11750&tid=13417 [accessed 15 September 2010].

Table 3.1 Estimated job creation potential of different electricity generation technologies[99]

Energy technology	Total jobs: Construction, manufacture & installation jobs (per MW) in 2009 [in 2030]	Total jobs: Operation & maintenance and fuel processing jobs (per MW)	Main Reference
Existing coal	0 [0]	0.75	DoE 2009c; Eskom, 2009a
Supercritical coal	2.5 [2.3]	0.65	Agama Energy, 2003; Eskom, 2009a
OCGT	3.4 [3.4]	0.17	Rutovitz & Atherton, 2009
Nuclear	1.8 [1.8]	0.68	Rutovitz & Atherton, 2009
Biomass	8.5 [8.5]	14	Working for Energy, 2009; Kammen, 2004
Landfill gas	3.8 [3.8]	2.3	Agama Energy, 2003
Wind	15 [10.4]	1	Agama Energy, 2003; EWEA, 2009
CSP	10 [5.5 – 6.5]	0.4	GPI & ESTELA, 2009; NREL, 2006
Solar photovoltaic	30 [9.1]	0.4	Agama Energy, 2003
SWH	21 [11]	0	

In the South African context it has been found that the implementation of solar water heaters (SWHs) creates even more job opportunities than RETs.[100] Therefore, while this research does not deal with non-grid connected SWHs, their importance should not be underestimated.

f) Lower lead times

Another advantage of renewable energy is that renewable energy plants actually take less time to build than conventional coal-fired power plants. Renewable energy plants have lead times of one to two years compared to four years for coal-fired power plants.[101] This is especially significant for South Africa, which urgently needs to increase the energy supply to meet its social and development needs.

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[99] Table 3.1 obtained from Edkins et al 'South Africa's Renewable Energy Policy Roadmaps' (n34) 15.
[100] Ibid, 24.
[101] H Winkler *Cleaner Energy Cooler Climate: Developing Sustainable Energy Solutions for South Africa* 2009, Table 5.14 at 133-134. See also Renewable Energy White Paper (n97) 40.

g) Contribution to the achievement of Millennium Development Goals

Access to energy is not included as a Millennium Development Goal (MDG) and

> '[e]nergy has been described as the "missing" Millennium Development Goal (MDG), the catalyst without which other goals on issues such as health, education and gender equality cannot be achieved'.[102]

It has been argued that providing access to modern energy services, such as renewable energy, would support the realisation of the MDGs.[103]

Many RETs are especially 'suited to off-grid applications'[104] and could assist in improving access to energy where it is difficult or expensive to connect to the national grid, which is especially relevant in South Africa.[105] As the concern here is with grid-connected electricity, off-grid applications are not considered in detail. However, their importance should not be ignored. In addition, the role that can be played by energy efficiency in reducing energy demand in the first place, while not considered further here, is also significant.[106]

Furthermore, the role that can be played by 'smart grids' in future electricity use and management may also be significant. In short, the smart grid is concerned with the usage of information technology to control electricity use and generation.[107] In contrast to the traditional electricity grid that is based on the transmission and distribution of electricity to consumers from large (centralised) power plants, this technology would facilitate the decentralised provision of electricity to the smart grid

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[102] Nganga et al *Powering Africa through Feed-in Tariffs* (n11) 8.
[103] IPCC *Special Report on Renewable Energy Sources and Climate Change Mitigation* (n6) 16. Further benefits of renewable energy are also discussed in the REFIT Regulatory Guidelines (n2) Appendix 2.
[104] Winkler 'Renewable Energy Policy in South Africa' (n92) 28.
[105] Ibid.
[106] Banks and Schäffler *The Potential Contribution of Renewable Energy in South Africa* (n27) 37. See also AG Hughes, MI Howells and AR Kenny (for the Department of Minerals and Energy) 'Energy Efficiency Baseline Study' *Capacity Building in Energy Efficiency and Renewable Energy* (Report No. 2.3.4 – 0.3 – Final Report) 2002 available at http://www.energy.gov.za/EEE/Projects/Energy%20Efficiency%20Baseline%20Study/Main%20Report.pdf [accessed 30 April 2013].
[107] In P Fox-Penner *Smart Power: Climate Change, the Smart Grid, and the Future of Electric Utilities* 2010, the term is described as meaning the combination of 'time-based prices with the technologies that can be set by users to automatically control their use and self-production, lowering their power costs and offering other benefits such as increased reliability to the system as a whole' (at 34).

by various generators of electricity, including electricity generated from renewable sources.

This concept is relatively new, with research and development still being conducted. While there is a smart grid initiative in South Africa,[108] having regard to the scope of this research and given that the implementation of such a system may require the complete overhaul and/or upgrading of the current electricity distribution system[109] and the costly introduction of advanced technologies,[110] smart grids are not considered further in this research. However, any advantages and/or disdvantages of the smart grid in relation to the traditional grid and the role that it may potentially play in the future, including with regard to the promotion of renewable energy, would need to be the subject of further research.

Despite all of the benefits associated with renewable energy (and by implication, RES-E), the deployment of RES-E remains low internationally. Barriers to renewable energy and RES-E are now considered.

3.2.2.3 Barriers to the implementation of renewable energy and RES- E

There are various barriers to the implementation of renewable energy and RES-E,[111] including that certain RETs – such as wind energy and solar energy – are intermittent and therefore the generation of energy from these sources is dependent on certain conditions being present, such as the sun shining or the wind blowing. Thus, they cannot provide baseload energy since they cannot provide continuous energy at a constant rate.[112] In addition, more capacity is required to generate the same amount of electricity than would be generated from an electricity technology

[108] See *South African Smart Grid Initiative* available at http://www.sasgi.org.za/.
[109] Fox-Penner *Smart Power* (n107) 59.
[110] Ibid, 45-48.
[111] See generally K Neuhoff 'Large-Scale Deployment of Renewables for Electricity Generation' 2005 (21) *Oxford Review of Economic Policy* 88-110; Fakir and Nicol *Investigation: Obstacles and Barriers to Renewable Energy in South Africa* (n86) and M Mendonça *Feed-In Tariffs: Accelerating the Deployment of Renewable Energy* 2007, 3-7.
[112] Raubenheimer 'Our Planet's Energy Picture' (n46) 9.

with a higher availability factor.[113] The higher availability factors of conventional energy technologies compared to renewable energy technologies are reflected in Table 3.2.

Table 3.2 Investment costs, efficiency and availability factors of various electricity supply technologies[114]

Technology	Investment cost	Efficiency	Availability factor
	R/kW	**%**	**%**
Coal			
New pulverised fuel plant	9980	35	72
Fluidised bed combustion (with flue gas desulphurisation)	9321	37	88
Nuclear			
PBMR initial modules	17136	41	82
PBMR multi modules	10761	41	82
Imported gas			
Combined cycle gas turbine	4583	50	85
Open cycle gas turbine	3206	32	85
Imported hydro			
Imported hydro			
Renewable energy			
Parabolic trough	18421	100	24
Power tower	19838	100	60
Wind turbine	6325	100	25, 30, 35
Small hydro	10938	100	30
Landfill gas (medium)	4287	n/a	89
Biomass co-generation (bagasse)	6064	34	57

[113] H Winkler, A Hughes and M Haw ‘Technology Learning for Renewable Energy: Implications for South Africa’s Long-Term Mitigation Scenarios’ 2009 (37) *Energy Policy* 4987-4996, 4993.
[114] Data obtained from Winkler *Cleaner Energy Cooler Climate* (n101) Table 5.14, 133-134.

Storage			
Pumped storage	6064	Storage	95

As noted (in 3.2.2.1) above, a potential solution is pumped storage. Various other storage techniques are under development.[115] In addition, it should be possible (at least in the short-term) to combine RES-E with other non-intermittent energy sources such as biomass. However, this does remain a barrier that has not yet been resolved.

Other barriers to RES-E include 'high perceived risk',[116] uncertainty regarding resource availability,[117] the lack of a legal framework for independent power producers (IPPs), restrictions on siting and construction,[118] and barriers related to infrastructure and the regulation of the energy sector.[119] However, the presence of these barriers would depend to some extent on a country's specific circumstances, and could arguably be resolved through national laws and policies to some degree.

A further significant barrier, which is the focus here, relates to the generally higher investment costs of RES-E in comparison to more established fossil fuel technologies,[120] as reflected in Table 3.2 above. This is a clear deterrent to investment in RES-E. Table 3.2 also shows that RETs that are less mature and consequently less developed, such as solar technologies, cost more than mature technologies, such as wind energy. However, the following factors must be borne in mind.

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[115] MB Gerrard 'Increasing Use of Renewable Energy: Legal techniques and impediments' 2011 (245:46) *New York Law Journal* 2.
[116] Turkenburg 'Renewable Energy Technologies' (n24) 266.
[117] Ibid.
[118] Mendonça *Feed-In Tariffs* (n111) 5-7.
[119] IPCC *Special Report on Renewable Energy Sources and Climate Change Mitigation* (n6) 23.
[120] See for example U Outka 'Environmental Law and Fossil Fuels: Barriers to renewable energy' 2012 (65) *Vanderbilt Law Review* 1679-1721, 1690; Renewable Energy White Paper (n97), 19 and 26 and A Waissbein, Y Glemarec, H Bayraktar and TS Schmidt (for the United Nations Development Programme) *Derisking Renewable Energy Investment: A Framework to Support Policymakers in Selecting Public Instruments to Promote Renewable Energy Investment in Developing Countries* 2013 available at http://www.undp.org/content/dam/undp/library/Environment%20and%20Energy/Climate%20Strategies/UNDP%20Derisking%20Renewable%20Energy%20Investment%20-%20Full%20Report%20%28April%202013%29.pdf [accessed 23 April 2013] 31. For further information on the costs of renewable energy see International Renewable Energy Association (IRENA) *Renewable Power Generation Costs in 2012: An Overview* 2013 available at http://irena.org/DocumentDownloads/Publications/Overview_Renewable%20Power%20Generation%20Costs%20in%202012.pdf [accessed 18 January 2013].

a) Externalities are excluded from total electricity prices

As discussed in Chapter 2, there are external environmental and social costs, relating *inter alia* to climate change, air pollution and water use, which are not included in the price of coal-generated electricity (and fossil fuel-generated electricity generally). Thus the true cost of coal-generated electricity is not actually reflected in electricity prices. Were these costs to be included, coal-generated electricity would have a much higher price. It has been argued that '[i]f resources are to be allocated efficiently, then consumers should pay the full social cost – including the uncompensated environmental costs – of the generation and distribution of their electricity'.[121] This is taken up further in 3.3.4.2 below and is also discussed in Chapter 4.

b) The operating costs of RES-E are lower than those of coal-generated electricity

While it is expensive to construct renewable energy plants compared to traditional fossil fuel power plants, the operating costs of renewable energy plants are generally lower. This is because fossil fuel plants incur costs with regard to extracting fuels. However, the 'fuel' with regard to a number of RETs, including solar energy, wind energy and hydropower is free.[122] For example, the construction costs of the largest solar plant in the world – the Waldpolenz (based in Germany) – are five times higher per megawatt than the imminent Medupi power plant. However, the operation and maintenance costs of Medupi will be 12 times higher than those of the Waldpolenz.[123]

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[121] The World Bank *Environmental Fiscal Reform: What Should be Done and How to Achieve It* 2005 available at http://www.unpei.org/PDF/policyinterventions-programmedev/EnvFiscalReform-whatshouldbedone.pdf [accessed 29 April 2011] 96.

[122] Banks and Schäffler *The Potential Contribution of Renewable Energy in South Africa* (n27) 91. See also Renewable Energy White Paper (n97) 44 and Waissbein et al *Derisking Renewable Energy Investment* (n120) 32-33.

[123] Edkins et al 'South Africa's Renewable Energy Policy Roadmaps' (n34) 4.

c) Coal-generated electricity will become more expensive

There are large global coal reserves remaining, with total recoverable reserves estimated at 946 billion tonnes.[124] While in theory there should be no concerns regarding energy security, it is getting more difficult to extract coal and therefore, the costs of extraction will increase.[125] This would most likely also threaten energy security.

d) Subsidies are provided to fossil fuel industries

Subsidies provided to coal industries are also a barrier to the penetration of renewable energy. It has been estimated that US$312 billion is provided per year in subsidies to fossil fuels, compared to only US$57 billion per year for renewable energy.[126] This makes energy generated from fossil fuels appear cheaper. While subsidies are often justified on the basis that they assist in providing energy access to the poor,

> 'studies have found that fossil-fuel subsidies as presently constituted tend to be regressive, disproportionately benefitting higher income groups that can afford higher levels of consumption… Without precise targeting, fossil-fuel subsidies are often an inefficient means of assisting the poor'.[127]

Of eleven countries with low levels of access to modern energy, including South Africa, China, India, Pakistan and Angola, South Africa scored the lowest with regard to the percentage of fossil fuel subsidies reaching the poorest people. Indeed, only 2

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[124] U.S. Energy Information Administration *International Energy Outlook 2013* available at www.eia.gov/forecasts/ieo/coal.cfm [accessed 21 October 2013].

[125] See Banks and Schäffler *The Potential Contribution of Renewable Energy in South Africa* (n27) 9 and 11; and I-Net Bridge 'Eskom May Run out of Domestic Coal' (21 June 2011) *Independent Online* available at http://www.iol.co.za/business/business-news/eskom-may-run-out-of-domestic-coal-1.1086146#.UNB9vnfhd2k [accessed 21 June 2011]. See also K Sharife and P Bond 'Above and Beyond South Africa's Minerals-Energy Complex' in J Daniel, P Naidoo, D Pillay and R Southall (eds) *New South African Review 2: New Paths, Old Compromises?* (Johannesburg, South Africa: Wits University Press) 2011, 290.

[126] UNEP FI *Financing Renewable Energy in Developing Countries* (n92) 28. It has furthermore been noted that 'renewable energy is competitive against unsubsidised fossil fuel technologies in many developing countries'. See Waissbein et al *Derisking Renewable Energy Investment* (n120) 26.

[127] IEA *World Energy Outlook* 2011 (n11) 518.

per cent of fossil fuel subsidies in South Africa reach the poorest 20 per cent of the population.[128]

Subsidies may also result in 'lock in situations' in which 'economic structures, production and consumption patterns adapt to low prices over time, and therefore become resistant to change'.[129] Low energy prices also increase reliance on this energy source and encourage overuse.[130]

Removing these subsidies could assist in promoting renewable energy, as coal-generated energy would become more expensive, or rather, its price would become more cost-reflective, thus making renewable energy comparatively cheaper. However, it would be important that energy prices for poor people would not be increased through the removal of subsidies.[131] Strong political will is required for subsidy reform.[132] Subsidies are considered further in Chapter 4.

e) Renewable energy (and RES-E) is becoming cheaper

The costs of renewable energy are decreasing rapidly due to the phenomenon known as 'learning effects'.[133] As experience is gained and renewable energy technologies become more mature, economies of scale are achieved and costs decrease.[134] Learning rates in the literature range from 3 to 68 per cent.[135] Thus, the price of solar PV (globally) has decreased from US$65/watt in 1976 to US$1.4/watt in 2010, while the price of onshore wind power plants in the United States of America has decreased from US$4.3/watt in 1984 to US$1.9/watt in 2009.[136]

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[128] Ibid, 519. In 2010 fossil fuel subsidies of just under US$ 50 per capita were provided in South Africa. See Figure 14.4 at 516.
[129] World Bank *Environmental Fiscal Reform* (n121) 97.
[130] Ibid, 94.
[131] Singer *The Energy Report* (n26) 75.
[132] World Bank *Environmental Fiscal Reform* (n121) 97.
[133] REFIT Regulatory Guidelines (n2) 28.
[134] See 'Executive Summary' *Stern Review: The Economics of Climate Change* 2006 available at http://news.bbc.co.uk/1/shared/bsp/hi/pdfs/30_10_06_exec_sum.pdf [last accessed 19 August 2012] xix-xx and Turkenburg 'Renewable Energy Technologies' (n24) 266.
[135] Winkler et al 'Technology Learning for Renewable Energy' (n113) Table 2 at 4989.
[136] IPCC *Special Report on Renewable Energy Sources and Climate Change Mitigation* (n6) 12.

The costs of RES-E are projected to decrease further and to become cost-competitive with fossil fuel-generated electricity in the not too distant future.[137] In certain circumstances, renewable energy is already becoming 'economically competitive'.[138] Indeed, onshore wind energy sometimes costs less than fossil fuel-generated energy.[139]

Despite the barriers to renewable energy, investment in renewable energy is increasing exponentially. Investment in renewable energy increased from US$161 billion in 2009 to US$257 billion in 2011.[140] This has been attributed to various factors including government policies, increasing energy demand, the decreasing costs of many RETs and the changing prices of fossil fuels.[141] The increase in installed capacity of certain RETs is reflected in Table 3.3.

Table 3.3 New global renewable energy capacity[142]

Renewable energy technology	**Installed capacity (GW)**	
	2009	**2012**
Hydropower	915	990
Solar PV	23	100
CSP	0.7	2.5
Wind power	159	283

137 See for example Table 2 in AD Owen 'Renewable Energy: Externality costs as market barriers' 2006 (34) *Energy Policy* 362-642, 635.

138 IPCC *Special Report on Renewable Energy Sources and Climate Change Mitigation* (n6) 9.

139 Delucchi and Jacobson 'Providing all Global Energy with Wind, Water, and Solar Power' (n84) Table 1 at 1175. This is also emerging in the South African context, and the third round of bidding under the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) generated average prices for wind energy of 66c/kWh. Department of Energy (Renewable Energy IPP Procurement Programme) *Bid Window 3: Preferred Bidders' Announcement* 2013 available at http://www.energy.gov.za/IPP/List-of-IPP-Preferred-Bidders-Window-three-04Nov2013.pdf [accessed 5 November 2013]. On the other hand, it has been reported that electricity generated from the new coal power plants, Medupi and Kusile, will cost 97c/kWh. See M Gosling 'Go-ahead for 19 new energy projects' (13 May 2013) *Cape Times*.

140 Renewable Energy Policy Network for the 21st Century (REN21) *Renewables 2012: Global Status Report* available at http://www.ren21.net/Portals/0/documents/activities/gsr/GSR2012_low%20res_FINAL.pdf [accessed 12 June 2012] 17.

141 IPCC *Special Report on Renewable Energy Sources and Climate Change Mitigation* (n6) 6.

142 Figures obtained from REN21 *Renewables 2012: Global Status Report* (n140) 17 and Renewable Energy Policy Network for the 21st Century (REN21) *Renewables 2013: Global Status Report* 2013 available at http://www.ren21.net/Portals/0/documents/Resources/GSR/2013/GSR2013_lowres.pdf [accessed 14 June 2013] 14.

A number of countries have been making significant inroads with regard to the rapid deployment of renewable energy. China leads worldwide with regard to total renewable energy capacity. Other countries with high levels of renewable energy capacity include the United States of America, Germany, Spain and India.[143]

Germany is the world leader with regard to total renewable energy on a per capita basis.[144] With regard to the renewable energy targets of the EU-27, Germany was one of only three countries (along with Denmark and Hungary) that had exceeded its target for 2010 by 2007.[145] For reasons elaborated on in Chapter 4, Germany's feed-in tariff policy is considered as a best practice example in Chapter 5.

Closer to home, RES-E has increased in sub-Saharan Africa by 72 per cent between 1998 and 2008, although most of this increase is made up by hydropower.[146] In particular, Kenya appears to be taking great strides. In 2008, 21 per cent of Kenya's electricity supply was generated by non-hydro renewable energy sources (including geothermal, biomass and wind energy), while all renewable energy sources accounted for 62 per cent of total electricity supply.[147]

While it could be argued that it is more difficult to implement RES-E in developing countries than in more developed countries like Germany and the United States, it is clear that developing countries such as China, India and Kenya are forging ahead with their renewable energy plans.

The next section considers the domestic context. It briefly sets out the history of South Africa's energy sector and then discusses South Africa's energy supply as well as electricity tariffs in South Africa. The following section discusses renewable energy and considers the barriers faced by renewable energy and the potential for

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[143] REN21 *Renewables 2012: Global Status Report* (n140) 19. See also DS Arora, S Busche, S Cowlin, T Engelmeier, H Jaritz, A Milbrandt, S Wang *Indian Renewable Energy Status Report: Background Report for DIREC 2010* (NREL/TP-6A20-48948) 2010 available at www.nrel.gov/docs/fy11osti/48948.pdf [accessed 27 July 2012].

[144] REN21 *Renewables 2012: Global Status Report* (n140) 19 and REN21 *Renewables 2013: Global Status Report* (n142) 17.

[145] IM de Alegria Mancisidor 'Promotion of Renewables and Energy Efficiency by Politics: Case Study of the European Union' in WY Chen, J Seiner, T Suzuki and M Lackner (eds) *Handbook of Climate Change Mitigation* 2012, Figure 9.3 at 306.

[146] UNEP FI *Financing Renewable Energy in Developing Countries* (n92) 9-10.

[147] Ibid, 22 and Nganga et al *Powering Africa through Feed-in Tariffs* (n11) 36.

renewable energy. The chapter concludes with some observations regarding some of the elements that are considered necessary to create an enabling environment for renewable energy in South Africa.

3.3 The South African context

3.3.1 History of South Africa's energy sector

Energy generation has played a significant role in South Africa's socioeconomic development and

> 'has lent prosperity and security to the country by providing heat and power for industry, transportation, and household use. The sector has been largely driven by economic and political forces, which have had a profound impact on energy policies'.[148]

Most of South Africa's electricity is provided by Eskom. Eskom started off in 1923 as the Electricity Supply Commission (Escom).[149] Escom was renamed Eskom in 1987[150] and was converted into a public company in 2001,[151] with the state as sole shareholder. State-owned Eskom is responsible for the generation, transmission and distribution of electricity.[152]

3.3.1.1 Pre-1994

During apartheid, and based on the policy of separate development, the government was concerned with providing

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[148] O Davidson 'Energy Policy' in H Winkler (ed) *Energy Policies for Sustainable Development in South Africa: Options for the Future* 2006 (Energy Research Centre, University of Cape Town) 5.
[149] Escom was established in terms of the Electricity Act 42 of 1922.
[150] In terms of the Eskom Act 40 of 1987.
[151] In terms of the Eskom Conversion Act 13 of 2001.
[152] B Bekker, A Eberhard, T Gaunt and A Marquard 'South Africa's Rapid Electrification Programme: Policy, institutional, planning, financing and technical innovations' 2008 (36) *Energy Policy* 3125-3137, 3127.

> 'modern energy services to the "white" population group, which formed 11% of the population, and limited or no services at all to the rest of the population. High priority was given to the needs of the industrial sector because of its role in economic and political security. In general, this meant concentrating on electricity and liquid fuels, as these were crucial to economic and political interests. Security, secrecy and control characterised most of the policies that prevailed'.[153]

In the late 1980s Eskom embarked on a programme of 'low-income electrification' and in 1987 adopted the slogan 'Electricity for All'.[154] There was overbuilding by Eskom in the 1980s, which resulted in excess capacity and a 55 per cent reserve margin by 1990.[155] Electricity prices remained cheap while no further capacity was required. This is dealt with further in 3.3.3.

In 1996 only 58 per cent of South Africa's population had access to electricity, and the statistics were skewed along racial lines, with only 25 per cent of non-urban black households being electrified compared to 97 per cent of non-urban white households.[156]

3.3.1.2 Post-1994

In 1994 the new democratically elected African National Congress government embarked upon an intense electrification programme. This was assisted by the fact that at the end of apartheid, South Africa's 'world-class' electricity supply industry faced few of the barriers usually experienced by developing countries with regard to electrification, including a lack of funding, skills and infrastructure.[157]

During 1994 and 1999 the focus was on achieving high connection rates, which was accomplished through the use of creative ways to decrease costs and

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[153] Davidson 'Energy Policy' (n148) 6.
[154] Bekker et al 'South Africa's Rapid Electrification Programme' (n152) 3128.
[155] Ibid, 3126.
[156] Ibid, 3125.
[157] Ibid, 3126 and 3128.

'overcome institutional barriers'.[158] This phase of electrification was effectively cross-subsidised by other electricity users.[159]

It should be noted that while the Constitution of the Republic of South Africa, 1996 includes various socio-economic rights such as the right of access to adequate housing[160] and the right of access to sufficient food and water,[161] it does not include a right of access to energy or electricity.

Once Eskom was converted into a public company and it was required to start paying tax, it was unwilling to fund the electrification programme, with the result that from 2001 the electrification programme was funded by the state directly from the fiscus.[162]

In 2003 a free basic electricity (FBE) policy was introduced in terms of which poor households that were connected to the grid were provided with 50 kWh of free electricity per month.[163] The FBE policy also makes provision for a subsidy to be provided in respect of solar heater systems in households that are not connected to the grid.[164]

The result of the electrification programme was that between 1994 and 2009, 4.9 million households were electrified, and by 2009, 75 per cent of households had access to electricity.[165] By 2011, 81 per cent of households had been connected to the grid.[166] Despite this electrification, many households cannot actually afford the electricity and therefore continue to rely on coal and paraffin.[167]

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158 Ibid, 3128.
159 Ibid, 3129.
160 Constitution of the Republic of South Africa, 1996, Section 26(1).
161 Ibid, Section 27(1)(b).
162 Bekker et al 'South Africa's Rapid Electrification Programme' (n152) 3129.
163 Department of Minerals and Energy *Electricity Basic Services Support Tariff (Free Basic Electricity) Policy* GN 1693 in *Government Gazette* No. 25088 dated 4 July 2003, Regulation 4.1.
164 Ibid, 1.
165 Department of Energy *Electrification Statistics* 2009 available at http://www.energy.gov.za/files/media/explained/statistics_electrification_2009.pdf [accessed 2 March 2011] 10-11.
166 Department of Energy *Revised Strategic Plan 2011/12 -2015/16* available at http://www.info.gov.za/view/DownloadFileAction?id=163946 [accessed 10 July 2012] 30.
167 Department of Minerals and Energy, Eskom, Energy Research Institute (University of Cape Town) *Energy Outlook for South Africa: 2000* 2002 available at http://www.info.gov.za/view/DownloadFileAction?id=124706 [accessed 13 November 2010] xi. See also H Winkler 'Energy Demand' in H Winkler (ed) *Energy Policies for Sustainable Development in South Africa: Options for the Future* 2006 (Energy Research Centre, University of Cape Town) 29.

While the high priority given to the industrial sector has been important in securing South Africa's international economic competitiveness, the 'apparent abundance [of coal] coupled with relatively low coal prices … have encouraged the development of many energy-intensive industries'.[168] The importance of cheap electricity to South Africa's industrial development has made it difficult to move away from conventional energy.[169]

In 2007/2008 there were electricity shortages and 'load shedding' took place throughout South Africa. This was despite the fact that already in 1998 it was projected by government that 'growth in electricity demand … [would] exceed generation capacity by approximately the year 2007'.[170] This led to the preparation of the Integrated Resource Plan 2010-2030,[171] which sets out South Africa's planned electricity expansion programme until 2030. The Integrated Resource Plan is discussed further in 3.3.2.3 below.

Further policy documents and legislation dealing with electricity and renewable energy, including the White Paper on the Energy Policy of the Republic of South Africa,[172] the White Paper on the Renewable Energy Policy of the Republic of South Africa[173] and the National Energy Act,[174] are discussed in Chapter 6.

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168 JN Blignaut and NA King 'The Externality Cost of Coal Combustion in South Africa' (paper presented at the first annual conference of the Forum for Economics and Environment) 2002, Cape Town available at http://www.elaw.org/system/files/Economic%20costs%20of%20coal%20combustion%20in%20RSA.pdf [accessed 6 June 2011] 4.

169 See J van Heerden, R Gerlagh, J Blignaut, M Horridge, S Hess, R Mabugu and M Mabugu 'Searching for Triple Dividends in South Africa: Fighting CO2 pollution and poverty while promoting growth' 2006 (27:2) *The Energy Journal* 113-141, 115, who note that one concern with regard to reducing emissions in South Africa is that it will negatively impact economic growth.

170 Department of Minerals and Energy *White Paper on the Energy Policy of the Republic of South Africa* in GN 3007 in *Government Gazette* No. 19606 dated 17 December 1998, 41.

171 IRP 2010-2030 (n16). The final Integrated Resource Plan 2010-2030 was preceded by the IRP 1 and the draft Integrated Resource Plan. See Department of Energy *Electricity Regulation Act, 2006: Determination regarding the Integrated Resource Plan and new generation capacity* GN 25 in *Government Gazette* No. 32898 dated 29 January 2010 and *Draft Integrated Resource Plan for Electricity* 2010 (Revision 2) (8 October 2010) available at http://www.energy.gov.za/IRP/irp%20files/INTEGRATED_RESOURCE_PLAN_ELECTRICITY_2010_v8.pdf [accessed 21 November 2010] respectively. The IRP 1 is discussed in Chapter 6.

172 Energy White Paper (n170).

173 Renewable Energy White Paper (n97).

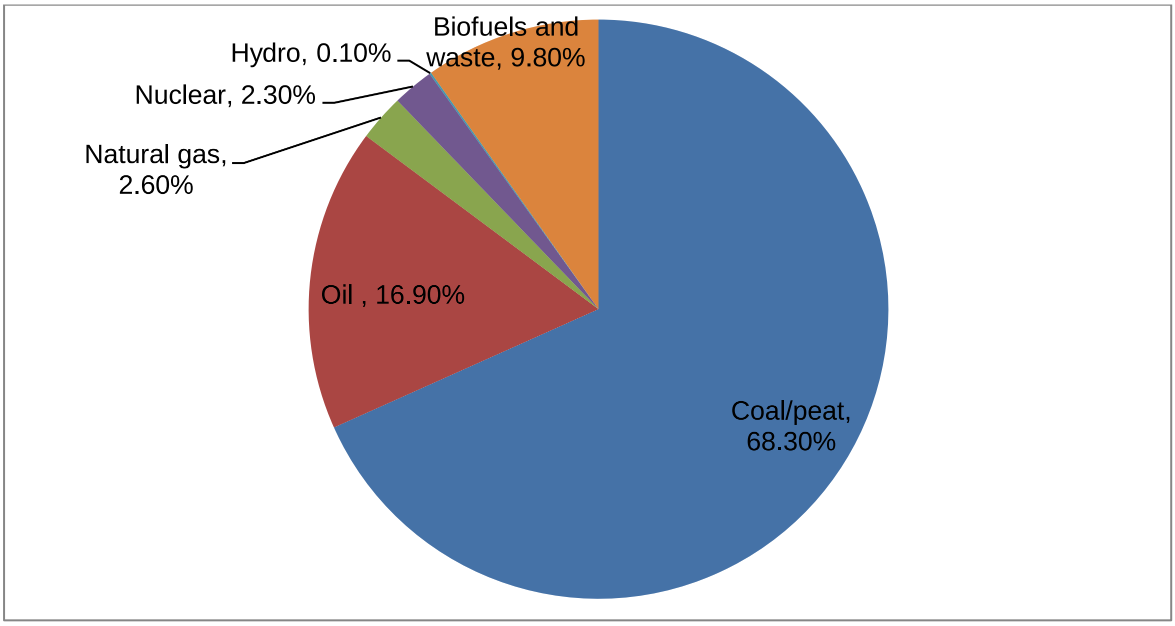
174 Act 34 of 2008.

3.3.2 Energy supply in South Africa

3.3.2.1 South Africa's energy and electricity profiles

South Africa's energy and electricity supplies are dominated by coal. In 2009 almost 70 per cent of South Africa's total primary energy supply was supplied by coal. South Africa's total primary energy supply is illustrated in Figure 3.4.

Figure 3.4 Total primary energy supply in South Africa[175]



With regard to electricity supply, out of a total of 248 TWh of electricity supplied in 2011, only about 0.001 per cent of electricity was supplied by wind energy and 0.8 per cent was supplied by hydro power. On the other hand, 92.8 per cent of electricity was supplied by coal and 5 per cent was supplied by nuclear energy.[176] This is reflected in Figure 3.5.

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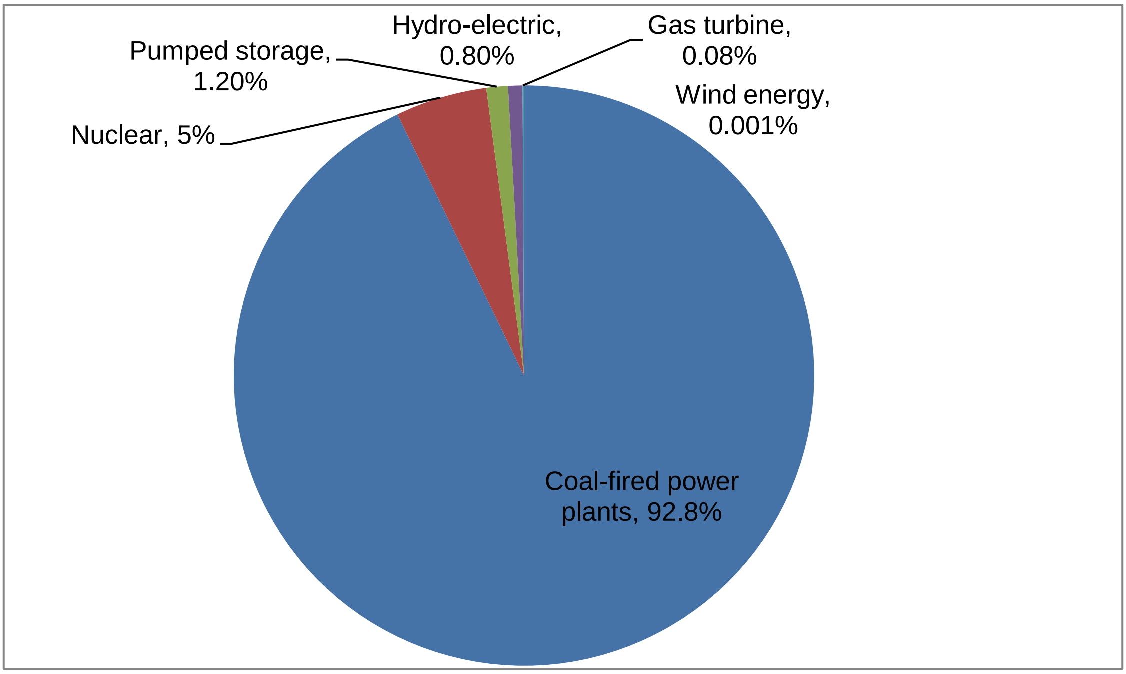
[175] Statistics obtained from International Energy Agency *Share of total primary energy supply in 2009* available at http://www.iea.org/stats/pdf_graphs/ZATPESPI.pdf [accessed 23 July 2012].

[176] Eskom *Integrated Report 2011* available at http://financialresults.co.za/2011/eskom_ar2011/downloads/eskom-ar2011.pdf [accessed 15 January 2013] 13.

Figure 3.5 Electricity supply in South Africa[177]



3.3.2.2 Sources of energy in South Africa

a) Coal

Coal was 'formed millions of years ago from massive accumulation of dead, land-based plant life, mainly trees'.[178] The plant material (and coal) is made up primarily of carbon, which is released when coal is combusted. Because coal takes millions of years to form, it is classified as a non-renewable source of energy.[179]

It has been estimated that South Africa has coal reserves of about 38 billion tons, and thus has the sixth largest coal reserves in the world.[180] Most of South Africa's coal (about 84 per cent) is produced in Mpumalanga, with much smaller

[177] Statistics obtained from Eskom *Integrated Report 2011* (n176) 13.
[178] H Sprohge and J Sirisom 'Coal Mining: The neglected environmental threat' in L Kreiser, J Sirisom, H Ashiabor and JE Milne (eds) *Environmental Taxation and Climate Change: Achieving Environmental Sustainability through Fiscal Policy* (Critical Issues in Environmental Taxation: Volume X) 2011, 129.
[179] Ibid, 129-130.
[180] After China, the USA, India, Russia and Australia. A Kenny 'Energy Supply in South Africa' in H Winkler (ed) *Energy Policies for Sustainable Development in South Africa: Options for the Future* 2006 (Energy Research Centre, University of Cape Town) 46.

quantities being produced in the Free State, Limpopo and KwaZulu-Natal.[181] The export of high-grade coal means that low-grade coal is used for electricity generation in South Africa.[182] The numerous negative impacts of coal-generated electricity were discussed in Chapter 2 above.

South Africa's Integrated Resource Plan 2010-2030[183] (IRP 2010-2030) sees coal capacity decrease from about 80 per cent in 2010 to about 46 per cent by 2030.[184] The contribution of coal to electricity supply will decrease from 90 per cent in 2010 to 65 per cent in 2030.[185] The major additions in respect of coal-generated power are the Medupi and Kusile power stations, which were anticipated to come on board in 2013 and 2017 respectively. Kusile (with a capacity of 4800 MW) and Medupi (with a capacity of 4764 MW) will be the third and fourth largest coal-fired power stations in the world respectively.[186] It was initially projected that Medupi would cost about US$30 billion to construct, however, more recently it has been projected that it will cost US$120 billion to construct.[187]

Importantly, coal provides baseload power. In order to provide this baseload power, coal power plants in South Africa run continuously and are 'generally only shut-down for scheduled maintenance or emergency repairs',[188] and thereafter take eight hours to start up again. Therefore, the grid is currently not well-suited to shutting down in order to accept renewable energy and then restarting (quickly) when more power is required.[189]

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[181] Ibid.
[182] R Spalding-Fecher and DK Matibe 'Electricity and Externalities in South Africa' 2003 (31) *Energy Policy* 721-734, 724.
[183] IRP 2010-2030 (n16). The Integrated Resource Plan is discussed further in 3.3.2.3 and Chapter 6 below. As also discussed further in Chapter 6, an Update to the IRP 2010-2030 was recently published. As the IRP 2010-2030 'remains the official government plan for new generation capacity until replaced by a full iteration', the focus remains on the official IRP 2010-2030 rather than on the Update. See Department of Energy *Integrated Resource Plan for Electricity (IRP) 2010-2030: Update Report 2013* (2013) available at http://www.doe-irp.co.za/content/IRP2010_updatea.pdf [accessed 9 December 2013] 10.
[184] IRP 2010-2030 (n16). The former figure has been calculated with reference to Figure 3 and Table 3 at 17-18.
[185] Ibid, Figure 3 at 18.
[186] P O' Flaherty (Eskom) *Presentation to Portfolio Committee on Energy: Update of Eskom's Capital Expansion Programme* 2011, 16 and 18.
[187] This was mentioned at the 'Strategic Energy Policy Developments in Germany and South Africa' *German South African Lecture Series: 'Energy Sciences'* (12 March 2013) (STIAS, Mostertsdrift, Stellenbosch).
[188] Gets and Mhlanga *Powering the Future* (n45) 15.
[189] Ibid, 15 and 20.

In South Africa, coal is also converted to liquid fuels at the Sasol plants, which were built for political reasons to ensure that South Africa would be independent of foreign oil. The process is highly energy- and carbon-intensive.[190]

b) Oil

South Africa has very small oil reserves and imports most of its oil, primarily from Saudi Arabia.[191]

c) Nuclear energy

South Africa's entire nuclear supply is provided by the Koeberg power station in the Western Cape. Nuclear energy relies on uranium, which is a by-product of gold mining.[192] Reserves of uranium in South Africa have been estimated at 261 000 tonnes.[193] A much larger role for nuclear energy is planned in the future in terms of the IRP 2010-2030,[194] and it is envisaged that nuclear energy will contribute about 20 per cent to total electricity supply by 2030.[195]

d) Gas

It was previously thought that South Africa had only small reserves of natural gas and as appears from Figures 3.4 and 3.5 above, gas contributes very little to South Africa's energy and electricity supplies. However, this may change with the recent discovery of shale gas in the Karoo region of South Africa. Estimates of the potential for shale gas vary. One estimate puts the potential for shale gas at 450 trillion cubic

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190 DME, Eskom and Energy Research Institute *Energy Outlook for South Africa* (n167) xvi and 17.
191 Kenny 'Energy Supply in South Africa' (n180) 47.
192 Ibid, 48. For information on South Africa's apartheid nuclear programme, see V Harris, S Hatang and P Liberman 'Unveiling South Africa's Nuclear Past' 2004 (30) *Journal of Southern African Studies* 457-475.
193 Kenny 'Energy Supply in South Africa' (n180) 48.
194 IRP 2010-2030 (n16).
195 Ibid, Figure 5 at 30. However, this may change depending on the new iteration of the Integrated Resource Plan that is expected to be published in 2014. See IRP 2010-2030: Update Report (n183).

feet (tcf).[196] There has been considerable public opposition to the mining of shale gas in the Karoo. Nevertheless, government appears committed to proceeding with hydraulic fracturing, or 'fracking', and has recently published draft Technical Regulations for Petroleum Exploration and Exploitation.[197]

e) Renewable energy

Most of South Africa's renewable energy is provided by biomass, which consists primarily of fuelwood used in households, which is harvested unsustainably.[198] In addition, biomass, in the form of sugarcane bagasse is used directly by sugar refineries to generate electricity. Pulp mills also generate electricity directly from bark and 'black liquor'.[199]

The wind energy contribution to South Africa's electricity supply is provided by the (privately-owned) Darling Wind Farm in the Western Cape and Eskom's Klipheuwel Wind Farm.

With regard to hydropower, South Africa has only 668 MW of installed capacity. Small hydro plants account for about 68 MW of this capacity. In addition, pumped storage schemes with a capacity of 1580 MW have been installed.[200]

Furthermore, over 350 000 solar water heaters (SWHs) had been installed by the first half of 2013.[201] While SWHs do not provide electricity directly, they displace the need for electricity generation. In 2009 about 1.35 TWh of energy was harnessed by SWHs.[202] It has been estimated that the use of SWHs could displace 42 TWh of

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[196] See P Vecchiatto 'Cabinet lifts moratorium on shale gas fracking in Karoo' (2 September 2012) *Business Day Live* available at http://www.bdlive.co.za/business/energy/2012/09/07/cabinet-lifts-moratorium-on-shale-gas-fracking-in-karoo [accessed 28 January 2013].

[197] Department of Mineral Resources *Proposed Technical Regulations for Petroleum Exploration and Exploitation* GN 1032 in *Government Gazette* No. 36938 dated 15 October 2013.

[198] Renewable Energy White Paper (n97) 20. See also Davidson 'Energy Policy' (n148) 5.

[199] Kenny 'Energy Supply in South Africa' (n180) 48-49.

[200] Banks and Schäffler *The Potential Contribution of Renewable Energy in South Africa* (n27) 24.

[201] D Peters (Minister of Energy) *Budget Vote Speech* 2013 available at www.pmg.org.za [accessed 14 May 2013].

[202] M Edkins, A Marquard and H Winkler 'Assessing the Effectiveness of National Solar and Wind Energy Policies in South Africa' 2010 (Final Report for the United Nations Environment Programme Research Programme: *Enhancing information for renewable energy technology deployment in Brazil, China and South Africa*) available at http://www.erc.uct.ac.za/Research/publications/10Edkinesetal-Solar_and_wind_policies.pdf [accessed 27 March 2011] iii.

electricity consumption by 2030.[203] In addition, there are off-grid renewable energy installations such as solar PV panels, which have wide application in rural areas.[204]

Renewable energy projects may receive subsidies from the Renewable Energy Finance and Subsidy Office (REFSO), which is located within Eskom. The REFSO has provided subsidies to six projects with a total installed capacity of 23.9MW.[205]

3.3.2.3 Future electricity supply

As a result of the electricity shortages and load shedding experienced in 2007/2008 it was determined that electricity capacity should be expanded.[206] The IRP 2010-2030 envisages that electricity capacity will be expanded from the 2010 level of approximately 44.5 GW to approximately 89.5 GW by 2030. The planned capacities of the various electricity technologies by 2030 are reflected in Table 3.4. An Update to the IRP 2010-2030[207] was recently published, which sees slightly different roles for these electricity technologies. However, the IRP 2010-2030 'remains the official government plan for new generation capacity until replaced by a full iteration'.[208] Thus, the focus remains on the current iteration of the IRP.

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[203] Banks and Schäffler *The Potential Contribution of Renewable Energy in South Africa* (n27) 21 and 41.

[204] Department of Environmental Affairs *South Africa's Second National Communication under the United Nations Framework Convention on Climate Change* 2011 available at http://unfccc.int/resource/docs/natc/zafnc02.pdf [accessed 24 November 2011] 19. Furthermore, a solar park (of potentially 5000 MW) is planned to be developed in the Northern Cape. See Department of Energy *Draft 2012 Integrated Energy Planning Report* in GN 513 in *Government Gazette* No. 36690 dated 24 July 2013, 68.

[205] Department of Energy *Renewable Energy Finance and Subsidy Office* available at http://www.energy.gov.za/files/esources/renewables/r_refso.html [accessed 13 March 2013]. The REFSO is discussed further in 6.2 below.

[206] In the meantime, the Department of Minerals and Energy released a document that detailed interventions to reduce 'the risk of load shedding'. See Department of Minerals and Energy 2008 *National Response to South Africa's Electricity Shortage: Interventions to address electricity shortages* available at http://www.info.gov.za/otherdocs/2008/nationalresponse_sa_electricity1.pdf [accessed 7 January 2010].

[207] IRP 2010-2030: Update Report (n183).

[208] Ibid, 10.

Table 3.4 Total electricity capacity by 2030[209]

Electricity source	Total capacity	
	MW	**Percentage**
Coal	41071	45.9
OCGT	7330	8.2
CCGT	2370	2.6
Pumped storage	2912	3.3
Nuclear	11400	12.7
Hydro	4759	5.3
Wind	9200	10.3
CSP	1200	1.3
PV	8400	9.4
Other	890	1.0

Table 3.4 shows that wind energy, CSP and solar PV will together make up 21 per cent of South Africa's electricity capacity in 2030. However, this 21 per cent of renewable energy capacity does not translate well into overall electricity supply, as illustrated in Figure 3.6.[210]

[209] Data obtained from Table 4 in IRP 2010-2030 (n16) 17.
[210] The distinction between electricity *capacity* and *supply* was discussed in 3.2.1 above.

Figure 3.6 Electricity supply by 2030[211]

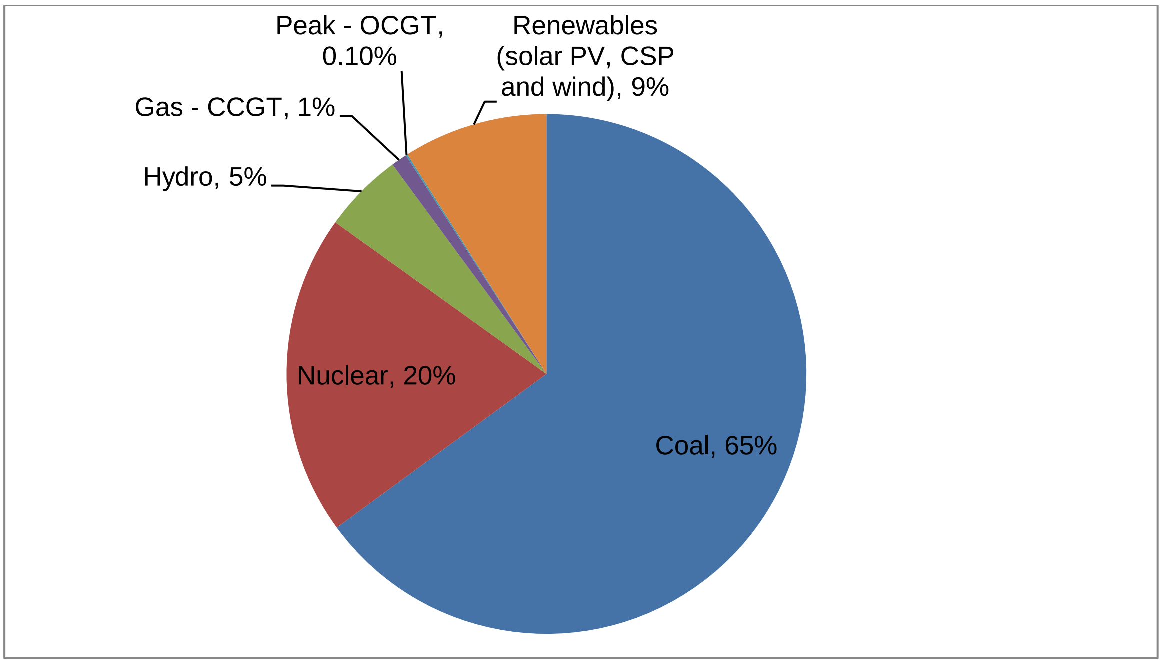

Figure 3.6 shows that coal will still supply the majority of electricity in 2030. Although there is a significant reduction from over 90 per cent today to the planned 65 per cent by 2030, it appears that the shortfall will, for the most part, simply be replaced by nuclear power.

It was recently argued in a report, commissioned by the National Planning Commission, that energy demand has decreased and that in 2030 it will be closer to 61 GW than to the 89 GW envisaged in the IRP 2010-2030. It is therefore argued in the report that investments in nuclear energy will not be required for at least the next 15 to 25 years.[212]

The Department of Energy has started to review the IRP 2010-2030,[213] and as noted above an Update to the IRP 2010-2030 has been published. The Update Report projects that electricity demand in 2030 will range between 345 and 416 TWh (81.4 GW) as opposed to the 454 TWh (89.5 GW) projected in the IRP 2010-2030.[214]

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[211] Figures obtained from Figure 3 in IRP 2010-2030 (n16) 18.
[212] Energy Research Centre, University of Cape Town *Towards a New Power Plan* (for the National Planning Commission) 2013 available at http://www.erc.uct.ac.za/Research/publications/13ERC-Towards_new_power_plan.pdf [accessed 25 April 2013]. The report furthermore highlights the importance of 'a steady stream of renewable energy investments in order to sustain a local RE industry' and that this area was 'not adequately dealt with in this modelling'.
[213] Department of Energy *IRP 2010 Update* (26 September 2013).
[214] IRP 2010-2030: Update Report (n183) 8 and Table 2 at 20.

The Update also sees a smaller role for nuclear energy, which would provide 6660 MW instead of 11 400 MW in 2030.[215] Yet, the IRP 2010-2030 'remains the official strategy' until replaced by a new iteration.[216]

3.3.3 Tariffs

Electricity tariffs in South Africa have traditionally been very low and in 2002 South Africa produced the cheapest electricity in the world.[217] There are a number of reasons for the 'unrealistically low'[218] electricity prices.

In the first place, there was excess electricity capacity due to Eskom's over-investment in the 1980s, which kept prices low while no additional capacity (nor investment) was required. Therefore, electricity prices have not reflected true costs.[219] In addition, electricity prices have not included external costs, or externalities, arising due to harm caused to the environment and society by fossil fuel-generated energy.[220] This issue is discussed further in 3.3.4.2 below and Chapter 4.

Further reasons for the low electricity prices include '[a]ccess to large reserves of low-grade coal and the use of technologies that maximise economies of scale', the subsidising of Eskom's investment by forward cover by the Reserve Bank,[221] the close proximity of power plants to mines[222] and the fact that more than 80 per cent of Eskom's sale revenue comes from large industrial and mining customers, which cost less to serve and are 'generally in a position to negotiate favourable prices'.[223] In

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[215] Ibid, Table 2 at 20.
[216] Ibid, 42 and 10.
[217] DME, Eskom and Energy Research Institute *Energy Outlook for South Africa* (n167) xiii.
[218] JC Nkomo 'Energy and Economic Development' in H Winkler (ed) *Energy Policies for Sustainable Development in South Africa: Options for the Future* 2006 (Energy Research Centre, University of Cape Town) 86.
[219] Winkler *Cleaner Energy Cooler Climate* (101) 50.
[220] Ibid.
[221] Nkomo 'Energy and Economic Development' (n218) 81.
[222] Spalding-Fecher and Matibe 'Electricity and Externalities in South Africa' (n182) 722.
[223] Ibid.

addition, until Eskom became a public company in 2001,[224] it was exempt from paying tax.[225]

While the low electricity prices have enabled South Africa to be competitive in the minerals processing market, they have not encouraged investment in alternative sources of energy or energy efficiency.[226] Furthermore, the 'unrealistically low' price of electricity has deterred potential competitors from entering the market.[227]

Electricity prices have started to increase in the last decade. From 2003 the costs of electrification started to become more expensive as the focus shifted to electrifying rural (more remote) areas and due to the increasing costs of the necessary commodities such as steel, copper and aluminium.[228] Average electricity tariffs from 2007 to 2013 are reflected in Table 3.5.

Table 3.5 Average electricity tariffs from 2007 to 2013[229] compared to inflation[230]

Financial year	Electricity tariff (R cents per kilowatt hour)	Increase in electricity price (%)	Consumer price index (%)
2007	18		
2008	19.4	7.8	9.4
2009	24.7	27.3	6
2010	31.9	29.2	3.4
2011	40.3	26.3	6.4
2012	50.3	24.8	5.7
2013	65	29.2	5.3

[224] In terms of the Eskom Conversion Act 13 of 2001.
[225] Spalding-Fecher and Matibe 'Electricity and Externalities in South Africa' (n182) 722.
[226] H Winkler and A Marquard 'Changing Development Paths: From an energy-intensive to low-carbon economy in South Africa' 2009 (1) *Climate and Development* 47-65, 52. See also Winkler 'Energy Demand' (n167) 23.
[227] Nkomo 'Energy and Economic Development' (n218) 86.
[228] Bekker et al 'South Africa's Rapid Electrification Programme' (n152) 3130 and 3132.
[229] Data obtained from Eskom *Integrated Report 2011* (n176) 15 and Eskom *Interim Integrated Report 2012* available at http://www.pads.eezeepage.co.za/i/94638/4 [accessed 16 January 2013] 13.
[230] Data obtained from inflation.eu *Historic inflation South Africa – CPI inflation* available at http://www.inflation.eu/inflation-rates/south-africa/historic-inflation/cpi-inflation-south-africa.aspx [accessed 31 January 2014].

Further price increases are due to take place. Eskom recently applied, in terms of the Multi-Year Price Determination 3, for tariffs to be increased by 16 per cent per year for the next five years.[231] The National Energy Regulator of South Africa (NERSA) approved a price increase of 8 per cent (per year) for the next three years.[232]

It should be noted that there is a significant discrepancy between the tariffs paid by different categories of users. For instance, the Department of Energy reported that in 2006 the average electricity price was 17.05c/kWh. While the price of electricity for 'Domestic and Street Lighting' was 40.08c/kWh, the electricity price was 14.75c/kWh for 'Industrial', 16.19c/kWh for 'Eskom Mining' and 9.83c/kWh for 'International'.[233] In addition, it is an open secret that a few energy-intensive companies have special pricing arrangements with Eskom. For instance, the price reportedly paid by BHP Billiton is 16c/kWh compared to the general rate of 65c/kWh.[234]

The next section considers the development of renewable energy in South Africa, and *inter alia* discusses the barriers to, and potential for, renewable energy and RES-E.

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[231] This would result in an average electricity tariff of 128c/kWh in 2017. Eskom *MYPD3 tariff restructuring plan – use-of-system charges* 2012 available at http://www.financialresults.co.za/2012/eskom_ar2012/integrated-report/downloads/electricity-pricing-and-tariffs/toolkit/UseOfSystem_charges_brochure_23Nov2012.pdf [accessed 27 January 2013] 2. Of the 16 per cent, 13 per cent would be required to meet Eskom's needs, while the other 3 per cent was required to support the introduction of independent power producers (IPPs). At 2.

[232] See Parliamentary Monitoring Group *NERSA's MYPD approval of 8% instead of 16%: Response by Eskom and South African Local Government Association* (24 May 2013) available at www.pmg.org.za [accessed 28 August 2013]. It has been argued that these price increases are not a result of investing in 'low-carbon generation options, but because the electricity price is currently below long-run marginal cost for historical reasons'. See Energy Research Centre (University of Cape Town) *Comments on Discussion Paper 'Reducing Greenhouse Gas Emissions: The Carbon Tax Option (Issued by National Treasury in December 2010)* 2011 available at http://www.erc.uct.ac.za/ERC_Comments_Treasury_carbon_tax%20.PDF [accessed 26 May 2011] 3.

[233] Department of Energy *South African Energy Price Report* 2010 available at www.energy.gov.za/files/media/explained/energy_price_report2010.PDF [accessed 8 October 2012] Table 4.2 at 86.

[234] D Pressly 'BHP Billiton defends its Eskom deals' *Business Report* (29 April 2013).

3.3.4 The development of renewable energy and RES-E in South Africa

3.3.4.1 Introduction

To date, RES-E has not played any significant role in South Africa as evidenced by the low contribution of RES-E to South Africa's total electricity supply.

In 2003 government acknowledged that South Africa must be a 'responsible global neighbour' and that 'alternative means of producing energy such as renewable energy sources, which have less impact on the environment compared to fossil fuels have to be considered'.[235] Government accordingly established a target of '10 000 GWh … renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro'.[236] Yet government has not pursued this target very actively.[237] Indeed, by 2009 only three per cent (296 GWh) of this target had been achieved.[238] To date, this target has been a primary driver for renewable energy policy in South Africa.[239]

In more recent years there has been a greater impetus to increase the uptake of renewable energy. The 10 000 GWh target has been amplified by the IRP 2010-2030,[240] which envisages that RETs will account for 21 per cent of total capacity and 9 per cent of total energy supply by 2030.

The Renewable Energy Feed-In Tariff (REFIT) was initially introduced to support the achievement of the 10 000 GWh target and to promote the competitiveness of

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235 Renewable Energy White Paper (n97) 20.
236 Ibid, i.
237 Indeed, the view of government previously was that
'[w]hereas it can be strongly argued that government, principally through [the Department of Minerals and Energy] and [the Department of Trade and Industry], should create market conditions in favour of renewable energy and energy efficiency to attract foreign and local investment, the burden of proof that such an approach would be successful on a large scale rests with the proponents of such schemes. Indeed, such a policy would be admirable, and should be encouraged, on an appropriate scale that caters for specific niche applications. However, the South African economy, unlike those of the major developed countries, would not easily be able to recover if such schemes were to be adopted widely and then proved unviable, hindering, rather than promoting, essential investment and development'. See Department of Environmental Affairs and Tourism *A National Climate Change Response Strategy for South Africa* 2004 available at http://unfccc.int/files/meetings/seminar/application/pdf/sem_sup3_south_africa.pdf [accessed 10 April 2008] 24.
238 A Pegels 'Renewable Energy in South Africa: Potentials, barriers and options for support' 2010 (38) *Energy Policy* 4945-4954, 4950.
239 Edkins et al 'South Africa's Renewable Energy Policy Roadmaps' (n34) ii.
240 IRP 2010-2030 (n16).

renewable energy in comparison to conventional energy options,[241] but was replaced by the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) in 2011. The REFIT and REIPPPP are both discussed in more detail in Chapter 7.

3.3.4.2 Barriers to renewable energy and RES-E

Eskom supplies 95 per cent of South Africa's electricity[242] and owns the entire transmission infrastructure and half of the distribution network.[243] It therefore holds a monopoly with regard to the generation, transmission and distribution of electricity in South Africa. Indeed, the structure of the energy sector and regulatory environment have not been 'conducive to entry',[244] which was acknowledged in the White Paper on the Renewable Energy Policy of the Republic of South Africa (REWP).[245]

It has furthermore been argued that

> '[a]s monopolistic energy providers, both Eskom and Sasol wield considerable power. They use their influence to protect those of the energy market's features suited to their core competencies. Fostering a favourable environment for renewable energy providers is certainly not a part of this strategy'.[246]

To date, there has not been any incentive for Eskom (or Sasol) to move away from fossil fuel-based energy. Indeed, Eskom's plans with regard to renewable energy include only 100 MW of wind energy (the Sere wind power plant) and 100 MW of solar energy (in the Northern Cape), as well as the installation of solar panels at 13 coal-fired power stations.[247] In this regard it has been argued that Eskom 'lacks

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[241] REFIT Regulatory Guidelines (n2) 13.
[242] O' Flaherty *Presentation to Portfolio Committee on Energy* (n186) 4.
[243] Municipalities own the other half of the distribution network. J Krupa and S Burch 'A New Energy Future for South Africa: The political ecology of South African renewable energy' 2011 (39) *Energy Policy* 6254-6261, 6256.
[244] Nkomo 'Energy and Economic Development' (n218) 77.
[245] Renewable Energy White Paper (n97) 26, which notes the 'lack of non-discriminatory open access to key energy infrastructure such as the national electricity grid'.
[246] Pegels 'Renewable Energy in South Africa' (n238) 4948.
[247] Eskom *Integrated Report for the year ended 31 March 2012* 2012 available at http://www.pads.eezeepage.co.za/i/69717 [accessed 15 January 2013] 52.

the will to meaningfully contribute to the area of alternative power generation, particularly in [renewable energy]'.[248]

It has been generally acknowledged that competition is important, and that competition in the energy sector can lead to decreased costs and increased consumer satisfaction.[249] In the South African context it is therefore important to try to reduce Eskom's monopoly through the introduction of IPPs.

Other barriers to renewable energy in South Africa include: a lack of local experience; difficulties in securing a black economic empowerment [BEE] partner; excessive permitting requirements and siting restrictions; that the public is not largely informed or aware of the benefits of renewable energy; too many agencies involved in the approval process and the difficulty experienced by IPPs in gaining access to the grid and obtaining the requisite approvals and licences.[250] Another barrier that may arise, as demand for RETs increases, is the availability of the necessary components.[251]

While it is crucial that all barriers are resolved, as highlighted earlier the focus of this research is on the financial barrier. In South Africa too, the initial costs of renewable energy are generally higher than those of conventional fossil fuel-generated energy.

As was noted with regard to the international context, when considering the costs of renewable energy and RES-E there are a number of factors that must be borne in mind, namely that: a) external costs of fossil fuel-generated energy are currently excluded; b) the operating costs of RES-E are lower than those of coal-generated electricity; c) coal-generated electricity will become more expensive; d) subsidies are provided to fossil fuel industries; and e) renewable energy (and RES-E) is becoming cheaper. These factors are equally relevant to the South African context and a few of these are considered in more detail.

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[248] AB Sebitosi and P Pillay 'Renewable Energy and the Environment in South Africa: A way forward' 2008 (36) *Energy Policy* 3312-3316, 3314.
[249] M Jefferson 'Energy Policies for Sustainable Development' in United Nations Development Programme, United Nations Department of Economic and Social Affairs and World Energy Council *World Energy Assessment: Energy and the Challenge of Sustainability* 2000, 426.
[250] Fakir and Nicol *Investigation: Obstacles and Barriers to Renewable Energy in South Africa* (n86) 30.
[251] Ibid, 32. See also Banks and Schäffler *The Potential Contribution of Renewable Energy in South Africa* (n27) 17.

With regard to externalities, in South Africa 'the price of electricity has never included any part of the environmental and social impacts of electricity generation'.[252] This can lead to resources being misallocated.[253] This also means that renewable energy and conventional energy do not compete on an equal playing field.[254]

A study has calculated the external costs of various technologies including coal, nuclear, gas, biomass, hydro, wind, CSP and PV, which are reflected in Table 3.6. The 'total externality costs' are indicated in the second last row.

Table 3.6 Best estimates of external costs for electricity generation technologies in South Africa[255]

Units: c/ kWh (2009 cents ZAR)	*Coal*	*Nuclear*	*Gas – CCGT*	*Diesel –OCGT*	*Biomass (incl biogas)*	*Hydro (small)*	*Wind*	*CSP*	*PV*
POWER GENERATION									
GHG emissions	48 (25 – 71)	0.3 (0.2 - 0.4)	27 (11 – 32)	45.5 (24 – 67)	4.3 (1.8 – 5)	0.15 (0.1 - 0.2)	0.8 (0.4 - 1.2)	0.7 (0.3 - 1.1)	2.8 (1.6 - 4.4)
Health impacts	1.35 (1.0 - 1.7)	0.03	0.34	0.22	0.39	0.05	0.09	0.09	0.19
FUEL (Production & Transport)									
Acid mine drainage	2.1* (0.4 - 3.9)	?	?	?	-	-	-	-	-
Biodiversity loss	0.7 (0.6 - 0.8)	0.1	0.39	0.9	0.13	0	0	0	0
Health impacts	0.36 (0.02 - 0.7)	0.15	0.14	0.15	0.05	0	0	0	0
GHG emissions	2.3 (1.3 - 3.3)	0.45	2.8	2.8	1.5	0	0	0	0
TOTAL EXTERNALITY COST (estimate)	~ 55	~ 1	~ 30	~ 50	~ 6	~ 0.2	~ 0.9	~ 0.8	~ 3
Benefits of electrification – positive externalities	18 (4.7 - 24.2)	18 (4.7 - 24.2)	18 (4.7 - 24.2)	18 (4.7 - 24.2)	18 (4.7 - 24.2)	18 (4.7 - 24.2)	18 (4.7 - 24.2)	18 (4.7 - 24.2)	18 (4.7 - 24.2)
* A presentation by the Federation for Sustainable Environment (Pretorius, 2009) estimates the water damage externality from Eskom's coal mining needs at about R cents 38/kWh.									

[252] Spalding-Fecher and Matibe 'Electricity and Externalities in South Africa' (n182) 722.
[253] Blignaut and King 'The Externality Cost of Coal Combustion in South Africa' (n168) 3.
[254] K Brick and M Visser 'Green Certificate Trading' *The Economics of Climate Change Mitigation* (Energy Research Centre, UCT; G:ENESIS and Environmental Policy Research Unit, University of Cape Town) available at http://www.erc.uct.ac.za/Research/publications/09Brick-Visser_Green_certificate_trading.pdf [accessed 7 July 2011] 2.
[255] Table 3.7 has been obtained from M Edkins, H Winkler, A Marquard and R Spalding-Fecher 'External Cost of Electricity Generation: Contribution to the Integrated Resource Plan 2 for Electricity' (for the Department of Environment and Water Affairs) (Energy Research Centre, University of Cape

Table 3.6 illustrates that coal-generated electricity has an externality cost of 55c/kWh, compared to between 0.8 and 6 c/kWh for various RETs. In addition, the proviso to Table 3.6 refers to an additional 'water damage externality' cost for 'Eskom's coal mining needs' (in the context of acid mine drainage),[256] which is estimated at about 38c/kWh.

This study suggests that, at the very least, an additional 55c/kWh (or possibly 93c/kWh) needs to be added to the current price of coal-generated electricity. It is clear that it would be much easier for RETs to compete with coal on this basis. Indeed, it has been argued that the environment and society are 'subsidising the coal combusting industries on average by an amount more than the private cost of coal'.[257] Without government and industry action to address these externalities, society will continue to assume these costs.[258]

While external costs do need to be internalised, it is clear that this would impact significantly on industries that use coal. It would be important that internalising these external costs does not impact negatively on poor people.[259]

As highlighted in 3.2.2.3 above, the costs of renewable energy are decreasing rapidly. It is already considered that onshore wind may be cheaper than coal-generated electricity in certain circumstances. Indeed, the average cost of wind energy under South Africa's REIPPP Programme (discussed in detail in Chapter 7) was 89 cents per kilowatt hour (c/kWh) in the second round of bidding and about 66c/kWh in the third round of bidding.[260] On the other hand, it has been reported that

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Town) 2010 available at http://www.erc.uct.ac.za/Research/publications/10Edkinsetal-External_costs_IRP2.pdf [accessed 27 March 2011] 3. See also Greenpeace 'Executive Summary' *The True Cost of Coal in South Africa* 2011 available at www.greenpeace.org/africa/Global/africa/publications/coal/TrueCostOfCoal.pdf [accessed 10 December 2012] 3, which discusses the projected externality costs of the imminent Kusile coal-fired power plant.

[256] For further information on acid mine drainage, see generally D Fig 'Corrosion and Externalities: The socio-economic impacts of acid mine drainage on the Witwatersrand' in J Daniel, P Naidoo, D Pillay and R Southall (eds) *New South African Review 2: New Paths, Old Compromises?* (Johannesburg, South Africa: Wits University Press) 2011 and Sprohge and Sirisom 'Coal Mining' (n178).

[257] Blignaut and King 'The Externality Cost of Coal Combustion in South Africa' (n168) 19. See also J van Heerden, R Gerlagh, J Blignaut, M Horridge, S Hess, R Mabugu and M Mabugu 'Searching for Triple Dividends in South Africa: Fighting CO2 pollution and poverty while promoting growth' 2006 (27:2) *The Energy Journal* 113-141, 115.

[258] Spalding-Fecher and Matibe 'Electricity and Externalities in South Africa' (n182) 728.

[259] Ibid.

[260] Department of Energy *Bid Window 3: Preferred Bidders' Announcement* (n139).

electricity generated from the new coal power plants, Medupi and Kusile, will cost 97c/kWh,[261] making wind energy a cheaper and cleaner alternative.

Furthermore, if technology learning effects with regard to renewable energy technologies are included in RES-E scenarios for South Africa

> 'the mitigation costs are dramatically reduced, or even provide a saving relative to business-as-usual. If such scenarios materialised, it would no longer take legislation to mandate shares of renewables, but greater uptake should be driven by economic incentives'.[262]

Coal-generated electricity is also projected to become more expensive as carbon capture and storage is taken into account.[263] The cost of coal-generated electricity would undoubtedly also increase when a carbon tax is introduced in South Africa.

3.3.4.3 Potential for renewable energy in South Africa

It has been noted that South Africa's renewable energy potential is 'enormous', greatly exceeding current and projected demand.[264] Government has acknowledged the country's significant renewable energy resources and has stated that 'so far these have remained largely untapped'.[265]

There appears to be no single study that has comprehensively determined the potential contributions of all of the RETs. Therefore, the figures referred to below have been obtained from various sources.

CSP is considered to be ideal for South African conditions and it has been argued that South Africa's renewable energy potential 'lies overwhelmingly with solar energy'.[266] For instance, Upington (in the Northern Cape) has more than 7 kWh/m^2

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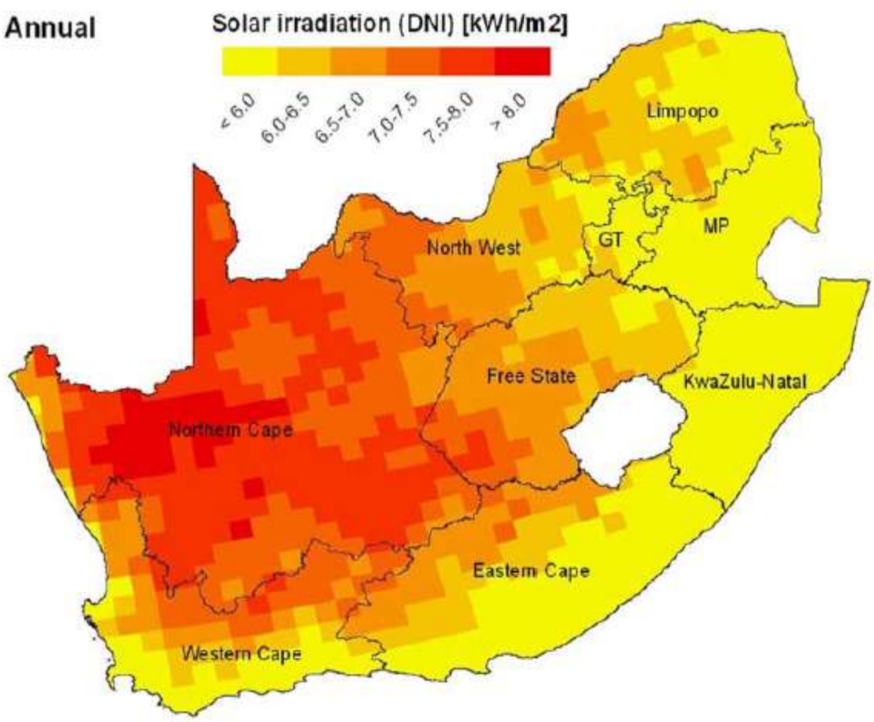
261 Gosling 'Go-ahead for 19 new energy projects' (n139).
262 Winkler et al 'Technology Learning for Renewable Energy' (n113) 4995.
263 A Marquard, B Merven and E Tyler (Energy Research Centre) 'Costing a 2020 Target of 15% Renewable Electricity for South Africa' 2008 available at http://www.erc.uct.ac.za/Research/publications/08-Marquardetal-costing_a_2020_target.pdf [accessed 26 May 2011] 11.
264 Banks and Schäffler *The Potential Contribution of Renewable Energy in South Africa* (n27) 13.
265 Renewable Energy White Paper (n97) 11.
266 Winkler *Cleaner Energy Cooler Climate* (n101) 89 and Edkins et al 'South Africa's Renewable Energy Policy Roadmaps' (n34) 3.

of daily average direct normal irradiation (DNI or amount of solar radiation), which is higher than that of 'sun-soaked countries' including Morocco, India and Spain.[267] The average daily DNI in South Africa is reflected in Figure 3.7.

Figure 3.7 Average daily direct normal irradiation[268]



It has been argued that if CSP were to be implemented in only four provinces – the Northern Cape, the Free State, the Western Cape and the Eastern Cape – that the potential capacity for South Africa would be 547.6 GW, with the greatest capacity

[267] Edkins et al 'Assessing the Effectiveness of National Solar and Wind Energy Policies in South Africa' (n202) 4-5.
[268] Figure 3.7 obtained from TP Fluri 'The Potential of Concentrating Solar Power in South Africa' 2009 (37) *Energy Policy* 5075-5080, 5076. It should be noted that the Council for Scientific and Industrial Research (CSIR) has been appointed by government to identify areas in South Africa that are 'best suited for the rollout of wind and solar PV energy projects and the supporting electricity grid network', with the object of developing 'Renewable Energy Development Zones', which would 'allow for wind and solar PV energy projects and the associated grid infrastructure to be developed in these areas without requiring additional environmental authorisation, subject to certain conditions or guidelines'. See CSIR *Strategic Environmental Assessment (SEA) for the rollout of wind and solar PV in South Africa* available at http://www.csir.co.za/nationalwindsolarsea/background.html [accessed 4 February 2013] and CSIR *Wind and Solar PV SEA Project Objectives* available at http://www.csir.co.za/nationalwindsolarsea/objectives.html [accessed 4 Febuary 2013]. Wind and solar PV data can be accessed at http://www.csir.co.za/nationalwindsolarsea.

by far being in the Northern Cape.[269] However, the plants would not run at full capacity throughout the year. Assuming that the plants only ran at 40 per cent capacity, they would still provide 1861.4 TWh of energy per year,[270] while South Africa's projected electricity demand for 2030 is just 454 TWh.[271]

While one would need to consider the practical potential for solar energy, as economic factors must be factored in, it is clear that solar energy could in theory, satisfy all of the country's electricity demands. Rolling out solar energy on a large scale would only be feasible if dry or 'water-wise cooling methods' were to be implemented, due to water shortages in South Africa.[272]

It has been argued that in the long term, CSP could potentially compete with baseload energy technologies.[273] Furthermore, due to the lack of market maturity, there is potential for 'South Africa to develop a competitive advantage in [the] design and manufacture of … [CSP], particularly if able to prove the technology at scale'.[274]

With regard to wind energy, in his doctoral dissertation, Killian Hagemann estimated the technical potential of wind energy to be 80 TWh per year.[275]

With regard to biomass, it has been estimated that biomass by-products could provide more than 12 900 GWh (12.9 TWh) of electricity per year.[276] However, particular attention would need to be paid to the sustainability of biomass especially due to the fact that South Africa is water-stressed.[277] It has been estimated that landfill gas has a potential of 7.2 TWh per year, potentially increasing to 10.8 TWh per year by 2040.[278]

With regard to other sources of renewable energy, the potential for hydropower is not great. This is *inter alia* because as a water-stressed country, South Africa is

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[269] Fluri 'The Potential of Concentrating Solar Power in South Africa' (n268) 5078.
[270] Ibid.
[271] IRP 2010-2030 (n16) Figure 3 at 18.
[272] Fluri 'The Potential of Concentrating Solar Power in South Africa' (n268) 5079.
[273] Marquard et al 'Costing a 2020 Target of 15% Renewable Electricity for South Africa' (n263) 8.
[274] Edkins et al 'South Africa's Renewable Energy Policy Roadmaps' (n34) 4.
[275] See K Hagemann 'Appendix 3 – New assessment of wind resources for South Africa' in Marquard et al 'Costing a 2020 Target of 15% Renewable Electricity for South Africa' (n263) 77. Wind energy data can also be accessed at http://www.csir.co.za/nationalwindsolarsea. See n268 above.
[276] REFIT Regulatory Guidelines (n2) 25.
[277] Banks and Schäffler *The Potential Contribution of Renewable Energy in South Africa* (n27) 27.
[278] Ibid, viii.

vulnerable to drought.[279] Most of the potential for hydropower in South Africa is limited to small-scale hydropower projects.[280] The potential of pumped storage has been estimated at 11.8 GW.[281]

Estimates regarding the potential contributions of various RETs are compiled in Table 3.7.

Table 3.7 Estimates of the technical potentials of various RETs in South Africa

RET	**Study**				
	Hagemann[282]	**Fluri**[283]	**Winkler**[284]	**Edkins, Marquard and Winkler**[285]	**Banks and Schäffler**[286]
	Potential contribution (TWh)				
PV				1000 (economic potential: 0)	
CSP		1861.4		1000 (economic potential: 52)	
Wind	80		64	80 (economic potential: 23)	106
Biomass			5.9		16.4
Landfill gas			0.6		7.2
Hydro			9.2		14.6
Pumped storage					[11.8GW]
Ocean					70

These estimates generally represent the technical potentials of the various RETs, rather than representing their economic potentials. For example, while the

279 Ibid, 26.
280 Kenny 'Energy Supply in South Africa' (n180) 50.
281 Banks and Schäffler *The Potential Contribution of Renewable Energy in South Africa* (n27) 26.
282 Hagemann 'Appendix 3 – New assessment of wind resources for South Africa' (n275).
283 Fluri 'The Potential of Concentrating Solar Power in South Africa' (n268).
284 Winkler *Cleaner Energy Cooler Climate* (n101) Table 5.15 at 135.
285 Edkins et al 'Assessing the Effectiveness of National Solar and Wind Energy Policies in South Africa' (n202) iii.
286 Banks and Schäffler *The Potential Contribution of Renewable Energy in South Africa* (n27) Table 3-2 at 34.

technical potentials presented by Edkins, Marquard and Winkler are 1000 TWh for CSP and PV and 80 TWh for wind energy, the economic potentials provided are 52 TWh for CSP, 0 TWh for PV and 23 TWh for wind.[287] However, it is submitted that the estimate provided for PV of 0 TWh is modest, especially considering that in terms of the IRP 2010-2030, solar PV will account for 3 per cent of electricity supply (about 14 TWh) in 2030.[288] The total economic potential of just these three RETs – CSP, solar PV and wind – amounts to 75 TWh, which is 16.5 per cent of the projected energy demand for 2030.

While it is not competent, nor is the object, to determine an appropriate target for RES-E it is instructive to consider the various RES-E targets that are considered in the literature to be feasible, which include: 13 per cent RES-E by 2020 'and easily 70 per cent or more by 2050';[289] 15 per cent RES-E by 2020;[290] 36 per cent RES-E by 2030;[291] 27 per cent RES-E by 2050[292] and at least 27 per cent RES-E by 2030.[293] It is significant that one study considered that achieving 15 per cent RES-E by 2030 'is possible with hardly any change in public and private investments'.[294] In contrast, under the IRP 2010-2030, RES-E will contribute only 9 per cent to electricity supply by 2030.

3.3.4.4 Creating an enabling environment for renewable energy and RES-E

It has been noted that the large-scale deployment of RETs 'requires both financing and regulatory support to compete with the dominant and mature fossil technologies, themselves often supported by a well-established historical subsidy base'.[295]

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[287] Ibid.
[288] IRP 2010-2030 (n16) Figure 5 at 30.
[289] Banks and Schäffler *The Potential Contribution of Renewable Energy in South Africa* (n27) 53.
[290] Marquard et al 'Costing a 2020 Target of 15% Renewable Electricity for South Africa' (n263).
[291] Rutovitz *South African Energy Sector Jobs to 2030* (n96) 10.
[292] Scenario Building Team *Long Term Mitigation Scenarios: Strategic Options for South Africa* (Technical Summary, Department of Environmental Affairs and Tourism) 2007.
[293] Edkins et al 'South Africa's Renewable Energy Policy Roadmaps' (n34).
[294] Ibid, 25.
[295] Marquard et al 'Costing a 2020 Target of 15% Renewable Electricity for South Africa' (n263) 33. See also Renewable Energy White Paper (n97) 44.

It is important that there be policy in place to promote RES-E.[296] In this regard, clear objectives and targets should be established.[297] In addition, any target for RES-E should be binding.[298] It is also submitted that such a target should be as ambitious as possible, and that it should be consistent with targets that have been considered in relevant studies, like those referred to in 3.3.4.3 above. Furthermore, priority grid access for RES-E is essential.[299]

The ability of independent power producers to access the grid must be facilitated with provision being made *inter alia* for generation licences, infrastructure to connect renewable energy plants to the existing infrastructure, as well as power purchase agreements of sufficient length.[300]

Enabling policies to support RES-E should also assist renewable energy developers in obtaining finance and successfully siting projects.[301] The development of renewable energy also requires the commitment of all sectors of society as well as political commitment.[302]

In this regard, it is important that the external costs of fossil fuel-generated electricity be internalised.[303] However, even if environmental externalities were to be included in electricity prices, renewable energy would generally still require financial support in order to 'achieve the necessary economies of scale, technological development and investor confidence'.[304] Once RETs 'become competitive and are driven by market forces alone', such financial support would no longer be required and should be phased out.[305]

An important consideration in the South African context, however, is that the present 'minerals-energy complex' plays an important role in South Africa's economy

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[296] See IPCC *Special Report on Renewable Energy Sources and Climate Change Mitigation* (n6) 9.
[297] J Lipp 'Lessons for Effective Renewable Electricity Policy from Denmark, Germany and the United Kingdom' 2007 (35) *Energy Policy* 5481-5495, 5493.
[298] Marquard et al 'Costing a 2020 Target of 15% Renewable Electricity for South Africa' (n263) 33.
[299] Singer *The Energy Report* (n26) 75.
[300] Renewable Energy White Paper (n97) 46-47.
[301] IPCC *Special Report on Renewable Energy Sources and Climate Change Mitigation* (n6) 23.
[302] Lipp 'Lessons for Effective Renewable Electricity Policy' (n297) 5493.
[303] Turkenburg 'Renewable Energy Technologies' (n24) 267.
[304] Renewable Energy White Paper (n97) 44.
[305] Ibid.

and exports and is an important source of local and international investment for the country.[306]

To the extent that an enabling environment for RES-E is created, '[w]ith the political will and South Africa's abundance of renewable energy resources, the country could become a renewable energy leader in Africa'.[307] In this regard, there is an opportunity for South Africa to 'leapfrog' over the developments of some developed countries. Indeed, rapidly industrialising countries such as China, Brazil, India and South Africa 'are becoming favourable theatres for innovation'.[308]

3.4 Concluding remarks

This chapter has provided a broad overview of energy and renewable energy. Even though renewable energy has important benefits, there are various barriers to its implementation, including that its initial costs are generally higher than those of fossil fuel-generated energy. In South Africa, coal accounts for the majority of the country's energy and electricity supplies, and has traditionally been very (unrealistically) cheap. This has acted as a significant barrier to renewable energy in the country.

This chapter has considered the potential role that could be played by renewable energy in South Africa's future energy supply. It was seen that the country has considerable renewable energy resources, especially solar energy, and that there is the potential for South Africa to become a leader in renewable energy. While the IRP 2010-2030 sees a larger role for RES-E in the future, it appears that the 'target' of 9 per cent contribution to electricity supply is relatively unambitious.

Elements that are considered necessary to create an enabling environment for RES-E in South Africa have been briefly outlined. In addition to legal or regulatory measures such as establishing an ambitious RES-E target and creating 'preferred grid access' for renewables, financial barriers need to be addressed.

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[306] Winkler *Cleaner Energy Cooler Climate* (n101) 33.

[307] F Adam, D Fig, D Gilbert, M Kantey, F Musana, N Schultz, M Steele, R Teule and S Thomas (for Greenpeace) *The True Cost of Nuclear Power in South Africa* available at http://www.greenpeace.org/africa/Global/africa/publications/The%20true%20cost%20of%20Nuclear%20Power%20in%20SA-Screen.pdf [accessed 8 August 2011] 28. See also Jefferson 'Energy Policies for Sustainable Development' (n249) 439.

[308] Jefferson 'Energy Policies for Sustainable Development' (n249) 439..

Chapter 4 now considers market-based instruments generally and discusses the rationale for their implementation. It also describes and discusses various market-based instruments that could be employed to support the uptake of RES-E.

Chapter 4

Market-based instruments

4.1 Introduction

Amongst other things, this chapter seeks to identify the instrument that has been the most effective in promoting renewable energy, and at a later stage (in Chapter 8) its implementation in the South African context will be discussed. The approach taken is to first discuss command-and-control instruments, including the reasons for their traditional dominance as well as their shortcomings (in 4.2). This chapter goes on to discuss environmental fiscal reform and the introduction of market-based instruments generally, as well as the reasons for their increasing prominence (in 4.3). It then describes market-based instruments that have been introduced to support renewable energy at the international level and discusses their effectiveness in this regard (in 4.4). While not directly concerned with renewable energy, this chapter also briefly considers carbon pricing (in 4.5).

4.2 Command-and-control instruments

'Command-and-control' approaches have traditionally been the dominant instruments for environmental regulation.[1] These instruments are regulatory in nature and 'operate by imposing mandatory obligations or restrictions on the behaviour of firms and individuals'.[2] Examples include: standards, (land) zoning,

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[1] The World Bank *Environmental Fiscal Reform: What Should be Done and How to Achieve It* 2005 available at http://www.unpei.org/PDF/policyinterventions-programmedev/EnvFiscalReform-whatshouldbedone.pdf [accessed 29 April 2011] 20, RN Stavins 'Experience with Market-Based Environmental Policy Instruments' 2001 (Discussion paper 01-58) (Resources for the Future) available at http://www.rff.org/documents/RFF-DP-01-58.pdf [accessed 29 April 2011] 40 and National Treasury: Tax Policy Chief Directorate *Draft Policy Paper: A Framework for Considering Market-Based Instruments to Support Environmental Fiscal Reform in South Africa* (April 2006) available at http://www.treasury.gov.za/public%20comments/Draft%20Environmental%20Fiscal%20Reform%20Policy%20Paper%206%20April%202006.pdf [accessed 10 May 2009] 44.

[2] R Perman, Y Ma, J McGilvray and M Common *Natural Resource and Environmental Economics* (3ed) 217.

quota restrictions, for example, with regard to the tonnage of fish that may be caught, permitting requirements, controls on technology and emissions permitting.[3]

Reasons for the dominance of command-and-control instruments include that they are considered to be more 'secure',[4] in that non-compliance with standards or other similar measures is prohibited and would lead to the imposition of sanctions. This arguably provides assurance that environmental objectives will be achieved.[5] This is in contrast to market-based instruments (MBIs), which are not compulsory in nature and do not prescribe mandatory objectives or standards, but rather incentivise 'environmentally friendly behaviour'[6] and disincentivise 'environmentally unfriendly behaviour'.[7] For example, it would be preferable to impose a complete ban on a toxic substance, rather than simply discourage its use through a product tax.[8]

Furthermore, command-and control instruments can be relatively simple to administer and monitor,[9] and there are 'a number of documented situations in which

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[3] It should be noted that with regard to standards, it is possible to distinguish broadly between technology-based and performance-based standards. Technology-based standards specify for example that specific equipment must be used, while performance-based standards specify for example the maximum amount of emissions allowed and leave 'the specific methods of achieving those levels up to regulated entities'. See JE Aldy and RN Stavins 'The Promise and Problems of Pricing Carbon: Theory and experience' 2012 (21) *Journal of Environment & Development* 152-180 at 154 and RN Stavins 'Experience with Market-Based Environmental Policy Instruments' in K-G Mäler and JR Vincent *Handbook of Environmental Economics* (Vol 1) 2003, 358.

[4] United Nations Environment Programme *The Use of Economic Instruments in Environmental Policy: Opportunities and Challenges* 2004 available at http://www.unep.ch/etb/publications/EconInst/econInstruOppChnaFin.pdf [accessed 29 April 2011] 27.

[5] See for example JP Barde *Economic Instruments in Environmental Policy: Lessons from the OECD Experience and their Relevance to Developing Economies* (Working Paper No. 92) (OECD Development Centre) 1994 available at http://www.oecd-ilibrary.org/docserver/download/5lgsjhvj7f35.pdf?expires=1367830740&id=id&accname=guest&checksum=6523C657FB8B4C3C034A0352BE2662BE [accessed 12 March 2012] 8. See also BS Fisher, S Barrett, P Bohm, M Kuroda, JKE Mubazi, A Shah and RN Stavins 'An Economic Assessment of Policy Instruments for Combating Climate Change' in JP Bruce, H Lee and EF Haites (eds) *Climate Change 1995: Economic and Social Dimensions of Climate Change* (Contribution of Working Group III to the Second Assessment Report of the Inter-governmental Panel on Climate Change) 429.

[6] See Barde *Economic Instruments in Environmental Policy* (n5) 13.

[7] Thus, with regard to renewable energy, a command-and-control instrument might prescribe renewable energy technologies or the amount of renewable energy that must be implemented by firms; while a market-based instrument, such as a tradable renewable energy certificate scheme (discussed in 4.4.1.2) or the feed-in tariff (discussed in 4.4.1.1) would merely provide an incentive to generate renewable energy.

[8] D O' Connor 'Applying Economic Instruments in Developing Countries: From theory to implementation' 1996 (OECD Development Centre) available at http://web.idrc.ca/uploads/user-S/10536145810ACF2AE.pdf [accessed 30 May 2009] 1.

[9] See DH Cole and PZ Grossman 'When is Command-and-Control Efficient? Institutions, technology, and the comparative efficiency of alternative regulatory regimes for environmental protection' 1999 *Wisconsin Law Review* 887-938, 904.

regulatory standards have worked well'.[10] For example, a law may prescribe that firms must implement a certain technology to reduce carbon emissions (command-and-control). Alternatively, government may implement a carbon tax in respect of carbon emissions emitted over a certain level (a market-based approach). The latter would require the continuous monitoring of emissions to determine whether a firm has emitted above the relevant level (and if so, the tax due), while compliance with the former could be established by simply visiting the relevant firm to determine whether the technology has actually been implemented.[11] While this example does not take into account which instrument would be more effective in reducing carbon, the former would arguably be preferable in certain contexts, for instance, where firms or countries do not have sophisticated monitoring technology or systems in place.[12]

The implementation of uniform standards (regarding either pollution reduction or technologies) would arguably also be relatively simple to administer as they involve the uniform treatment of all firms or individuals. It has also been noted that industry tends to prefer direct regulation to incentive measures,[13] *inter alia* because 'firms may have greater influence over the specifics of uniform standards'.[14]

However, it has been argued that 'inappropriate over-reliance has traditionally been placed on the command-and-control approach to regulation',[15] and various problems have been identified with regard to these instruments. It has *inter alia* been recognised that the imposition of uniform pollution standards can be inflexible and lead to inefficiencies. This is because 'the efficient pollution level will vary from case to case'.[16] This means that while one firm might be able to comply with a pollution

[10] S Gupta, DA Tirpak, N Burger, J Gupta, N Hohne, AI Boncheva, GM Kanoan, C Kolstad, JA Kruger, A Michaelowa, S Murase, J Pershing, T Saijo and A Sari 'Policies, Instruments and Co-operative Agreements' in B Metz, OR Davidson, PR Bosch and LA Meyer (eds) *Climate Change 2007: Mitigation* (Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change) 754.

[11] Indeed, it has been noted that '[o]ne reason for the prevalence of minimum technology requirements as a pollution control instrument may be that those costs are low relative to those of instruments that try to regulate emissions output levels'. See Perman et al *Natural Resource and Environmental Economics* (n2) 236.

[12] Cole and Grossman 'When is Command-and-Control Efficient?' (n9) 905.

[13] Fisher et al 'An Economic Assessment of Policy Instruments for Combating Climate Change' (AR2) (n5) 429.

[14] Ibid. See also UNEP *The Use of Economic Instruments in Environmental Policy* (n4) 27.

[15] A Paterson 'Incentive-based Measures' in A Paterson and LJ Kotze (eds) *Environmental Compliance and Enforcement in South Africa* 2009, 306.

[16] M Faure and S Ubachs 'Comparative benefits and optimal use of environmental taxes' in J Milne, K Deketelaere, L Kreiser and H Ashiabor *Critical Issues in Environmental Taxation: International and*

standard relatively easily and cheaply, it might be far more difficult and expensive for another firm to comply with the same standard.[17] If standards are applied uniformly, without adapting them to the specific circumstances of a firm, this can increase costs 'without improving environmental effectiveness'.[18] On the other hand, environmental effectiveness could be improved, for example, by allowing a firm that must comply with an emissions standard (command-and-control) to buy emission credits (a market-based approach) from a firm that is able to reduce its pollution more easily and cheaply than the former.

Furthermore, once compliance with a pollution standard has been achieved, there is no incentive to reduce pollution further[19] or to adopt new, more efficient technologies.[20] For example, a law may provide that sulphur dioxide emissions may not exceed five grams per 100 grams and prescribe a fine in the case that this standard is violated. Once a firm complies with this standard, there is no incentive to reduce emissions below five grams per 100 grams and emissions below the standard 'are essentially free for the polluter'.[21]

Implementation of command-and-control instruments may actually be more complex than originally thought due to the fact that a mature and corruption-free government is required for their enforcement.[22] It has also been argued that implementation of command-and-control instruments is expensive and resource-intensive.[23] Finally, and importantly, command-and-control instruments 'fail … to remedy market failure to account for the use of environmental goods and services such as soil, air, water, fauna, flora and broader ecosystems'.[24]

Comparative Perspectives (Vol 1) 2003, 30. See also Stavins 'Experience with Market-Based Environmental Policy Instruments' 2001 (n1) 2.

[17] See N Bruce and GM Ellis 'Environmental Taxes and Policies for Developing Countries' *Policy Research Working Paper Series* (World Bank) available at http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/1993/09/01/000009265_3961005091708/Rendered/PDF/multi_page.pdf [accessed 29 April 2011] 28 and Stavins 'Experience with Market-Based Environmental Policy Instruments' 2003 (n3) 358.

[18] Gupta et al 'Policies, Instruments and Co-operative Agreements' (AR4) (n10) 754.

[19] See for instance World Bank *Environmental Fiscal Reform* (n1) 20.

[20] Stavins 'Experience with Market-Based Environmental Policy Instruments' 2001 (n1) 2. See also Gupta et al 'Policies, Instruments and Co-operative Agreements' (AR4) (n10) 754.

[21] UNEP *The Use of Economic Instruments in Environmental Policy* (n4) 27.

[22] Ibid.

[23] Paterson 'Incentive-based Measures' (n15) 306. See also Barde *Economic Instruments in Environmental Policy* 1994 (n5) 9.

[24] Paterson 'Incentive-based Measures' (n15) 307. Market failure is discussed further below.

4.3 Environmental fiscal reform and market-based instruments

While command-and-control instruments are still dominant,[25] there has been a move internationally towards 'environmental fiscal reform', which has been implemented in a number of European Union (EU) countries including Sweden, Denmark, Germany, the United Kingdom (the UK), Estonia and the Czech Republic.[26] Environmental fiscal reform can be described as

> 'a range of taxation or pricing instruments that can raise revenue, while simultaneously furthering environmental goals. This is achieved by providing economic incentives to correct market failure in the management of natural resources and the control of pollution'.[27]

Environmental fiscal reform essentially involves the implementation of environmentally-related fiscal instruments. A number of terms have been used, sometimes interchangeably, to describe such instruments including 'economic instruments', 'market-based instruments' and 'economic incentives'.

In the context of pollution, 'market-based instruments' have been defined as 'regulations that encourage behavior through market signals rather than through explicit directives regarding pollution control levels or methods',[28] and furthermore as 'a group of policy instruments that seek to correct environmentally-related market failures through the price mechanism'.[29] Examples include tax benefits, direct

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[25] World Bank *Environmental Fiscal Reform* (n1) 20 and Stavins 'Experience with Market-Based Environmental Policy Instruments' 2001 (n1) 40.
[26] S Speck and D Gee 'Implications of Environmental Tax Reforms: Revisited' in L Kreiser, J Sirisom, H Ashiabor and JE Milne (eds) *Environmental Taxation and Climate Change: Achieving Environmental Sustainability through Fiscal Policy* (Critical Issues in Environmental Taxation: Volume X) 2011, 20.
[27] World Bank *Environmental Fiscal Reform* (n1) 1. See generally Speck and Gee 'Implications of Environmental Tax Reforms' (n26).
[28] Stavins 'Experience with Market-Based Environmental Policy Instruments' 2001 (n1) 1.
[29] National Treasury: Tax Policy Chief Directorate *Draft Policy Paper: A Framework for Considering Market-Based Instruments to Support Environmental Fiscal Reform in South Africa* (April 2006) available at http://www.treasury.gov.za/public%20comments/Draft%20Environmental%20Fiscal%20Reform%20Policy%20Paper%206%20April%202006.pdf [accessed 10 May 2009] 2.

subsidies, emission charges or taxes, tradable (pollution) permits, user charges and product taxes.[30]

This research uses the term 'market-based instruments' in order to emphasise the impact of the instruments discussed herein on the market. The term 'market-based instruments' (MBIs) is used in a wide sense to include *those instruments that are concerned with promoting environmental objectives and that are economic or financial in nature and have an impact on the market*. The decision to use this term is strengthened by the recognition that climate change is the world's greatest market failure.[31]

It should be noted that there is a distinction between price and quantity instruments.[32] 'Quantity instruments' refer to instruments for which the quantity is prescribed by government and the price is determined by the market, such as carbon trading and the trading of renewable energy certificates. On the other hand, 'price instruments' refer to instruments for which the price is determined by government and the quantity is determined by the market, including carbon taxes and feed-in tariffs.[33] All of these instruments are considered in detail below.

Despite the dominance of command-and-control instruments,[34] more attention is being paid to MBIs as it is increasingly being recognised that they may provide an efficient, flexible and cheaper way to control pollution,[35] when used alongside

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[30] See Paterson 'Incentive-based Measures' (n15) 300-304 for further examples of market-based instruments.

[31] ''Executive Summary' *Stern Review: The Economics of Climate Change* 2006 available at http://news.bbc.co.uk/1/shared/bsp/hi/pdfs/30_10_06_exec_sum.pdf [last accessed 19 August 2012] i.

[32] See for example ML Weitzman 'Prices vs. Quantities' 1974 (41) *The Review of Economic Studies* 477-491 and P Menanteau, D Finon and M-L Lamy 'Prices versus Quantities: Choosing policies for promoting the development of renewable energy' 2003 (31) *Energy Policy* 799-812.

[33] It appears that quantity instruments are more readily considered 'market-based' than price instruments. See for example A Baranzini, J Goldenberg and S Speck 'A Future for Carbon Taxes: Survey' 2000 (32) *Ecological Economics* 395-412, 396. It has also been noted that while both fixed price systems (such as feed-in tariffs) and renewable energy certificate systems 'use the market mechanism to set quantity or price … both are only pseudo-markets, because governments set the other parameter: price or quantity'. See NI Meyer and AI Koefoed 'Danish Energy Reform: Policy implications for renewables' 2003 (31) *Energy Policy* 597-607, 598. It has also been noted that in an 'environment of complete knowledge and perfect certainty' there would not be any difference between using prices or quantities as 'planning instruments'. See Weitzman 'Prices vs. Quantities' (n32) 480.

[34] World Bank *Environmental Fiscal Reform* (n1) 20 and Stavins 'Experience with Market-Based Environmental Policy Instruments' 2001 (n1) 40.

[35] National Treasury 'Reducing Greenhouse Gas Emissions: The Carbon Tax Option' *Discussion Paper for Public Comment* (December 2010) available at http://www.treasury.gov.za/public%20comments/Discussion%20Paper%20Carbon%20Taxes%20812

command-and-control instruments.[36] Furthermore, MBIs 'achieve improved environmental outcomes through the market by altering the relative prices that individuals and firms face'.[37] The role of MBIs has also increased in South Africa, as discussed in Chapter 7 below.

The rationale for the implementation of MBIs is considered in more detail in the following section. Thereafter, this chapter *inter alia* considers the advantages of MBIs (in 4.3.2) as well as specific market-based instruments (in 4.4 and 4.5).

4.3.1 Economic rationale for the introduction of MBIs

Historically, natural resources have been exploited with no regard to the consequences of such exploitation, including depletion of natural resources and adverse impacts on the environment and human health. This situation has come about because the environment and environmental quality have not traditionally been conceived of as having any economic value.[38]

In the context of energy specifically, this results in externalities, which arise when

> 'certain environmental costs of production are not reflected in the market cost of the commodity (in this case, energy). To the extent that the ultimate consumer of these products does not pay these costs, or does not compensate people for harm done to them, they do not face the full cost of the services they purchase (i.e. implicitly their energy use is being subsidised) and thus energy resources will not be allocated efficiently'.[39]

10.pdf [accessed 15 December 2010] 4-5. See also Stavins 'Experience with Market-Based Environmental Policy Instruments' 2001 (n1) 3 and UNEP *The Use of Economic Instruments in Environmental Policy* (n4) 22-23.

[36] See for example UNEP *The Use of Economic Instruments in Environmental Policy* (n4) 19. See also Paterson 'Incentive-based Measures' (n15) 299.

[37] MBI Policy Paper (n29) 44.

[38] See Bruce and Ellis 'Environmental Taxes and Policies for Developing Countries' (n17) 12, who suggest that environmental quality should be thought of as an 'economic good' and harm caused to the environment by economic activities as 'an input or cost into those activities'. See also MBI Policy Paper (n29) 22.

[39] AD Owen 'Renewable Energy: Externality costs as market barriers' 2006 (34) *Energy Policy* 632-642, 633-634. See also JN Blignaut and NA King 'The Externality Cost of Coal Combustion in South Africa' (paper presented at the first annual conference of the Forum for Economics and Environment) 2002, Cape Town available at

When resources are not allocated efficiently, this results in a market failure – which can be resolved by including environmental and social costs in the market prices of goods and services (through MBIs) so that external costs are internalised, which is necessary 'for the optimal allocation of resources'.[40]

With regard to renewable energy specifically, it has been noted that

> '[w]ithout government support to stimulate technological change, market forces alone would result in less than optimal diffusion of renewable sources… As long as negative externalities of fossil fuel use are not internalized in its prices there is a strong case for government intervention in energy markets'.[41]

4.3.2 Advantages of MBIs

The advantages of MBIs that are discussed in the literature are generally discussed in relation to pollution control. However, these can provide lessons with regard to the MBIs that could be used to promote renewable energy.

A significant advantage of MBIs, in the context of pollution, is that they provide more flexibility 'by allowing polluters to allocate pollution reductions more heavily where they are less expensive to achieve', which reduces the costs of compliance.[42] This is referred to as 'static efficiency'.[43] One study estimated that the use of

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http://www.elaw.org/system/files/Economic%20costs%20of%20coal%20combustion%20in%20RSA.pdf [accessed 6 June 2011].

[40] K Brick and M Visser 'Green Certificate Trading' 2009 Energy Research Centre, University of Cape Town available at http://www.erc.uct.ac.za/Research/publications/09Brick-Visser_Green_certificate_trading.pdf [accessed 7 July 2011] 2. It has also been noted that '[l]eft to their own devices, free markets in energy services do not always work effectively … [and that] [i]n particular, they do not take account of any social and environmental benefits and costs that might be associated with certain types of energy activities. Consequently, there is a role for governments to intervene in energy markets in pursuit of social and environmental objectives…'. See United Nations Environment Programme (UNEP) *Reforming Energy Subsidies: Opportunities to Contribute to the Climate Change Agenda* 2008 available at http://www.unep.org/pdf/pressreleases/reforming_energy_subsidies.pdf [accessed 8 April 2013] 22. See also MBI Policy Paper (n29) 22.

[41] K Jordan-Korte *Government Promotion of Renewable Energy Technologies* 2011, 49-50. See also Menanteau et al 'Prices versus Quantities' (n32) 800 who note that such government support can be justified on the basis of 'correcting negative externalities resulting from the use of fossil fuels and of achieving dynamic efficiency by stimulating technical change.

[42] UNEP *The Use of Economic Instruments in Environmental Policy* (n4) 12 and 22-23. See also World Bank *Environmental Fiscal Reform* (n1) 20 and Bruce and Ellis 'Environmental Taxes and Policies for Developing Countries' (n17) iii.

[43] MBI Policy Paper (n29) 8.

incentive-based measures in the United States of America (the USA) generated a saving of US$ 11 billion in 1992, compared to command-and-control measures.[44]

MBIs could be used to provide more flexibility in the context of renewable energy specifically. For example, a government might prescribe that ten per cent of the energy needs of all firms must be generated from renewable energy sources (command-and-control), with no regard to the ability of different firms to comply with this requirement. However, an MBI, such as the trading of renewable energy certificates, would provide flexibility in complying with this requirement, as firms could opt to buy renewable energy certificates if this was cheaper than actually investing in renewable energy.

A further benefit is that MBIs may raise revenue, which can be valuable in developing countries.[45] It should be noted however that economic instruments (market-based and financial) are

> 'not "just another tax". Indeed, in some cases they involve no taxation at all. Their purpose may be to change the relative prices of goods and services and thereby to change behaviour, not necessarily to raise revenue'.[46]

While both command-and-control measures and MBIs require monitoring and enforcement, it has been argued that many MBIs encourage more transparency than command-and-control measures *inter alia* through trading levels and fee receipts.[47]

In contrast to command-and-control instruments, MBIs incentivise pollution reduction beyond a uniform standard. In particular, environmentally-related taxes provide polluters with an ongoing incentive to reduce emissions, since 'every unit of

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[44] RW Hahn 'The Impact of Economics on Environmental Policy' 2000 (39) *Journal of Environmental Economics and Management* 375-399, 382. See also UNEP *The Use of Economic Instruments in Environmental Policy* (n4) 22.
[45] Bruce and Ellis 'Environmental Taxes and Policies for Developing Countries' (n17) 42-43. Also see World Bank *Environmental Fiscal Reform* (n1) 17-18 and 20.
[46] SA Joseph 'Why should there Always be a Loser in Environmental Taxation?' in L Kreiser, J Sirisom, H Ashiabor and JE Milne (eds) *Environmental Taxation and Climate Change: Achieving Environmental Sustainability through Fiscal Policy* (Critical Issues in Environmental Taxation: Volume X) 2011, 64.
[47] UNEP *The Use of Economic Instruments in Environmental Policy* (n4) 24.

emission that is not emitted saves money for the company'.[48] This is referred to as 'dynamic efficiency'.[49]

Four primary criteria for assessing environmental policy instruments generally have been identified, namely environmental effectiveness, cost-effectiveness, distributional considerations and institutional feasibility.[50] While these will not be discussed specifically here, these have been touched on above. For example, it has been seen that in many cases market-based instruments are more cost-effective than command-and-control instruments.

It is generally agreed that MBIs should not replace command-and control instruments and that they should be implemented in conjunction with regulatory or command-and-control approaches.[51]

4.3.3 The role of subsidies

Subsidies generally refer to 'all measures that keep prices for consumers below market level or keep prices for producers above market level or that reduce costs for consumers and producers by giving direct or indirect support'.[52]

Attention must be paid to the impacts of subsidies paid to fossil fuel industries, which are negative or 'perverse'. Internationally, there are many subsidies in place for polluting and energy-intensive activities and subsidies for fossil fuels grew to US$523 billion in 2011.[53] In the South African context, government provides

[48] SR Goers, AF Wagner and J Wegmayr 'New and Old Market-Based Instruments for Climate Change Policy' 2010(12) *Environmental Economics and Policy studies* 1-30, 22. With regard to emissions trading '[e]very unit of emission a company does not emit provides an additional certificate saleable on the market'. At 22. See also World Bank *Environmental Fiscal Reform* (n1) 20.
[49] MBI Policy Paper (n29) 8.
[50] Gupta et al 'Policies, Instruments and Co-operative Agreements' (AR4) (n10) 751.
[51] See for example, Stavins 'Experience with Market-Based Environmental Policy Instruments' 2001 (n1) 40, World Bank *Environmental Fiscal Reform* (n1) 17 and UNEP *The Use of Economic Instruments in Environmental Policy* (n4) 19.
[52] De Moor (2001) op cit C Riedy and M Diesendorf 'Financial Subsidies to the Australian Fossil Fuel Industry' 2003 (31) *Energy Policy* 125-137, 126. See also UNEP *Reforming Energy Subsidies* (n40) 11.
[53] International Energy Agency 'Executive Summary' *World Energy Outlook 2012* 2012 available at http://www.iea.org/publications/freepublications/publication/English.pdf [accessed 29 May 2013] 1.

'significant incentives for investment in energy-intensive industries … [which] are still an important source of employment, investment and income for the country'.[54]

While (negative) subsidies are not externalities they cause economic inefficiency, which may manifest in several ways, including by causing increased energy consumption due to decreased incentives to conserve energy (because energy is cheaper), reducing the incentive for energy generators to decrease their costs by 'cushioning them from competitive market pressures', exhausting government revenue, as well as undermining the 'development and commercialisation of other technologies that might ultimately become more economically (as well as environmentally) attractive'.[55]

Furthermore, as noted above (in 3.2.2.3), subsidies lead to 'lock-in' situations.[56] It has also been argued that subsidies that are intended to benefit the poor actually benefit energy companies and wealthier households, to the detriment of the poor[57] and that they tend to extend 'inefficiency and harmful emissions throughout the energy chain'.[58]

There have thus been calls for such subsidies to be removed, even in the face of opposition from powerful interest groups and the public.[59] The importance of removing subsidies in developing countries in particular has been noted,[60] as well as

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[54] H Winkler and A Marquard 'Changing Development Paths: From an energy-intensive to low-carbon economy in South Africa' 2009 (1) *Climate and Development* 47-65, 62.

[55] UNEP *Reforming Energy Subsidies* (n40) 15-16. See also World Bank *Environmental Fiscal Reform* (n1) 34-36; JP Barde 'Environmental Taxes in OECD Countries: An overview' in OECD *Environmental Taxes: Recent Developments in China and OECD Countries* 1999, 20 and Fisher et al 'An Economic Assessment of Policy Instruments for Combating Climate Change' (AR2) (n5) 409.

[56] World Bank *Environmental Fiscal Reform* (n1) 97. See also Winkler and Marquard 'Changing Development Paths' (n54) 58. In South Africa, the government estimated that (using 2004 values) the cost of 'stranding' a 3600MW coal-fired power plant would be R3 billion and that it would cost R40 billion to replace this with a similar coal-fired power plant. See Department of Environmental Affairs and Tourism *A National Climate Change Response Strategy for South Africa* 2004 available at http://unfccc.int/files/meetings/seminar/application/pdf/sem_sup3_south_africa.pdf [accessed 10 April 2008] 23.

[57] UNEP *Reforming Energy Subsidies* (n40) 17.

[58] M Jefferson 'Energy Policies for Sustainable Development' in United Nations Development Programme, United Nations Department of Economic and Social Affairs and World Energy Council *World Energy Assessment: Energy and the Challenge of Sustainability* 2000, 425.

[59] A Pegels 'Renewable Energy in South Africa: Potentials, barriers and options for support' 2010 (38) *Energy Policy* 4945-4954, 4949-4950.

[60] Bruce and Ellis 'Environmental Taxes and Policies for Developing Countries' (n17) 56.

the fact that subsidies should be removed before considering the implementation of environmentally-related taxes.[61]

Removing subsidies 'would send market signals to consumers and encourage more rational use and valuation of power resources'.[62] It would also promote competition in the electricity industry by removing the advantage enjoyed by nuclear and fossil fuel industries.[63] Furthermore, removing subsidies would lead to government revenue becoming available, which could be used to fund other programmes.[64] It has also been shown that eliminating subsidies that promote fossil fuels would significantly reduce carbon dioxide emissions.[65]

Reforming fossil fuel subsidies would of course encounter great resistance and would be difficult politically. However, policymakers could introduce measures to overcome the resistance and to reduce any hardship such as ensuring that subsidy reform takes place gradually.[66]

4.3.4 The South African context

As noted above, the South African government has started to consider the introduction of market-based instruments, which was evidenced by the publication of the Draft Policy Paper: A Framework for Considering Market-Based Instruments to Support Environmental Fiscal Reform in South Africa in 2006.[67] Government has also specifically recognised that MBIs are capable of promoting renewable energy and reducing greenhouse gas (GHG) emissions in South Africa,[68] and a number of

[61] World Bank *Environmental Fiscal Reform* (n1) 37 and Barde 'Environmental Taxes in OECD Countries' (n55) 21. It has also been noted that '[p]hasing out fossil fuel subsidies can represent significant progress toward "getting prices right" for fossil fuel consumption, especially in some developing countries, where subisides are particularly large'. See Aldy and Stavins 'The Promise and Problems of Pricing Carbon' (n3) 161.
[62] BK Sovacool 'The Importance of Comprehensiveness in Renewable Electricity and Energy-Efficiency Policy' 2009 (37) *Energy Policy* 1529-1541, 1533.
[63] Ibid.
[64] Ibid, 1534.
[65] Stavins 'Experience with Market-Based Environmental Policy Instruments' 2001 (n1) 40.
[66] See UNEP *Reforming Energy Subsidies* (n40) 27.
[67] MBI Policy Paper (n29).
[68] Carbon Tax Discussion Paper (n35) 25-26 and Department of Minerals and Energy *White Paper on the Renewable Energy Policy of the Republic of South Africa* GNR 513 in *Government Gazette* No. 26169 dated 14 May 2004, 44-46.

MBIs that are concerned with promoting renewable energy have been introduced in recent years. These are discussed fully in Chapter 7.

Specific market-based instruments will now be considered in more detail and reference will also be made to international experience with some of these instruments. It has been noted that more than one policy instrument is usually required to effectively promote investment in renewable energy.[69]

4.4 Market-based instruments that are of relevance to renewable energy

There are a number of MBIs that could promote the uptake of renewable energy (whether directly or indirectly), including direct subsidies, feed-in tariffs, tradable renewable energy certificates, tax incentives, emissions charges and taxes and product taxes. This section is concerned with considering those MBIs that are directly relevant to the promotion of renewable energy.

Internationally, feed-in tariffs and the renewable obligation, combined with tradable renewable energy certificates, have been the most widely implemented.[70] The feed-in tariff appears to be most popular in European countries while the renewable portfolio standard or renewable obligation is preferred in the USA and UK.[71] For this reason both the feed-in tariff and renewable obligation will be described here. Due to the fact that renewables tendering has been implemented in South Africa, this will also be described below. Furthermore, a number of 'secondary'

[69] M Ragwitz, A Held, G Resch, T Faber, R Haas, C Huber, PE Morthorst, SG Jensen, R Coenraads, M Voogt, G Reece, I Konstantinaviciute and B Heyder *OPTRES: Assessment and Optimisation of Renewable Energy Support Schemes in the European Electricity Market* (Final Report) 2007 available at http://www.optres.fhg.de/OPTRES_FINAL_REPORT.pdf [accessed 11 July 2011] 4.

[70] See J Lipp 'Lessons for Effective Renewable Electricity Policy from Denmark, Germany and the United Kingdom' 2007 (35) *Energy Policy* 5481-5495, 5481.

[71] It has been observed that while the renewable obligation and feed-in tariff are generally contrasted, they appear to be converging. However, an important difference remains that the feed-in tariff features more government involvement, while the renewable obligation (combined with tradable renewable energy certificates) 'relies more on market forces'. NH van der Linden, MA Uyterlinde, C Vrolijk, LJ Nilsson, J Khan, K Astrand, K Ericsson and R Wiser *Review of International Experience with Renewable Energy Obligation Support Mechanisms* 2005 (Energieonderzoek Centrum Nederland) available at http://eetd.lbl.gov/ea/ems/reports/57666.pdf [accessed 25 August 2011] 8.

or supporting MBIs, which play a less central role in countries' strategies to promote renewable energy will be briefly outlined.

4.4.1 Primary instruments

4.4.1.1 Feed-in tariffs

The (renewable energy) feed-in tariff (FIT) enjoys strong support globally and by early 2013 some form of FIT policy had been implemented in 71 countries and 28 states or provinces.[72]

Under the FIT, renewable energy generators receive a guaranteed rate for their electricity from government.[73] Rates or tariffs are usually differentiated with reference to the renewable energy technology (RET) and the size of the relevant project.[74] Thus, generators would receive different rates per kilowatt hour, depending on whether they are producing energy from wind, solar, biomass or hydro. It is important that the period for which the rate is received 'cover[s] a significant proportion of the working life of the installation' and that this period is established in law.[75] An obligation is usually imposed on grid operators (or suppliers) to buy renewable energy from renewable energy generators.[76] In some jurisdictions, such as Spain, renewable energy generators are provided with the option of receiving a premium on top of the market price of electricity, instead of a fixed tariff.[77]

There are a number of arguments for and against the FIT. Those opposed to the FIT argue that the FIT does not promote competition as it does not encourage

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[72] Renewable Energy Policy Network for the 21st Century (REN21) *Renewables 2013: Global Status Report* available at http://www.ren21.net/Portals/0/documents/Resources/GSR/2013/GSR2013_lowres.pdf [accessed 14 June 2013] 72.
[73] Lipp 'Lessons for Effective Renewable Electricity Policy' (n70) 5482.
[74] M Mendonça *Feed-In Tariffs: Accelerating the Deployment of Renewable Energy* 2007, 8.
[75] Ibid.
[76] Ragwitz et al *OPTRES Report* (n69) 100.
[77] For more information see A Held, M Ragwitz, G Resch, F Nemac and K Vertin *Feed-In Systems in Germany, Spain and Slovenia – A comparison* 2010 (Fraunhofer ISI, Energy Restructuring Agency and Energy Economics Group) available at http://www.feed-in-cooperation.org [accessed 25 May 2011] 8.

renewable energy generators to generate electricity at least cost due to the fixed prices.[78] Furthermore, it is argued that the FIT encourages more government intervention, which is not considered to be desirable.[79] In addition, the failure to set tariffs at appropriate levels, or to revise tariffs could lead to consumers paying unreasonably high prices[80] and producers earning windfall profits.[81] Importantly, if the price rather than the quantity of renewable energy is prescribed, it is not possible to know beforehand the amount of renewable energy that will be taken up.[82]

However, with regard to concerns around competition, it has been argued that renewable energy generators have an interest in keeping costs low and using the most cost-effective components, which has pushed technology costs down.[83] In addition, it has been shown that there was more competition among the producers of wind turbines under the FIT (in Germany) than under both the renewable obligation and renewables tendering (in the UK).[84]

Furthermore, a general feature of the FIT is degression, which means that tariffs are decreased by a certain amount per year, on the basis that as experience is gained and RETs become more mature, their costs will decrease.[85] As discussed earlier, this is due to the phenomenon known as ‘learning effects’.[86] Because tariffs are progressively reduced, this would incentivise renewable energy developers to seek cheaper means of production in order to remain profitable.[87] As prices are decreased by the relevant authority, this will lead to decreased costs for consumers. Furthermore, the FIT has relatively low administration and transaction costs, and thus does not impose high costs on society.[88]

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[78] Lipp ‘Lessons for Effective Renewable Electricity Policy’ (n70) 5483.
[79] Ibid.
[80] Mendonça *Feed-In Tariffs* (n74) 13.
[81] Van der Linden et al *Review of International Experience with Renewable Energy Obligation Support Mechanisms* (n71) 13.
[82] Ibid, 11.
[83] Lipp ‘Lessons for Effective Renewable Electricity Policy’ (n70) 5483.
[84] L Butler and K Neuhoff ‘Comparison of Feed-In Tariff, Quota and Auction Mechanisms to Support Wind Power Development’ 2008 (33) *Renewable Energy* 1854-1867, 1864-1865.
[85] For instance, digression rates for renewable energy technologies in Germany vary from 1 per cent to 6.5 per cent per year. Mendonça *Feed-In Tariffs* (n74) 35. See also Ragwitz et al *OPTRES Report* (n69) 49.
[86] National Energy Regulator of South Africa *South Africa Renewable Energy Feed-In Tariff (REFIT): Regulatory Guidelines* in GN 382 in *Government Gazette* 32122 dated 17 April 2009, 28.
[87] J Prest ‘The Future of Feed-in Tariffs: Capacity caps, scheme closures and looming grid parity’ 2012 (1) *Renewable Energy Law and Policy Review* 25-41, 36.
[88] REFIT Regulatory Guidelines (n86) 27-28. See also Mendonça *Feed-In Tariffs* (n74) 13.

While the FIT has 'a reputation for being inherently "expensive"', feed-in tariffs are flexible and can be applied in different ways and thus will not necessarily 'be "expensive" from the point of view of ratepayers'.[89]

Another advantage of the FIT is that because it provides differentiated tariffs for different renewable energy technologies, it encourages the development of all RETs (that are included in the relevant FIT programme), as opposed to simply encouraging investment in the cheapest technologies.[90] The FIT can also promote the development of a local renewable energy industry, which may lead to many opportunities including job creation.[91]

The most important advantage of the FIT is that, through providing fixed, guaranteed prices, it provides certainty and security to renewable energy generators, which is necessary to encourage investment and growth in the renewable energy industry.[92] In this regard, it is significant that construction of wind plants in Denmark was brought 'almost to a halt' when a move to the renewable obligation (discussed in 4.4.1.2) was announced.[93]

The FIT has been implemented as the main instrument to support the promotion of electricity generated from renewable energy sources (RES-E) in 20 of the 27 EU countries,[94] and FITs have been responsible for 93 per cent of onshore wind capacity and almost all of solar PV capacity installed in Europe until the end of 2010.[95] Furthermore, feed-in tariffs are the most common type of renewable energy

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[89] W Rickerson, C Laurent, D Jacobs, C Dietrich and C Hanley *Feed-in Tariffs as a Policy Instrument for Promoting Renewable Energies and Green Economies in Developing Countries* 2012 (United Nations Environment Programme) available at www.unep.org/pdf/UNEP_FIT_Report_2012F.pdf [accessed 28 March 2013] viii.
[90] See Lipp 'Lessons for Effective Renewable Electricity Policy' (n70) 5483. See also REFIT Regulatory Guidelines (n86) 28.
[91] REFIT Regulatory Guidelines (n86) 27.
[92] Lipp 'Lessons for Effective Renewable Electricity Policy' (n70) 5483. See also REFIT Regulatory Guidelines (n86) 27.
[93] V Lauber 'REFIT and RPS: Options for a harmonised Community framework' 2004 (32) *Energy Policy* 1405-1414, 1409. See also Ragwitz et al *OPTRES Report* (n69) 36 and Lipp 'Lessons for Effective Renewable Electricity Policy' (n70) 5487.
[94] A Klein, E Merkel, B Pfluger, A Held, M Ragwitz, G Resch and S Busch (Fraunhofer ISI and Energy Economics Group) *Evaluation of Different Feed-in Tariff Design Options – Best practice paper for the International Feed-In Cooperation* 2010 available at http://www.feed-in-cooperation.org/wDefault_7/content/research/index.php [accessed 5 September 2011] 7.
[95] M Ragwitz, J Winkler, C Klessmann, M Gephart and G Resch (Fraunhofer ISI, Ecofys and Energy Economics Group) *Recent Developments of Feed-in Systems in the EU – A research paper for the International Feed-In Cooperation* 2012 available at http://www.feed-in-cooperation.org/wDefault_7/content/research/index.php [accessed 28 March 2013] 6.

policy implemented in developing countries, although they are often combined with other policies.[96]

Germany is widely considered to be the largest success story with regard to the deployment of renewable energy through the feed-in tariff. Indeed,

> '[d]espite modifications and improvements to the details of the policy, the German framework … has fostered a high level of investor certainty by framing its FIT policy as a central part of a long-term strategy to meet its overall objectives'.[97]

However, the FIT has not been successful everywhere and has not led to much renewable energy deployment in jurisdictions such as Greece and Finland.[98] The design of the instrument is therefore important and there are various elements that governments should consider, including the level of support (the tariffs) that will be provided as well as the duration of such support. Governments should also consider how often the tariffs will be reviewed or revised,[99] whether tariffs will be differentiated within renewable energy technology categories to take account of different plant sizes or levels of wind or solar radiation (a 'stepped tariff'),[100] whether there will be tariff degression and the rate thereof,[101] whether renewable energy generators should be required to forecast and report in advance how much electricity they will supply to the grid[102] and whether generators will have the option of choosing between a fixed tariff and a premium.

It has been noted above that a feed-in tariff for renewable energy (the REFIT) was introduced in South Africa in 2009.[103] While it was replaced by a renewables tendering programme before really getting off the ground, both the REFIT and the

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[96] Rickerson et al *Feed-in Tariffs in Developing Countries* (n89) 14.
[97] TD Couture, K Cory, C Kreycik and E Williams *A Policymaker's Guide to Feed-in Tariff Policy Design* (for the national Renewable Energy Laboratory, US Department of Energy) 2010 available at http://www.nrel.gov/docs/fy10osti/44849.pdf [accessed 24 April 2012] 11.
[98] See D Reiche and M Bechberger 'Policy Differences in the Promotion of Renewable Energies in the EU Member States' 2004 (32) *Energy Policy* 843-849, 847. It has been noted that in Greece the same tariff was applied in respect of all RES-E projects. See P del Río 'The Dynamic Efficiency of Feed-in Tariffs: The impact of different design elements' 2012 (41) *Energy Policy* 139-151, 147.
[99] Mendonça *Feed-In Tariffs* (n74) 92.
[100] Ibid, 93. It has been argued that a stepped tariff increases the efficiency of the FIT policy. See Ragwitz et al *OPTRES Report* (n69) 5.
[101] Mendonça *Feed-In Tariffs* (n74) 96.
[102] Ibid, 101.
[103] REFIT Regulatory Guidelines (n86).

renewables tendering programme are discussed in Chapter 7. With regard to the viability of a FIT policy in South Africa, one study found that

> 'renewable energy policies, in particular the REFIT, aimed at substantial renewable energy targets can encourage GHG savings and employment without requiring too much additional private and public investment above the Baseline projection'.[104]

4.4.1.2 Renewable obligation

This instrument is referred to as the renewable portfolio standard (RPS) in the USA and the renewable obligation (RO) in the UK. This research uses the term 'renewable obligation'.

Under the RO, government decides how much electricity should be generated from renewable energy sources and imposes an obligation on generators, suppliers or consumers regarding a minimum amount of renewable energy[105] (to be generated, supplied, or consumed). The obligation is usually placed on suppliers,[106] and successively higher targets are set for each compliance period. No distinction is traditionally made between different renewable energy technologies. The RO is administered by government.

Suppliers (or generators or consumers) obtain green certificates or renewable energy certificates for the renewable energy supplied (or generated or consumed).[107] A renewable energy or green certificate 'represents the "renewable" value of electricity produced from renewable sources',[108] and certifies that the renewable energy has actually been supplied (generated or consumed). The possession of

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[104] Under the 'Baseline projection' only supercritical coal plants would be built to meet rising electricity demand in South Africa. M Edkins, A Marquard and H Winkler 'South Africa's Renewable Energy Policy Roadmaps' 2010 for the United Nations Environment Programme Research Project *Enhancing information for renewable energy technology deployment in Brazil, China and South Africa* (Energy Research Centre, UCT) available at http://www.erc.uct.ac.za/Research/publications/10Edkinesetal-Renewables_roadmaps.pdf [accessed 27 March 2011] 31.

[105] Brick and Visser 'Green Certificate Trading' (n40) 3.

[106] Van der Linden et al *Review of International Experience with Renewable Energy Obligation Support Mechanisms* (n71) 20.

[107] S Espey 'Renewables Portfolio Standard: A means for trade with electricity from renewable energy sources?' 2001 (29) *Energy Policy* 557-566, 560.

[108] Van der Linden et al *Review of International Experience with Renewable Energy Obligation Support Mechanisms* (n71) 10.

such certificates at the end of a compliance period demonstrates compliance with the target that has been imposed on a particular supplier (generator or consumer).[109]

While not always the case, this instrument is often combined with the option to trade renewable energy or green certificates to provide ‘flexibility in achieving compliance’.[110] When combined with the option to trade, the RO combines both command-and-control and market-based elements.[111] Thus, a firm that is not able to generate or supply the required amount of electricity from renewable sources, has the option to buy renewable energy certificates from firms that have been able to comply with their obligations and that have surplus certificates.[112] At some stage generators are required to submit their renewable energy or green certificates to show that they have complied with their respective obligations.[113] A penalty is usually imposed for non-compliance.[114]

In some jurisdictions, such as in the UK, a ‘buy out price’ is established. This has the effect of placing a ‘cap’ on the price that is paid for RES-E,[115] as electricity generators would opt to pay the buy-out price if renewable energy is more expensive than this. Experience in various EU countries shows that greater compliance with the RO is achieved if the buy out price (or penalty) is (significantly) higher than the price of a certificate.[116] In the UK, the revenue raised from the payment of the buy-out price by those who do not comply with their obligations, is ‘recycled back’ to those entities that do comply with their obligations,[117] providing a further incentive to comply with the renewable obligations.

The renewable electricity and the actual certificates are traded at different markets, namely the ‘physical electricity market’ and the ‘financial certificate market’.[118]

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[109] Espey ‘Renewables Portfolio Standard’ (n107) 560.
[110] Brick and Visser ‘Green Certificate Trading’ (n40) 3.
[111] UNEP *The Use of Economic Instruments in Environmental Policy* (n4) 71.
[112] Espey ‘Renewables Portfolio Standard’ (n107) 560.
[113] Ibid.
[114] Brick and Visser ‘Green Certificate Trading’ (n40) 3.
[115] Lipp ‘Lessons for Effective Renewable Electricity Policy’ (n70) 5483.
[116] Ragwitz et al *OPTRES Report* (n69) 131-135.
[117] Van der Linden et al *Review of International Experience with Renewable Energy Obligation Support Mechanisms* (n71) 25.
[118] Brick and Visser ‘Green Certificate Trading’ (n40) 4. See also C Mitchell and P Connor ‘Renewable Energy Policy in the UK 1990-2003’ 2004 (32) *Energy Policy* 1935-1947, 1939.

The RO combined with tradable renewable energy certificates has been implemented in the UK, a number of states in the USA, as well as in several European countries. There is also an international trading system that is linked to all tradable renewable energy certificates (TRECs) in the world – the Renewable Energy Certificate System (RECS).[119]

This instrument is preferred by 'free-market proponents'[120] as it appears to feature little government involvement.[121] The RO does not specify the price at which renewable energy must be bought, only the amount of electricity that must be procured from renewable sources. Generators or suppliers of electricity thus have the choice as to which RETs to invest in and at what price.[122] The result is that generators and suppliers invest in technologies that are more well-established or mature and thus cheaper[123] than less mature technologies such as solar energy.

The emphasis on least-cost leads to prices being brought down quickly as renewable energy generators try to generate renewable energy as cheaply as possible.[124] Proponents of the RO thus argue that it is cheaper and more effective than the feed-in tariff.[125]

An important advantage of the renewable obligation is that it '[a]llows control over [the] amount of renewable capacity added'.[126] In theory, it should also provide more certainty regarding the market share of renewable energy in the future.[127] Raising the renewable energy target can lead to long-term planning for renewable energy,[128] and thus security for renewable energy developers.

However, the claim of cost-effectiveness has been disputed and several assessments have shown that the cost of renewable energy has actually been cheaper under the FIT than under the RO due in part to the uncertainty and risk

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[119] Brick and Visser 'Green Certificate Trading' (n40) 5.
[120] Lipp 'Lessons for Effective Renewable Electricity Policy' (n70) 5483.
[121] Espey 'Renewables Portfolio Standard' (n107) 565.
[122] Lipp 'Lessons for Effective Renewable Electricity Policy' (n70) 5483.
[123] Ibid.
[124] Ragwitz et al *OPTRES Report* (n69) 16 and 56, Pegels 'Renewable Energy in South Africa' (n59) 4949 and Mendonça *Feed-In Tariffs* (n74) 14.
[125] Mendonça *Feed-In Tariffs* (n74) 39-40.
[126] Renewable Energy White Paper (n68) 29. See also Van der Linden et al *Review of International Experience with Renewable Energy Obligation Support Mechanisms* (n71) 14.
[127] Mendonça *Feed-In Tariffs* (n74) 14.
[128] L Nielsen and T Jeppesen 'Tradable Green Certificates in Selected European Countries – Overview and assessment' 2003 (31) *Energy Policy* 3-14, 5.

under the RO system[129] (discussed further below). It has been argued that the development of wind energy has been more expensive in the UK than in any other country in Europe.[130] Furthermore, the UK has low levels of renewable energy generally when compared to countries that have introduced the FIT such as Denmark and Germany.[131] This is despite the UK having 'one of the best wind potentials in Europe'.[132] One study has shown that onshore wind producers experienced high profits under the RO (in comparison to under the FIT), despite very low growth in wind energy.[133] This suggests that the RO is more profitable for RE generators, which would arguably increase the costs for consumers. Indeed, it has been argued that the 'opacity of [tradable green certificate] schemes helps to explain why they escaped from political controversy, unlike the more modest profits in the FIT case'.[134]

Furthermore, due to the emphasis on least-cost, the RO would implicitly not encourage investment in RETs that are less mature, such as solar energy, as more expensive technologies 'will generally not be chosen during the competitive process'.[135] This would result in less mature RETs not enjoying the investment required to enable them to achieve economies of scale.[136] The RO also does not encourage renewable energy investment beyond the target, as 'profitability exists only within the quota'.[137]

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[129] Lipp 'Lessons for Effective Renewable Electricity Policy' (n70) 5492. See also Ragwitz et al *Recent Developments of Feed-in Systems in the EU* (n95) 8-9.
[130] Lipp 'Lessons for Effective Renewable Electricity Policy' (n70) 5492.
[131] Ibid, Table 1 at 5484.
[132] Meyer and Koefoed 'Danish Energy Reform' (n33) 598. See also S Fakir and D Nicol *Investigation: Obstacles and Barriers to Renewable Energy in South Africa* 2008 (a study prepared for the National Environmental Advisory Forum, Department of Environmental Affairs and Tourism) available at http://www.environment.gov.za/Branches/COO/neaf_2005/Documents/Obstacles%20&%20barriers%20to%20renewable%20energy%20in%20SA.pdf [accessed 12 May 2011] 38.
[133] Ragwitz et al *OPTRES Report* (n69) Figure 38, 46.
[134] A Verbruggen and V Lauber 'Assessing the Performance of Renewable Electricity Support Instruments' 2012 (45) *Energy Policy* 635-644, 642.
[135] R Wiser, G Barbose and E Holt 'Supporting Solar Power in Renewables Portfolio Standards: Experience from the United States' 2011 (39) *Energy Policy* 3894-3905, 3896.
[136] 'Economies of scale' refers to increased efficiency due to more goods being produced; and a company achieves economies of scale when it is able to decrease 'the average cost per unit through increased production since fixed costs are shared over an increased number of goods'. See Investopedia 'Economies of scale' available at http://www.investopedia.com/terms/e/economiesofscale.asp#ixzz1ZLmh7eUL [accessed 29 September 2011].
[137] Mendonça *Feed-In Tariffs* (n74) 14.

Another disadvantage is that the emphasis on least-cost often leads to development occurring in concentrated areas, for example, where there is a high wind yield,[138] which may result in opposition to renewable energy projects.[139]

The RO does not provide price certainty to investors as the prices are established by the market.[140] Furthermore, the UK experience has shown that when a RO is imposed on suppliers, suppliers are opposed to entering into long-term contracts with renewable energy generators, in case prices decrease in the future. This further undermines price security for renewable energy generators.[141] The negotiation of contracts on an individual basis also means that generators do not have certainty regarding the volume of renewable energy that will be taken up in the future.[142]

Due to the high investment risks and transaction costs, smaller investors would be disadvantaged in comparison to larger, more established investors.[143] In addition, the design of the RO is much more complex than the FIT, *inter alia* because it combines electricity markets and certificate markets.[144]

A report by a government-sponsored body in the United Kingdom found that the RO in the UK was not efficient and would not lead to the renewable energy targets being met.[145] Indeed, in 2010 a feed-in tariff policy in respect of small-scale projects

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[138] Lipp 'Lessons for Effective Renewable Electricity Policy' (n70) 5483.
[139] Mendonça *Feed-In Tariffs* (n74) 14. See also Fakir and Nicol *Investigation: Obstacles and Barriers to Renewable Energy in South Africa* (n132) 37.
[140] Pegels 'Renewable Energy in South Africa' (n59) 4949.
[141] Mitchell and Connor 'Renewable Energy Policy in the UK' (n118) 1939. See also Fakir and Nicol *Investigation: Obstacles and Barriers to Renewable Energy in South Africa* (n132) 37.
[142] Lipp 'Lessons for Effective Renewable Electricity Policy' (n70) 5489.
[143] B Woodman and C Mitchell 'Learning from Experience? The development of the Renewables Obligation in England and Wales 2002-2010' 2011 (39) *Energy Policy* 3914-3921, 3916.
[144] Verbruggen and Lauber 'Assessing the Performance of Renewable Electricity Support Instruments' (n134) 642. See also Van der Linden et al *Review of International Experience with Renewable Energy Obligation Support Mechanisms* (n71) 57.
[145] Mendonça *Feed-In Tariffs* (n74) 11-12. Indeed, the renewable energy target for 2005 was not met. See Lipp 'Lessons for Effective Renewable Electricity Policy' (n70) 5489.

was introduced in the UK.[146] It has been argued that the FIT is more effective in developing renewable energy than the renewable obligation.[147]

Some of the design issues that must be considered in implementing the RO include determining the minimum percentage or proportion of electricity that must be procured from renewable sources and determining how this will increase over time.[148] It is also necessary to determine which RETs should be included under this instrument,[149] who should be subject to the obligation[150] and whether a 'buy out' or penalty price should be established.[151] With regard to the certificates, it is important that they be made tradable so as to 'establish a real market for certificates'.[152] Authorities would also need to decide whether certificates may be 'banked' or 'borrowed'.[153] Other considerations relate to the organisation of the market and the institutions involved in this scheme.[154]

The implementation of a tradable renewable energy certificate (TREC) system has been considered in South Africa in a study entitled 'Tradable Renewable Energy Certificates: System Feasibility Study'.[155] This will be considered further in Chapter 7.

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[146] M Ragwitz, A Held, E Stricker, A Krechting, G Resch and C Panzer *Recent Experiences with Feed-In Tariff Systems in the EU – A research paper for the International Feed-In Cooperation* 2010 (commissioned by the Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)) available at http://www.feed-in-cooperation.org/wDefault_7/content/research/index.php [accessed 5 September 2011] 13.

[147] See Lipp 'Lessons for Effective Renewable Electricity Policy' (n70) 5494 and Pegels 'Renewable Energy in South Africa' (n59) 4949.

[148] Espey 'Renewables Portfolio Standard' (n107) 560.

[149] Ibid.

[150] Ibid, 561.

[151] Ragwitz et al *OPTRES Report* (n69) 131-135.

[152] Espey 'Renewables Portfolio Standard' (n107) 561.

[153] 'Banking' allows the relevant parties to save certificates to use in future compliance periods; while 'borrowing' allows parties to use certificates from future compliance periods for the current compliance period. Ragwitz et al *OPTRES Report* (n69) 144-145. See also Nielsen and Jeppesen 'Tradable Green Certificates in Selected European Countries' (n128) 5-6.

[154] See Espey 'Renewables Portfolio Standard' (n107) 561-562.

[155] Department of Minerals and Energy 'Tradable Renewable Energy Certificates System Feasibility Study' (Final Report; Report No. DME/CE/001/260307) *New and Renewable Energy* available at http://nano.co.za/TRECSystemFeasibilityFinalReport7May07.pdf [accessed 9 July 2011].

4.4.1.3 Renewables tendering

Under this instrument, the relevant authority specifies an amount of electricity to be generated from renewable sources and generators bid for contracts to enter into power purchase agreements (PPAs) through a competitive bidding process.[156] Tenders may be differented according to the type of RET.[157] The relevant authority specifies the maximum price of electricity per kilowatt hour.[158] Therefore, prices are not fixed and are determined through the bidding process, and it is usually the most competitive bids (i.e. the bids providing the lowest cost per kilowatt hour) that are awarded contracts.[159] The prices that are proposed in the winning bids are guaranteed for a specified period.[160]

Bidding systems encourage competition between renewable energy generators as it is the most competitive bids (i.e. the lowest bids) that are awarded contracts. This provides an incentive for generators to use the most economical components.[161] Thus, it has been argued that this system is cost effective.[162] For instance, under the Non-Fossil Fuel Obligation[163] wind energy prices decreased from 12.34p/kWh in 1998 to 3.99p/kWh in 2000.[164]

It is also arguable that renewables tendering ensures that the development of renewable energy is controlled, since tendering processes ‘are issued for finite blocks of power [footnote omitted] with specific, standardized conditions that define access and eligibility’.[165] In addition, tendering can provide a timetable regarding the

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[156] Mendonça *Feed-In Tariffs* (n74) 14. See also Van der Linden et al *Review of International Experience with Renewable Energy Obligation Support Mechanisms* (n71) 11.
[157] Brick and Visser ‘Green Certificate Trading’ (n40) 3.
[158] Mendonça *Feed-In Tariffs* (n74) 14.
[159] Van der Linden et al *Review of International Experience with Renewable Energy Obligation Support Mechanisms* (n71) 11.
[160] Mendonça *Feed-In Tariffs* (n74) 15.
[161] Ragwitz et al *OPTRES Report* (n69) 56.
[162] Brick and Visser ‘Green Certificate Trading’ (n40) 3; Van der Linden et al *Review of International Experience with Renewable Energy Obligation Support Mechanisms* (n71) 11 and Mendonça *Feed-In Tariffs* (n74) 15.
[163] This was a renewables tendering programme that was in place in the UK from 1990 until it was replaced by the renewable obligation in 2002.
[164] Butler and Neuhoff ‘Comparison of Feed-In Tariff, Quota and Auction Mechanisms’ (n84) 1856. See also Rickerson et al *Feed-in Tariffs in Developing Countries* (n89) 12, who note that tendering ‘may create opportunities to put downward pressure on renewable electricity prices’.
[165] See C Kreycik, TD Couture and KS Cory *Innovative Feed-In Tariff Designs that Limit Policy Costs* (National Renewable Energy Laboratory: Technical Report NREL/TP-6A20-50225) 2011 available at http://www.nrel.gov/docs/fy11osti/50225.pdf [accessed 8 April 2013] 31 and Menanteau et al ‘Prices versus Quantities’ (n32) 807.

procurement of additional electricity capacity, which can assist with future energy planning.[166]

On the other hand, tendering processes may be very complex. Another problem that has arisen is that 'unrealistically low bids' may be submitted, which leads to funds being committed to projects that are not completed.[167] It has been noted that in Europe 'contract failure rates under competitive tenders for renewable energy ranged from 67%-78% … Contract failure rates are no[t] always so high, however, and results are highly dependent upon design'.[168]

Indeed, when the National Energy Regulator of South Africa (the NERSA) introduced the REFIT (before this was abandoned in favour of a tendering programme) the NERSA noted that

> '[t]endering systems tend to favour established businesses and can allow existing companies to keep potential competitors out of the market by bidding low on projects, regardless of whether or not the company has any intention or ability to actually build the renewable energy project'.[169]

Furthermore, oversight will be required to oversee and confirm the outcome of an auction.[170] Tendering can also result in 'market concentration' with a few (well-established and well-funded) investors receiving most of the contracts.[171] In part this is because the tendering process requires prospective investors to

> 'incur significant upfront costs in order to mount a bid with no assurance that they will obtain a contract. It is likely that this will reduce investment certainty, make project financing more tenuous, and limit the market to a smaller subset of players'.[172]

This may act as a barrier to smaller projects. Thus competitive tendering may not be appropriate 'in countries where the policy goals include supporting a diversity of

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[166] Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n165) 31.
[167] Mendonça *Feed-In Tariffs* (n74) 15.
[168] Rickerson et al *Feed-in Tariffs in Developing Countries* (n89) 12.
[169] REFIT Regulatory Guidelines (n86) 27.
[170] Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n165) 31.
[171] Ibid, 32.
[172] Ibid.

project sizes and/or attracting a broad range of capital providers to participate in the market'.[173]

Furthermore, the RO does not provide certainty to renewable energy generators *inter alia* due to 'intermittency of tenders'.[174] In this regard it has been argued that

> 'bidding rounds can be time-consuming, costly and can create cycles of stop-and-go. Because quotas often create on-off cycles, they do not allow for continuous development of the market, they discourage innovation, and they make it difficult to establish a strong domestic industry because investment in production facilities will take place only with a short-term perspective. This in turn limits potential job growth and economic development benefits associated with renewable energy'.[175]

However, in order to decrease costs sustainable markets are essential and, to date, these have been provided most consistently by payment systems (i.e. the FIT).[176] It can therefore be argued that while tendering provides certainty to policymakers, it does not provide investment security to prospective renewable energy generators, which is necessary for the development of a sustainable renewable energy industry. A number of authors have argued that renewables tendering has not been as successful as feed-in tariffs in promoting renewable energy.[177] Indeed, up till the end of 2000, 20 times more renewable energy capacity was installed in Germany, Spain and Denmark under the FIT, than in the UK, Ireland and France under a tendering programme.[178]

Tendering programmes were replaced in both the UK and Ireland, leaving France as the only EU country that makes significant use of the tendering

[173] Rickerson et al *Feed-in Tariffs in Developing Countries* (n89) 12. See also JL Sawin *National Policy Instruments: Policy Lessons for the Advancement & Diffusion of Renewable Energy Technologies Around the World* (Thematic Background Paper) 2004 available at http://siteresources.worldbank.org/EXTRENENERGYTK/Resources/5138246-1237906527727/59507051239290499336/National0Polic1ies0around0the0World.pdf [accessed 26 April 2013] 11.

[174] Mendonça *Feed-In Tariffs* (n74) 15. See also Van der Linden et al *Review of International Experience with Renewable Energy Obligation Support Mechanisms* (n71) 11.

[175] Sawin *National Policy Instruments: Policy Lessons* (n173) 9.

[176] Ibid.

[177] Brick and Visser 'Green Certificate Trading' (n40) 3, Van der Linden et al *Review of International Experience with Renewable Energy Obligation Support Mechanisms* (n71) 11, and Mendonça *Feed-In Tariffs* (n74) 15.

[178] Menanteau et al 'Prices versus Quantities' (n32) Table 1, 806.

process.[179] Tendering programmes have also been used in other countries including China, India and the USA.[180] With regard to the countries that have renewables tendering programmes in place, it should be noted that these programmes are generally not broad-based programmes and usually only apply in respect of specific RETs, specific quantities of RES-E or specific projects. For example, Egypt recently introduced a bidding process in respect of a single 1000 MW wind farm.[181] In addition, China and India use tendering programmes in conjunction with both the feed-in tariff and renewable obligation, as discussed in Chapter 5.

A renewables tendering programme, the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), was introduced in South Africa in 2011 and is discussed in detail in Chapter 7.

4.4.1.4 General comments

In light of all of the above, the feed-in tariff has emerged internationally as the instrument that has been the most effective in driving growth in renewable energy. Indeed, it has been noted that

> '[t]o date, feed-in – or pricing – systems have been responsible for most of the renewable electricity capacity and generation, while driving down costs through technology advancement and economies of scale, and developing domestic industries'.[182]

It has been argued more strongly that

> '[I]t is the overwhelming conclusion of the world's leading researchers in this area of policy that [feed-in tariffs] – if well designed and implemented, and in

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[179] Ragwitz et al *OPTRES Report* (n69) 17. See also Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n94) 8.

[180] See for example REN21 *Renewables 2013: Global Status Report* (n72) Table 3 at 80.

[181] Renewable Energy Policy Network for the 21st Century (REN21) *Renewables 2012: Global Status Report* available at http://www.ren21.net/Portals/0/documents/activities/gsr/GSR2012_low%20res_FINAL.pdf [accessed 12 June 2012] 68.

[182] Sawin *National Policy Instruments: Policy Lessons* (n173) 3.

concert with complementary programmes – give rise to the fastest, lowest-cost deployment of renewable energy'.[183]

As noted in Chapter 1, the first research objective was *inter alia* concerned with identifying the market-based instrument that has been most effective in promoting renewable energy worldwide. In light of the above, it will thus be considered in Chapter 8 how a feed-in tariff policy might be implemented in the South African context, with reference to the international examples discussed in Chapter 5.

4.4.2 Secondary instruments

The following instruments (in 4.4.2.1 to 4.4.2.4) are 'secondary' in nature and would not constitute a country's primary support instrument for renewable energy, but would rather accompany primary instruments, such as those that have been discussed above. A brief overview of a few secondary instruments follows below.

4.4.2.1 Energy levy

This involves the imposition of a levy on all energy that is not generated from renewable sources. The levy would ultimately be paid for by consumers. Such a levy has been implemented in South Africa and is discussed further in Chapter 7.

4.4.2.2 Subsidies for renewable energy

Under this instrument, government offers financial subsidies to firms to assist them in starting up renewable energy projects. Support may be provided as a certain amount per kilowatt hour generated or as a certain percentage of the total start up costs.[184] Subsidies for renewable energy are in contrast to the 'perverse' incentives provided to fossil fuel industries, discussed in 4.3.3 above.

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[183] Mendonça *Feed-In Tariffs* (n74) xix.
[184] Van der Linden et al *Review of International Experience with Renewable Energy Obligation Support Mechanisms* (n71) 12.

In South Africa, subsidies are provided by the Renewable Energy Finance and Subsidy Office (REFSO), which is discussed further in Chapters 6 and 7.

4.4.2.3 Net metering

Under this instrument people who have installed renewable energy generation systems at their home or work, may feed their excess energy to the grid, for which they are paid wholesale prices by the utility.[185] The overall consumption of electricity by such consumers is measured by a 'bi-directional meter or a pair of unidirectional meters spinning in opposite directions'.[186] If generation is greater than consumption, the meter spins backwards,[187] thereby indicating the compensation due to the relevant consumer. However, if generation does not exceed consumption, then no compensation would be due to the relevant consumer.

Net metering has been implemented in a number of countries, including Japan, Thailand, Canada and several states in the USA.[188] This instrument has been recommended for implementation in South Africa.[189]

4.4.2.4 Subsidies for solar water heaters

Under this instrument, government provides subsidies for the installation of solar water heaters. A subsidy programme for solar water heaters was introduced in South Africa in 2008 and is discussed further in Chapter 7.

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[185] Mendonça *Feed-In Tariffs* (n74) 15. See also Verbruggen and Lauber 'Assessing the Performance of Renewable Electricity Support Instruments' (n134) 637.
[186] Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n94) 54.
[187] Ibid.
[188] Mendonça *Feed-In Tariffs* (n74) 15. See also REN21 *Renewables 2013: Global Status Report* (n72) Table 3, 80.
[189] Department of Energy *Electricity Regulation Act No. 4 of 2006: Electricity Regulations on the Integrated Resource Plan 2010-2030* GN R400 in *Government Gazette* No 34263 dated 6 May 2011, 24.

4.5 Market-based instruments of relevance to carbon pricing: Carbon taxing and trading

The aim of carbon taxing and trading is to internalise the negative impacts arising from climate change by '[p]utting a price on carbon'.[190] A general difference between carbon taxation and carbon trading is that a carbon tax is a 'price instrument' (i.e. the price is established) while carbon trading is a 'quantity instrument' (i.e. the quantity of allowed emissions is established).[191] The decision to implement carbon taxation or trading will depend *inter alia* on a country's particular circumstances.[192]

As noted above, carbon taxation and carbon trading are not directly concerned with promoting renewable energy, since they are concerned primarily with reducing carbon emissions. However, over 90 per cent of South Africa's electricity is generated from coal, which is heavily carbon-intensive. Thus, an instrument that discourages generation of electricity from coal would theoretically result in a shift away from coal to less carbon-intensive energy sources, including renewable energy. Indeed, the South African government considers that a carbon tax, in addition to reducing emissions, would encourage a shift away from coal-generated energy, *inter alia* to renewable energy.[193]

There is therefore some degree of overlap between MBIs that promote renewable energy directly and carbon pricing, since both would encourage an increase in the uptake of renewable energy, which would necessarily lead to a decrease in greenhouse gas emissions. However, in light of the focus of this research, namely the promotion of renewable energy, carbon pricing is treated here as being of indirect relevance to promoting renewable energy.

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[190] H Winkler, A Marquard, E Tyler, M Visser and K Brick 'Economics of Climate Change: Context and concepts related to mitigation' 2009 *The Economics of Climate Change Mitigation* (available at http://www.erc.uct.ac.za/Research/publications/09Winkler-etal-%20Economics_Climate_change.pdf [accessed 12 September 2011] 1. See also Carbon Tax Discussion Paper (n35) 3 and *Stern Review: The Economics of Climate Change* (n31) xviii.

[191] M Goldblatt 'Comparison of Emissions Trading and Carbon Taxation in South Africa' 2010 (10) *Climate Policy* 511-526, 513.

[192] *Stern Review: The Economics of Climate Change* (n31) xviii.

[193] Carbon Tax Discussion Paper (n35) 55. Also see H Winkler and A Marquard 'Analysis of the economic implications of a carbon tax' 2009 *The Economics of Climate Change Mitigation* (ERC, G:ENESIS and EPRU) available at http://www.erc.uct.ac.za/Research/publications/09Winkler-Marquard-carbon_tax.pdf [accessed 27 March 2011] 4

The South African government plans to implement a carbon tax in 2015,[194] which is discussed in detail in Chapter 7. Government has also considered the introduction of carbon trading and has announced that it will publish a discussion paper on emissions trading.

Carbon taxation generally is discussed in 4.5.1 and carbon trading is discussed thereafter in 4.5.2.

4.5.1 Carbon taxation[195]

4.5.1.1 The economic rationale

The idea of environmental taxation generally is usually attributed to A.C. Pigou[196] who, in short, argued that where one person provides a service that results in 'incidental uncharged disservices' to another person and 'technical considerations' make it such that it is not possible to pay compensation to the injured party,[197] that the person should be held responsible for these 'incidental uncharged disservices'.[198] This can be achieved through the imposition of 'extraordinary restraints' or taxes by government,[199] which should result in the situation where the 'tax-inclusive price faced by the consumer is then equal to the marginal social cost of the product'.[200]

However, 'ideal Pigouvian taxes are seldom seen in practice' due to the difficulty in determining the appropriate tax rate (which arises from a lack of information),[201] and tax rates are usually set below the costs of the pollution to society.[202]

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[194] See National Treasury *Carbon Tax Policy Paper: Reducing greenhouse gas emissions and facilitating the transition to a green economy* 2013 available at http://www.info.gov.za/view/DownloadFileAction?id=189311 [accessed 2 May 2013].

[195] It should be noted that some of the sources relied on refer to environmental taxes generally while others refer specifically to carbon taxes. Any reference here to environmental taxes, applies similarly to carbon taxes.

[196] See A.C. Pigou *The Economics of Welfare* 1920.

[197] Ibid, 159 and 161.

[198] Pigou provides the example of an industry that produces and sells 'intoxicants' and states that it should be held responsible for 'the extra costs in policemen and prisons which it indirectly makes necessary'. Ibid, 162.

[199] Ibid, 168.

[200] Bruce and Ellis 'Environmental Taxes and Policies for Developing Countries' (n17) 17.

[201] Faure and Ubachs 'Comparative benefits and optimal use of environmental taxes' (n16) 33.

[202] Carbon Tax Discussion Paper (n35) 43.

While a number of authors deal with environmental taxation generally,[203] the concern here is with carbon taxation specifically, which is now considered.

4.5.1.2 Implementing a carbon tax

A carbon tax internalises the external costs of electricity production and generation,[204] thus making electricity generated from carbon-intensive fossil fuels more expensive. A carbon tax is usually expressed as a price per ton of ton carbon dioxide (R*x*/tCO_2).

A concern regarding environmentally-related taxes generally is that they 'are not the most effective way for governments to raise revenue, nor are they necessarily the best approach to protecting the environment'.[205] This is because while an environmental or carbon tax discourages polluting activities by putting a price on such activities, the activities and their associated emissions are not *prohibited* and thus emission reductions are not guaranteed.[206] Polluters could simply opt to pay the carbon tax rather than change their behaviour. Concerns have also been raised regarding the impacts of a carbon tax on the poor and on industrial competitiveness, which are discussed further below.

On the other hand, an important advantage of a carbon tax is that it provides an efficient and least-cost way to reduce emissions.[207] Efficiency results in part because a carbon tax provides flexibility to firms regarding when emissions will be reduced, and so firms can choose to implement emissions reductions at a time when it is most suitable (and cheapest).[208]

In addition, as the price of a carbon tax is fixed, it provides certainty to those subject to the tax[209] and allows taxpayers to plan ahead and adapt their behaviour. This stability is important for firms wishing to make 'long-term investment

[203] See Barde 'Environmental Taxes in OECD Countries' (n55), Faure and Ubachs 'Comparative benefits and optimal use of environmental taxes' (n16) 37-38 and Bruce and Ellis 'Environmental Taxes and Policies for Developing Countries' (n17) 16-27.
[204] Carbon Tax Discussion Paper (n35) 5.
[205] World Bank *Environmental Fiscal Reform* (n1) 23.
[206] See for example Gupta et al 'Policies, Instruments and Co-operative Agreements' (n10) 747.
[207] Carbon Tax Discussion Paper (n35) 26.
[208] Goldblatt 'Comparison of Emissions Trading and Carbon Taxation in South Africa' (n191) 516.
[209] Carbon Tax Discussion Paper (n35) Table 5, 28.

decisions'.[210] Carbon taxation also results in revenue that 'is likely to be more predictable and stable and hence can allow for better planning (by government) of revenue recycling or tax-shifting programmes'[211] (discussed further below).

A carbon tax can also be easily linked to an existing tax administration system,[212] which would reduce complexity, which is arguably important in the South African context. Furthermore, revenue raised from environmental taxes replaces the revenue raised from more distortionary means or taxes, which adds to their 'efficiency value'.[213] While both carbon taxes and carbon trading are capable of raising revenue, experience shows that the revenue generated through carbon taxation is likely to be substantial.[214]

A carbon tax could be an important tool to promote renewable energy, as 'a tax [set] at an appropriate level and phased in over time to the "correct level" will provide a strong price signal to both producers and consumers to change their behaviour over the medium to long term'.[215] Furthermore, establishing a 'meaningful carbon price, through internalising environmental and social costs would help to create 'a level playing field between renewable and conventional energy options'.[216] Imposing a carbon tax in South Africa could provide a way to simultaneously reduce emissions and raise revenue.[217]

There are various issues that must be considered in implementing a carbon tax, namely the tax base, the tax level, who is subject to the tax and the use of the revenue.[218] These are outlined briefly.

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[210] Goldblatt 'Comparison of Emissions Trading and Carbon Taxation in South Africa' (n191) 517.
[211] Ibid, 518.
[212] Carbon Tax Discussion Paper (n35) Table 5, 28. See also Goldblatt 'Comparison of Emissions Trading and Carbon Taxation in South Africa' (n191) 519 and World Bank *Environmental Fiscal Reform* (n1) 3.
[213] Bruce and Ellis 'Environmental Taxes and Policies for Developing Countries' (n17) 58.
[214] Goldblatt 'Comparison of Emissions Trading and Carbon Taxation in South Africa' (n191) 518.
[215] Carbon Tax Discussion Paper (n35) 29.
[216] UNEP Finance Initiative *Financing Renewable Energy in Developing Countries: Drivers and Barriers for Private Finance in Sub-Saharan Africa* (A study and survey by UNEP Finance Initiative on the views, experiences and policy needs of energy financiers) 2012 available at http://www.unepfi.org/fileadmin/documents/Financing_Renewable_Energy_in_subSaharan_Africa.pdf [accessed 18 January 2013] 34.
[217] Carbon Tax Discussion Paper (n35) 3.
[218] The identification of these categories is based on the categories identified in DG Duff 'Carbon Taxation in British Columbia' 2008 (10) *Vermont Journal of Environmental Law* 87-107.

a) Tax base

It is preferable that environmental taxes, including a carbon tax, are 'directly linked to the source of the pollution'.[219] This would require that carbon dioxide that is emitted from factories etc. is monitored and taxed directly. This is the most effective and efficient way to encourage a decrease in carbon emissions as it is the most 'precisely targeted'.[220] However, monitoring of emissions can be difficult and expensive, especially in developing countries.

The next best option is to 'tax an input or other activity that is associated with the polluting activity'.[221] Therefore, the tax could be imposed (indirectly) on the coal used to generate electricity or on the actual electricity generated from the polluting activity. The former approach, i.e. taxing the input, has been recommended for developing countries and is considered to be more targeted than the latter.[222]

b) Tax level

The carbon tax should be set at the correct level to ensure that external costs are internalised into the cost of electricity generation.[223] Ideally, the cost of reducing pollution should be less than the tax itself in order to provide an incentive to reduce pollution.[224] However, determining these costs may be difficult, practically and politically.[225] A number of studies have been carried out to establish the price of carbon dioxide. The estimates in these studies vary substantially from below US$10 to over US$300.[226]

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[219] S Himes and F de Kam 'Environmentally-Related Taxes: A tax policy perspective' in OECD *Environmental Taxes: Recent Developments in China and OECD Countries* 1999, 57.
[220] Carbon Tax Discussion Paper (n35) 30. See also Perman et al *Natural Resource and Environmental Economics* (n2) 217.
[221] Himes and de Kam 'Environmentally-Related Taxes' (n219) 58. See also World Bank *Environmental Fiscal Reform* (n1) 36-37 and S Devarajan, DS Go, S Robinson and K Thierfelder 'Tax Policy to Reduce Carbon Emissions in a Distorted Economy: Illustrations from a South Africa CGE Model' 2011 (11) *The Berkeley Electronic Journal of Economic Analysis & Policy* 1-22, 15.
[222] See N Bruce and GM Ellis 'Environmental Taxes and Policies for Developing Countries' (n17) 63. See also MBI Policy Paper (n29) 81, which considers such an approach suitable in South Africa.
[223] Faure and Ubachs 'Comparative benefits and optimal use of environmental taxes' (n16) 33.
[224] Himes and de Kam 'Environmentally-Related Taxes' (n219) 58.
[225] Jefferson 'Energy Policies for Sustainable Development' (n58) 423.
[226] Carbon Tax Discussion Paper (n35) 23.

c) Who is subject to the tax

Government must decide who the tax will be imposed on. Concerns have arisen regarding the impacts of a carbon tax on the poor and on energy-intensive industries. These concerns may be alleviated by providing exemptions to the poor and to energy-intensive firms, or these groups could pay a reduced tax. These concerns are considered further below and in Chapter 8.

d) Use of the revenue

There is no consensus on how the revenue raised from a carbon tax should be used and this aspect would depend on the priorities of the relevant government. The revenue raised from a carbon tax could be directed to the general fiscus or environmentally-related programmes,[227] or more specifically to investments in renewable energy or energy efficiency. It has also been suggested that government could reduce other taxes such as value-added tax (VAT) or taxes on food,[228] in order to address concerns regarding the impacts of a carbon tax on the poor. Another option is to pay compensation to the poor,[229] or to decrease the social security contributions paid by employers (which would lower labour costs).[230] It is widely agreed that 'revenue recycling can significantly lower the costs of a carbon tax'.[231]

With regard to energy-intensive industries in South Africa, government could implement measures such as exempting certain sectors temporarily or reducing tax rates.[232] However, it would be problematic if the most energy-intensive entities (like Eskom and Sasol) receive respite from such a tax, as this would arguably reduce its effectiveness. It is thus important that measures implemented to reduce threats to competitiveness do not undermine the effectiveness of this MBI.

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[227] See for instance R Spalding-Fecher and DK Matibe 'Electricity and externalities in South Africa' 2003 (31) *Energy Policy* 721-734, 729.
[228] See for instance Pegels 'Renewable Energy in South Africa' (n59) 4952.
[229] See Carbon Tax Discussion Paper (n35) 39.
[230] MS Andersen 'Environmental and Economic Implications of Taxing and Trading Carbon: Some European experiences' 2008 (10) *Vermont Journal of Environmental Law* 61-85, 84.
[231] Fisher et al 'An Economic Assessment of Policy Instruments for Combating Climate Change' (AR2) (n5) 410. Revenue recycling is discussed immediately below.
[232] Carbon Tax Discussion Paper (n35) 39.

e) Revenue neutrality and double or triple dividends

The above touches on the importance of 'revenue neutrality'. While it is not possible to discuss this fully, revenue neutrality refers to the principle that the overall tax burden should not be increased, which is important with regard to the acceptability of environmental taxes.[233] Therefore, if government introduces or increases one tax (i.e. a carbon tax), other taxes (such as taxes on foodstuffs or labour) should be decreased.[234] This has been demonstrated internationally and a number of Organisation for Economic Co-operation and Development (OECD) countries have implemented 'fiscally neutral environmental tax reforms'.[235]

It has been found that by reducing taxes on 'goods' (such as labour) and increasing taxes on 'bads' (such as pollution or carbon) a so-called 'double dividend' may be achieved.[236] This may result because a tax on carbon should lead to a reduction in carbon dioxide, thus reducing pollution, which is a 'welfare gain'. If the revenue generated from the carbon tax is used to reduce other taxes (such as taxes on labour) a second gain is possible as reducing other taxes will reduce welfare losses.[237]

One South African study found that the imposition of four types of environmental taxes (all concerned with reducing carbon emissions), including a direct tax on carbon emissions, yielded a 'triple dividend' (if they were 'recycled' by being combined with reduced food prices), namely by: reducing greenhouse gas emissions, increasing gross domestic product (GDP) and alleviating poverty ('because poor consumers' consumption basket mostly consists of food').[238]

While a carbon tax may not be appropriate in developing countries that have low or non-existent income taxes, South Africa, with its relatively high level of income tax, is specifically considered to be an exception to this principle.[239]

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233 Barde 'Environmental Taxes in OECD Countries' (n55) 33.
234 See for instance Spalding-Fecher and Matibe 'Electricity and externalities in South Africa' (n227) 729.
235 World Bank *Environmental Fiscal Reform* (n1) 28.
236 Andersen 'Environmental and Economic Implications of Taxing and Trading Carbon' (n230) 70-71.
237 World Bank *Environmental Fiscal Reform* (n1) Box 8, 28.
238 See J van Heerden, R Gerlagh, J Blignaut, M Horridge, S Hess, R Mabugu and M Mabugu 'Searching for Triple Dividends in South Africa: Fighting CO_2 pollution and poverty while promoting growth' 2006 (27) *The Energy Journal* 113-141, 132-133.
239 World Bank *Environmental Fiscal Reform* (n1) endnote 12, 29.

A carbon tax is being considered for implementation in South Africa, and the National Treasury has most recently released the Carbon Tax Policy Paper,[240] which is discussed in Chapter 7. It should be noted that the National Treasury considers a carbon tax to be preferable to emissions trading for various reasons including that it provides for greater oversight by revenue authorities and that its costs and administrative burden are lower.[241]

Carbon trading is now briefly considered.

4.5.2 Carbon trading

Under a carbon trading scheme, the government establishes a limit or cap on emissions and then allocates the cap as allowances or permits amongst emitters, who are required to 'hold allowances equal to their emissions' at the end of a defined period, either by mitigating their emissions or trading allowances.[242] A permit would represent a certain quantity, for example, one permit would represent one ton of carbon dioxide.

Allowances may be allocated through auctioning by the relevant authority,[243] or through grandfathering, in terms of which allowances are given away to existing firms.[244] The amount of allowances allocated (grandfathered) is based on the historical emissions of existing firms.[245] In practice, grandfathering is generally preferred by existing firms as it 'may reduce the rate of entry of new firms and slow technological change'.[246]

Carbon trading combines elements of the command-and-control and market-based approaches through its setting of an emissions limit and its use of the market

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240 Carbon Tax Policy Paper (n194).
241 Ibid, 6.
242 E Tyler, M du Toit and Z Dunn 'Emissions Trading as a Policy Option for Greenhouse Gas Mitigation in South Africa' 2009 *The Economics of Climate Change Mitigation* available at http://www.erc.uct.ac.za/Research/publications/09Tyler-etal-Emissions_trading.pdf [accessed 7 July 2011] 2. See also Faure and Ubachs 'Comparative benefits and optimal use of environmental taxes' (n16) 31.
243 Tyler et al 'Emissions Trading as a Policy Option for Greenhouse Gas Mitigation in South Africa' (n242) 5.
244 See Gupta et al 'Policies, Instruments and Co-operative Agreements' (AR4) (n10) 757.
245 Goers et al 'New and Old Market-Based Instruments for Climate Change Policy' (n48) 4.
246 Fisher et al 'An Economic Assessment of Policy Instruments for Combating Climate Change' (AR2) (n5) 417.

respectively.[247] This instrument creates scarcity by allocating 'fewer allowances than emissions', which forces emitters to either reduce their emissions in accordance with their allocations or to buy additional allowances to offset their excess emissions.[248] Such a system will only be effective if a sanction is imposed if emission limits are exceeded and the required permits have not been obtained.[249]

Internationally a number of emission trading schemes have been established. Trading schemes regulating carbon dioxide have been implemented in the EU (the European Union Emissions Trading Scheme or EU ETS),[250] Australia (New South Wales Greenhouse Gas Reduction Scheme) and the USA (Regional Greenhouse Gas Initiative).

An advantage of carbon trading is that it allows government to specify the carbon reduction target[251] and thus provides more certainty with regard to the emission reductions that will actually be achieved. [252]

However, this may come at a potentially considerable price,[253] which is not certain,[254] as this is determined by the market. Price volatility reduces certainty for those involved in the scheme and does not encourage decisions regarding long-term investment.[255] Furthermore, whether the carbon reduction target will actually be achieved depends on the coverage of the scheme,[256] as emissions trading schemes do not cover all of a country's emissions. In practice, carbon trading has not been as effective as carbon taxation in reducing emissions. It has been argued that this is due to the 'high levels of uncertainty and incomplete information'.[257]

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[247] Tyler et al 'Emissions Trading as a Policy Option for Greenhouse Gas Mitigation in South Africa' (n242) 1.
[248] Ibid.
[249] Faure and Ubachs 'Comparative benefits and optimal use of environmental taxes' (n16) 32.
[250] This is discussed in Gupta et al 'Policies, Instruments and Co-operative Agreements' (AR4) (n10) Box 13.4 at 757.
[251] Tyler et al 'Emissions Trading as a Policy Option for Greenhouse Gas Mitigation in South Africa' (n242) 11.
[252] Goldblatt 'Comparison of Emissions Trading and Carbon Taxation in South Africa' (n191) 517.
[253] Ibid.
[254] Carbon Tax Discussion Paper (n35) Table 5, 28.
[255] Goldblatt 'Comparison of Emissions Trading and Carbon Taxation in South Africa' (n191) 517.
[256] Ibid.
[257] Tyler et al 'Emissions Trading as a Policy Option for Greenhouse Gas Mitigation in South Africa' (n242) 11.

A carbon trading system is more complex than a carbon tax as governments would need to create new institutions[258] as well as entirely new processes, as opposed to simply relying on existing tax instruments[259] and extensive data are required for the effective implementation of such a system.[260] In the South African context, it has been suggested that 'emissions trading may just be too sophisticated for a developing country with an existing skills deficit and major gaps in available emissions data from industry'.[261]

Furthermore, carbon trading systems may lack transparency due to hidden pricing and costs.[262] Criticism may also be levelled against emissions trading as, morally, the impression is created that pollution is acceptable, provided that one has paid for the right to pollute.[263]

Nevertheless, carbon trading appears to be preferred to carbon taxation in developed countries for various reasons, including that trading systems prevent the entry of new players to the market, which protects the position of existing firms,[264] and due to political pressure and lobbying by those in favour of carbon trading.[265]

There are various design issues that need to be addressed, including where the emissions should be regulated. It is possible to regulate emissions either 'upstream', 'downstream' or on products. Usually emissions are targeted downstream, which would involve targeting the emissions, *inter alia*, of electricity generators.[266] Further issues relate to establishing a clear regulatory framework, establishing an overall emissions cap and the process for allocating emission quotas, timing issues such as

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[258] Carbon Tax Discussion Paper (n35) Table 5, 28.
[259] S Vorster, H Winkler and M Jooste 'Mitigating Climate Change through Carbon Pricing: An emerging policy debate in South Africa' 2011 (3) *Climate and Development* 242-258, 252.
[260] Tyler et al 'Emissions Trading as a Policy Option for Greenhouse Gas Mitigation in South Africa' (n242) 11.
[261] Vorster et al 'Mitigating Climate Change through Carbon Pricing' (n259) 252. See also Goldblatt 'Comparison of Emissions Trading and Carbon Taxation in South Africa' (n191) 521 and 523-524.
[262] Carbon Tax Discussion Paper (n35) Table 5, 28.
[263] Faure and Ubachs 'Comparative benefits and optimal use of environmental taxes' (n16) 32 and 34.
[264] Ibid, 45-46.
[265] Goldblatt 'Comparison of Emissions Trading and Carbon Taxation in South Africa' (n191) 521.
[266] Tyler et al 'Emissions Trading as a Policy Option for Greenhouse Gas Mitigation in South Africa' (n242) 3.

determining the duration of the trading system, and establishing accurate methods to measure emissions.[267]

As noted above, the South African government is considering the implementation of a carbon trading system. However, the National Treasury has stated that '[c]reating the necessary market conditions for open trade will be difficult in South Africa because many industries are still largely oligopolistic and dominated by a small number of large firms'.[268] As also noted above, the South African government currently considers a carbon tax to be preferable to emissions trading.[269]

4.6 Concluding remarks

This chapter has discussed the difference between traditional command-and-control instruments and MBIs, as well as the reasons for the increasing prominence of MBIs. It has considered specific MBIs that could be used to promote renewable energy in order to ascertain the relative advantages and disadvantages of each of the instruments considered.

A significant principle that has emerged is the importance of providing certainty and stability, which consequently reduces the risk for prospective renewable energy investors. Indeed, it has been argued that the most important factor for renewable energy developers is the stability provided by the relevant instrument implemented,[270] and it has been seen that the feed-in tariff is considered to provide the most stability.[271] It is also considered to be the most effective instrument in promoting renewable energy to date. It was noted that a FIT could be viable in the

[267] United States Environmental Protection Agency *International Experiences with Economic Incentives for Protecting the Environment* (Revision 1) 2005 available at http://yosemite.epa.gov/ee/epa/eerm.nsf/vwAN/EE-0487-01.pdf/$file/EE-0487-01.pdf [accessed 29 April 2011] 27. See also Tyler et al 'Emissions Trading as a Policy Option for Greenhouse Gas Mitigation in South Africa' (n242) 4.

[268] MBI Policy Paper (n29) 51-52.

[269] Carbon Tax Discussion Paper (n35) 6.

[270] Ragwitz et al *OPTRES Report* (n69) 21.

[271] See also C Mitchell, D Bauknecht and PM Connor 'Effectiveness Through Risk Reduction: A comparison of the renewable obligation in England and Wales and the feed-in system in Germany' 2006 (34) *Energy Policy* 297-305, who identify three types of risk, namely price risk, volume risk and balancing risk; and argue that the FIT presents none of these risks, while the renewable obligation presents all of these risks. At 297 and 301-303.

South African context.[272] Thus, Chapter 8 considers the implementation of a feed-in tariff policy in South Africa with reference to the international examples discussed in the next chapter.

While the MBIs discussed above have been considered separately, various authors have pointed to the possibility of combining instruments, or at least combining the positive aspects of different instruments[273] and the possibility is noted that different situations may call for different policy instruments.[274] This research does not specifically consider how different MBIs might be combined, but does not rule out this possibility.

Chapter 5 now considers the implementation of the feed-in tariff internationally. Thereafter, Chapter 6 considers South Africa's policy documents and legislation that are relevant to renewable energy. Chapter 7 outlines the MBIs that have been implemented in South Africa.

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[272] Edkins et al 'South Africa's Renewable Energy Policy Roadmaps' (n104) 31.
[273] See for example Faure and Ubachs 'Comparative benefits and optimal use of environmental taxes' (n16) 40 and 44-45 and D O' Connor 'Applying Economic Instruments in Developing Countries: From theory to implementation' 1999 (1) *Environment and Development Economics* 91-110, 92.
[274] See Stavins 'Experience with Market-Based Environmental Policy Instruments' 2001 (n1) 46. See also Goldblatt 'Comparison of Emissions Trading and Carbon Taxation in South Africa' (n191) 514 in the context of carbon taxation and trading.

Chapter 5

The implementation of the feed-in tariff internationally

5.1 Introduction

Amongst other things, this chapter is concerned with identifying the elements of an effective feed-in tariff policy. It has been acknowledged above that Germany's feed-in tariff (FIT) is considered to have been the most successful in promoting renewable energy worldwide. Therefore, the focus of this chapter is on Germany's FIT, which is considered as a best practice example. Thereafter, this chapter outlines the FIT policy that has been implemented in Spain, which is considered to have been the most effective after Germany in promoting renewable energy through the FIT.[1] The FIT policy of Spain is outlined in order to highlight the different ways in which feed-in tariffs can be implemented. The chapter goes on to briefly consider how the lessons learned from these two countries might be relevant to South Africa. It also outlines the FIT policies of two developing countries – China and India. The examples of India and China are described briefly to highlight the endeavours of other developing countries in implementing the FIT.

[1] M Mendonça *Feed-In Tariffs: Accelerating the Deployment of Renewable Energy* 2009, 47.

5.2 Germany

5.2.1 Introduction[2]

In 2012 Germany's total primary energy supply consisted of 87.4 per cent of non-renewable sources including oil, coal, natural gas and nuclear and 12.6 per cent of renewable energy.[3] Germany is ranked first in the world in terms of renewable energy capacity on a per capita basis (excluding hydro power), followed by Sweden, Spain, Italy and Canada respectively.[4]

As a member of the European Union (EU), Germany has obligations with regard to the promotion of electricity generated from renewable energy sources (RES-E), and by 2010 was required to achieve the penetration of 12.5 per cent of RES-E.[5] Germany exceeded its 2010 target, and by 2008 had already implemented 15.4 per cent of RES-E.[6] Germany is also required, in terms of its EU obligations, to increase

[2] It should be noted that the adoption of the various renewable energy laws in Germany has been informed by the prevailing political circumstances. See for example S Jacobsson and V Lauber 'The Politics and Policy of Energy System Transformation – Explaining the German Diffusion of Renewable Energy Technology' 2006 (34) *Energy Policy* 256-276. See also J Lipp 'Lessons for effective renewable electricity policy from Denmark, Germany and the United Kingdom' 2007 (35) *Energy Policy* 5481-5495, 5487-5489. While relevant, Germany's changing political landscape is not discussed herein.

[3] Federal Ministry for the Environment, Nature Conservation and Nuclear Safety *Development of Renewable Energy Sources in Germany 2012: Graphics and Tables* 2013 available at http://www.erneuerbare-energien.de/fileadmin/Daten_EE/Dokumente__PDFs_/20130328_hgp_e_ppt_2012_fin_bf.pdf [accessed 14 November 2013] 2.

[4] Renewable Energy Policy Network for the 21st Century (REN21) *Renewables 2013: Global Status Report* available at http://www.ren21.net/Portals/0/documents/Resources/GSR/2013/GSR2013_lowres.pdf [accessed 14 June 2013] 19. It is interesting to note that at the end of 2011 the picture looked a bit different. While Germany still led with regard to renewable energy capacity (excluding hydropower) on a per capita basis, Germany was followed by Spain, Italy, the United States and Japan respectively. Renewable Energy Policy Network for the 21st Century (REN21) *Renewables 2012: Global Status Report* 2012 available at http://www.map.ren21.net/GSR/GSR2012.pdf [accessed 12 June 2012] 19.

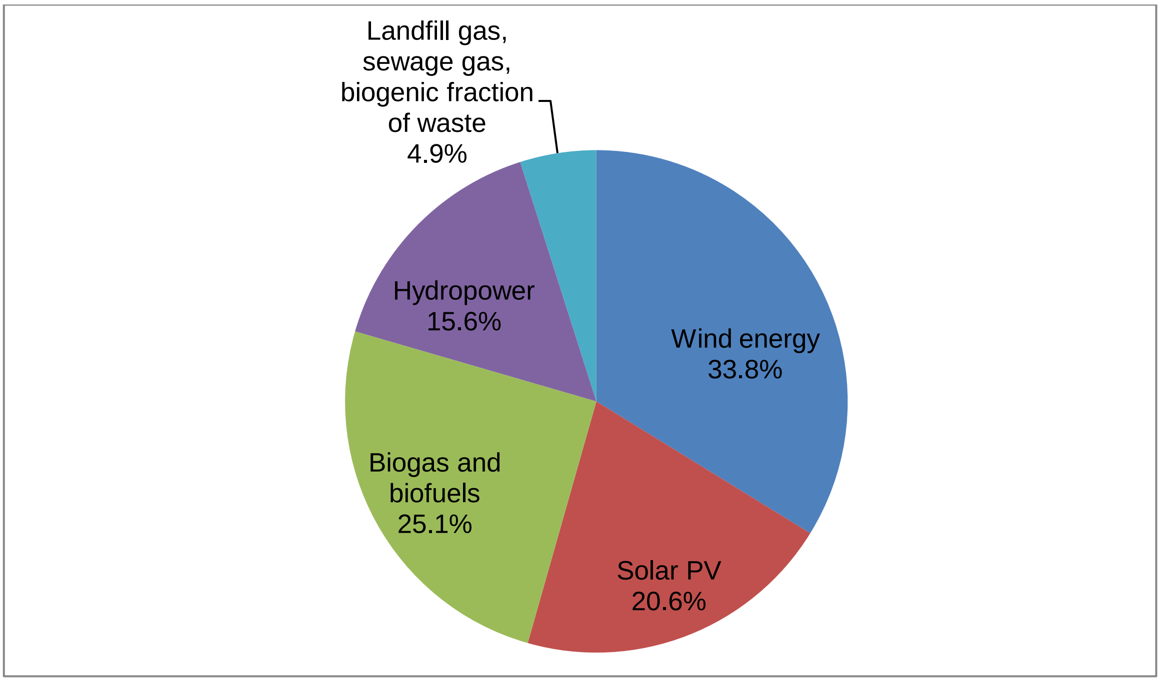
[5] In terms of European Union 'Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market'.

[6] Federal Ministry for the Environment, Nature Conservation and Nuclear Safety *Renewable Energy Sources in Figures: National and International Development* 2011 available at http://www.bmu.de/files/english/pdf/application/pdf/broschuere_ee_zahlen_en_bf.pdf [accessed 20 June 2012] 67.

the contribution of renewable energy to total energy supply to 18 per cent by 2020.[7] By 2012, Germany had implemented 12.6 per cent of renewable energy.[8]

Although Germany's electricity supply is dominated by non-renewable sources, the contribution of renewable sources has been increasing steadily from 3.1 per cent in 1990, to 6.4 per cent in 2000 and to 22.9 per cent in 2012.[9] While wind energy is dominant, other renewable energy technologies (RETs) make an important contribution to the overall supply of RES-E, which is reflected in Figure 5.1

Figure 5.1 RES-E in Germany[10]



The contribution of solar photovoltaic (PV) has increased rapidly, from only 64 gigawatt hours (GWh) in 2000 to 28 000 GWh by the end of 2012.[11] While Germany cannot be considered to be rich in solar resources, it is ranked first in the world in terms of PV capacity and by the end of 2012 had 32 per cent of the world's installed

[7] In terms of European Union 'Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC'.
[8] BMU *Development of Renewable Energy Sources in Germany 2012* (n3) 2.
[9] Ibid, 12.
[10] Ibid, 15.
[11] Ibid, 12.

PV capacity.[12] This is in part due to the generous tariffs that are offered for solar PV, which are discussed further below.[13]

While other instruments and policies relevant to renewable energy have been introduced in Germany, the feed-in tariff is considered to have been the most significant in promoting RES-E.[14]

The Act on Renewable Electricity Fed into the Grid was introduced in 1991, and is discussed in 5.2.3. For various reasons (discussed in 5.2.3) this Act was replaced by the Renewable Energy Sources Act in 2000, which is set out in 5.2.4. First, institutional and operational aspects are briefly outlined.

5.2.2 Institutional and operational aspects

The Renewable Energy Sources Act[15] is administered by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). Other relevant actors include the Federal Ministry of Economics and Technology (BMWi), the German parliament,[16] the Federal Environmental Agency and the German Energy Agency.[17]

In terms of electricity generation and transmission, generators of RES-E are connected to the distribution network operators (DNOs) (which are referred to in the Renewable Energy Sources Act as grid system operators), and tariffs are paid to RES-E generators by the DNO to whose grid the RES-E plant is physically connected. The German transmission grid is divided into four regions, which are run

[12] REN21 *Renewables 2013: Global Status Report* (n4) 17 and 45.
[13] However, it should be noted that Germany's tariffs for solar power have decreased drastically in recent years, and further cuts are proposed, as discussed further below.
[14] P Agnolucci 'Use of Economic Instruments in the German Renewable Electricity Policy' 2006 (34) *Energy Policy* 3538-3548, 3539.
[15] Gesetz fur den Vorrang Erneuerbarer Energien (Erneuerbare-Energien-Gesetz, BGBI. I S. 1754) (Renewable Energy Sources Act) (EEG of 1 April 2012) available at http://www.erneuerbare-energien.de/fileadmin/Daten_EE/Dokumente__PDFs_/eeg_2013_bf.pdf [accessed 14 November 2013].
[16] FN Laird and C Stefes 'The Diverging Paths of Germany and United States Policies for Renewable Energy: Sources of difference' 2009 (37) *Energy Policy* 2619-2629, 2622 and 2626.
[17] A Held, M Ragwitz, G Resch, F Nemac and K Vertin *Feed-In Systems in Germany, Spain and Slovenia – A Comparison* 2010 available at http://www.feed-in-cooperation.org [accessed 25 May 2011] 7.

by different operators,[18] referred to as transmission systems operators (TSOs). DNOs are connected to the TSOs and the DNOs transfer electricity to the respective TSOs at the fixed price. The TSOs are responsible for transforming 'the load fluctuating profiles to a standard load profile [which] …are sold to all utilities that deliver electricity to final consumers. The utilities charge the average tariff to their customers'.[19] Large wind parks sometimes connect and sell directly to the TSO.[20]

5.2.3 Act on Renewable Electricity Fed into the Grid

The Act on Renewable Electricity Fed into the Grid (Stromeinspeisegesetz or StrEG)[21] came into effect in 1991 and applied in respect of hydropower, wind energy, solar energy, landfill gas, sewage gas and biomass.[22] Utilities larger than 5 megawatts (MW) were excluded.[23] The StrEG obliged electricity utilities (grid operators) to pay renewable energy generators in 'their supply area' for RES-E fed into the grid.[24]

Grid operators were required to pay renewable energy generators a fixed rate, which was calculated as a percentage of the retail price for electricity and, which ranged from 65-90 per cent of the average electricity retail prices paid by final customers.[25] This was a premium that was added to the market price of electricity.[26] The tariff was set at 80 per cent for small hydro, sewage gas, landfill gas and biomass of less than 500 kilowatts (kW) and 65 per cent for installations of 500kW-

[18] O Langniβ, J Diekmann and U Lehr 'Advanced Mechanisms for the Promotion of Renewable Energy – Models for the Future Evolution of the German Renewable Energy Act' 2009 (37) *Energy Policy* 1289-1297, 1290.
[19] C Klessmann, C Nabe and K Burges 'Pros and Cons of Exposing Renewables to Electricity Market Risks – A comparison of the market integration approaches in Germany, Spain and the UK' 2008 (36) *Energy Policy* 3646-3661, 3650.
[20] Ibid.
[21] Stromeinspeisungsgesetz (BGBI. I S. 2663) (Act on Renewable Energy Fed into the Grid) Unofficial translation available at http://wind-works.org/FeedLaws/Germany/ARTsDE.html [accessed 9 May 2012] (the StrEG).
[22] Ibid, Section 1.
[23] Laird and Stefes 'The Diverging Paths of Germany and US Policies for Renewable Energy (n16) 2622.
[24] StrEG (n21) Section 2.
[25] Lipp 'Lessons for Effective Renewable Electricity Policy' (n2) 5488.
[26] C Mitchell, D Bauknecht and PM Connor 'Effectiveness through Risk Reduction: A comparison of the renewable obligation in England and Wales and the feed-in system in Germany' 2006 (34) *Energy Policy* 297-305, 298.

5MW. The tariff was set at 90 per cent for wind and solar energy.[27] The intention was to 'create a level playing field between [RES-E] and conventional electricity generation'.[28]

Between 1990 and 2000, wind energy increased from 68 MW to more than 6000 MW.[29] However, other types of renewable energy, such as solar energy, did not fare as well. This is because the rates included under the StrEG were not sufficient to promote large-scale investment in other renewable energy sources especially biomass and PV.[30] Furthermore, the StrEG did not provide security regarding the duration of contracts,[31] as there was no obligation regarding the length of time for which the tariffs had to be paid.

Even though the costs of renewable energy decreased after the StrEG was adopted, the premium tariffs were not reduced correspondingly.[32] Opposition to the StrEG increased further when the amount of renewable energy increased in certain areas (and led to increasing costs for grid operators, and thus, consumers) but costs were not distributed evenly across the country.[33]

This led to a 'hardship clause' being introduced, which served to exempt 'utilities from their purchase obligation if it would put an undue economic, technical or legal burden on them'.[34] This clause was 'redefined' in 1998,[35] to provide that grid operators were only required to purchase renewable energy amounting to not more than five per cent of the total amount of electricity that they sold in one year.[36] Once this five per cent limit was reached, an 'upstream system operator' was obliged to

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[27] StrEG (n21) Section 3. See also R Wüstenhagen and M Bilharz 'Green Energy Market Development in Germany: Effective public policy and emerging customer demand' 2006 (34) *Energy Policy* 1681-1696, 1685.
[28] Lipp 'Lessons for Effective Renewable Electricity Policy' (n2) 5488.
[29] Laird and Stefes 'The Diverging Paths of Germany and US Policies for Renewable Energy (n16) 2622.
[30] Gesetz fur den Vorrang Erneuerbarer Energien (Erneuerbare-Energien-Gesetz, BGBI. I S. 305) (Renewable Energy Sources Act) (Original EEG) available at http://www.erneuerbare-energien.de/files/pdfs/allgemein/application/pdf/res-act.pdf [accessed 14 June 2011] Explanatory Memorandum, A. General Provisions.
[31] Laird and Stefes 'The Diverging Paths of Germany and US Policies for Renewable Energy (n16) 2624.
[32] V Lauber 'REFIT and RPS: Options for a harmonised Community framework' 2004 (32) *Energy Policy* 1405-1414, 1407.
[33] Ibid.
[34] Wüstenhagen and Bilharz 'Green Energy Market Development in Germany' (n27) 1687.
[35] Ibid.
[36] StrEG (n21) Section 4.

compensate the relevant grid operator for the additional costs incurred due to the five per cent limit being exceeded,[37] until the upstream operator had also reached its five percent threshold.[38] Thereafter, the grid operator was no longer obliged to purchase renewable energy.[39]

This hardship clause was introduced in order to reduce the burden on grid operators in windy regions. However, it has been argued that this led to inefficiency, as it led to less windy locations being preferred over windier locations if the threshold had not yet been reached in the less windy locations.[40]

Because the tariff was linked to the price of electricity, when electricity prices decreased, this led to renewable energy generators losing revenue.[41] Even though electricity generated from renewable sources increased from 17 086 GWh in 1990 to 37 218 GWh in 2000,[42] in light of the problems identified above, the StrEG was replaced in 2000 by the Renewable Energy Sources Act in order to streamline the promotion of RES-E.

5.2.4 Renewable Energy Sources Act

5.2.4.1 Overview

The Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz or EEG),[43] came into effect in 2000. The EEG was significant in that it 'dramatically increased the importance of other renewable energy sources'.[44]

The EEG has been amended several times since its introduction, with the amendments coming into effect in 2004, 2009 and in 2012.[45] Due to the excessive

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[37] Ibid.
[38] Agnolucci 'Use of Economic Instruments in the German Renewable Electricity Policy' (n14) 3539-3540.
[39] Wüstenhagen and Bilharz 'Green Energy Market Development in Germany' (n27) 1687.
[40] Agnolucci 'Use of Economic Instruments in the German Renewable Electricity Policy' (n14) 3544.
[41] Lipp 'Lessons for Effective Renewable Electricity Policy' (n2) 5488.
[42] BMU *Renewable Energy Sources in Figures* (n6) 16.
[43] Original EEG (n30).
[44] Laird and Stefes 'The Diverging Paths of Germany and US Policies for Renewable Energy (n16) 2624.

uptake of solar PV the EEG was amended again in 2012 by the ‘Act to Amend the Legal Framework for Electricity Generated from Solar Radiation and other Amendments to the Law on Renewable Energy Sources’,[46] which was agreed to at the end of June 2012 but was applicable from 1 April 2012.[47]

With each amendment, a new Act has been produced, and the EEG has evolved from a relatively basic Act of only 12 sections to a far more nuanced Act of 66 sections in its current form. The approach taken here is to discuss the latest version of the Act, but to also highlight amendments or developments where these are considered significant or for illustrative purposes.

5.2.4.2 Objective and scope of application

The EEG is intended to

> ‘facilitate a sustainable development of energy supply, particularly for the sake of protecting our climate and the environment, to reduce the costs of energy supply to the national economy, also by incorporating external long-term effects, to conserve fossil fuels and to promote the further development of technologies for the generation of electricity from renewable energy sources’.[48]

The Act applies to:

- priority connection to the grid ‘for general electricity supply of installations generating electricity from renewable energy sources and from mine gas’ within Germany and its exclusive economic zone;[49]
- ‘the priority purchase, transmission, distribution of and payment for such electricity by the grid system operations’ as well as electricity generated from combined heat and power;[50] as well as

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[45] The original EEG Act is referred to as ‘Original EEG’. The amendments that came into effect in 2004, 2009 and 2012 are referred to herein as the ‘EEG of 2004’, the ‘EEG of 2009’ and the ‘EEG of 1 January 2012’ respectively.
[46] Gesetz zur Änderung des Rechtsrahmens für Strom aus solarer Strahlungsenergie und weiteren Änderungen in Recht der erneuerbaren Energien. This Act (in German) is available at http://www.eeg-kwk.net/de/file/BGBl_1754_120823.pdf [accessed 14 November 2013].
[47] The latest amendment of the EEG is referred to as the ‘EEG as amended’, ‘EEG of 1 April 2012’, ‘the current version of the EEG’, or simply ‘the EEG’. EEG of 1 April 2012, Preamble.
[48] EEG of 1 April 2012 (n15) section 1(1).
[49] Ibid, section 2(1).

- the ‘nationwide equalisation scheme’,[51] dealt with in 5.2.4.10.

While previous versions of the EEG excluded from their application installations that were part-owned by the German government,[52] the current version of the EEG does not appear to contain similar provisions. Presumably then, government-owned installations would also qualify for tariffs under the EEG.

5.2.4.3 Definitions

The EEG defines ‘renewable energy sources’ as

> ‘hydropower, including wave power, tidal power, salt gradient and flow energy, wind energy, solar radiation, geothermal energy, energy from biomass, including biogas, biomethane, landfill gas and sewage treatment gas, as well as the biodegradable fraction of municipal waste and industrial waste’.[53]

An ‘installation’ refers to ‘any facility generating electricity from renewable energy sources or from mine gas…’.[54]

An ‘installation operator’ refers to ‘anyone, irrespective of the issue of ownership, who uses the installation to generate electricity from renewable energy sources or from mine gas’[55] (i.e. the renewable energy generator).

‘Grid system operators’ are defined as ‘the operators of grid systems of all voltages for general electricity supply’.[56]

‘Transmission system operators’ refer to ‘the system balancing grid operators of high-voltage and extra-high voltage grid systems which are used for the supraregional transmission of electricity to downstream grid systems’.[57]

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[50] Ibid, section 2(2).
[51] Ibid, section 2(3).
[52] See for example Gesetz fur den Vorrang Erneuerbarer Energien (Erneuerbare-Energien-Gesetz, BGBl. I S. 2074) (Renewable Energy Sources Act) (EEG of 2009) Section 66(3).
[53] EEG of 1 April 2012 (n15) section 3(3).
[54] Ibid, section 3(1). While not defined in the Act, mine gas refers to gas that is released during the mining process and consists primarily of methane.
[55] Ibid, section 3(2).
[56] Ibid, section 3(8).
[57] Ibid, section 3(11).

5.2.4.4 Targets

One of the objectives of the original EEG was to

> 'achieve a substantial increase in the percentage contribution made by renewable energy sources to power supply in order at least to double the share of renewable energy sources in total energy consumption by the year 2010'.[58]

The EEG of 2004 introduced the specific target of increasing the percentage of electricity generated from renewable sources to at least 12.5 per cent by 2010 and to at least 20 per cent by 2020.[59] The 2010 target was in accordance with Germany's EU obligation with regard to the promotion of RES-E.[60] This target was increased in the EEG of 2009 to at least 30 per cent by 2020 'and to continuously increase … thereafter'.[61]

The level of ambition was increased further in the EEG of 1 January 2012, which put in place successive targets to achieve the Act's purpose, namely by 'increas[ing] the share of renewable energy sources in [the] electricity supply to at least:

1. 35 percent by no later than 2020;
2. 50 percent by no later than 2030;
3. 65 percent by no later than 2040; and
4. 80 percent by no later than 2050'.[62]

These targets have been retained in the current version of the EEG. Achieving the goal (for 2020) is intended to result in renewable energy sources accounting for 18 per cent of total energy consumption by 2020.[63] As noted above, this is in

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[58] Original EEG (n30) section 1.
[59] Gesetz fur den Vorrang Erneuerbarer Energien (Erneuerbare-Energien-Gesetz, BGBI. I S. 1918) (Renewable Energy Sources Act) (EEG of 2004) Article 1(2).
[60] In terms of EU 'Directive 2001/77/EC' (n5). As noted above Germany exceeded this target, and by 2008 had already implemented 15.4 per cent of RES-E. BMU *Renewable Energy Sources in Figures* (n6) 67.
[61] EEG of 2009 (n52) Section 1(2).
[62] Gesetz fur den Vorrang Erneuerbarer Energien (Erneuerbare-Energien-Gesetz, BGBI. I S. 1634) (Renewable Energy Sources Act) (EEG of 1 January 2012) section 1(2).
[63] EEG of 1 April 2012 (n15) section 1(3).

accordance with Germany's EU obligation with regard to promoting the overall share of renewable energy.[64]

5.2.4.5 Obligations relating to connection, purchase and upgrading

In the first place, an obligation is imposed on grid system operators to

> 'immediately and as a priority *connect* installations generating electricity from renewable energy sources and from mine gas to that point in their grid system (grid connection point) which is suitable in terms of the voltage and which is at the shortest linear distance from the location of the installation if no other grid system has a technically and economically more favourable grid connection point'[65] (*own emphasis*).

The EEG makes provision for the expeditious connection of installation operators to grid systems and obliges grid system operators to *inter alia* provide those wishing to feed electricity into the grid with a timetable regarding the procedural steps involved, as well as the information that must be submitted and an estimation of the costs involved.[66]

Grid system operators are furthermore obliged to 'immediately and as a priority *purchase, transmit and distribute* the entire available quantity of electricity from renewable energy sources and from mine gas'[67] (*own emphasis*). Installation operators and grid system operators may agree, in certain circumstances, to deviate from this obligation of priority purchase.[68]

Grid system operators are also obliged, upon request from those wishing to feed electricity into the grid, to

> 'immediately *optimise, strengthen and expand* their grid systems in accordance with the best available technology in order to guarantee the purchase,

[64] In terms of EU 'Directive 2009/28/EC' (n7).
[65] EEG of 1 April 2012 (n15) section 5(1).
[66] Ibid, section 5(5) and (6).
[67] Ibid, section 8(1).
[68] Ibid, section 8(3a).

> transmission and distribution of the electricity generated from renewable energy sources or from mine gas'[69] (*own emphasis*).

This is essentially an obligation imposed on grid system operators to upgrade their grids. This obligation may also apply where the installation is not directly connected to the relevant grid system provided certain conditions are met.[70] Those wishing to feed electricity into the grid may demand compensation if grid system operators violate the obligation to 'immediately optimise, strengthen and expand their grid systems'.[71] However, the grid system operator is not obliged to upgrade the grid system if this is 'economically unreasonable'.[72]

Installation operators who claim payment of the relevant tariffs are required to make the entire amount of electricity generated from that installation available to the grid operator.[73] Grid system operators are prohibited from making the performance of their obligations under the EEG 'conditional upon the conclusion of a contract'.[74]

Importantly, the EEG does not impose an overall capacity limit.[75] The EEG prohibits electricity generated from renewable energy sources, mine gas, landfill gas or sewage treatment gas from being sold more than once.[76]

5.2.4.6 Obligation on renewable energy generators to install facilities to reduce output

The EEG of 2009 introduced an obligation on installation operators to provide a facility that can 'reduce output by remote means in the event of grid overload'[77] in certain circumstances, which is maintained in the current version of the EEG.[78]

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[69] Ibid, section 9(1).
[70] Ibid.
[71] Ibid, section 10(1) read with section 9(1).
[72] Ibid, section 9(3).
[73] Ibid, section 16(3).
[74] Ibid, section 4(1).
[75] Mitchell et al 'Effectiveness Through Risk Reduction' (n26) 298. It should be noted however, that due to the increasing costs arising due to the EEG and the consequent public resistance, capacity caps have recently been introduced in respect of solar PV. This is discussed in 5.2.4.8 below.
[76] EEG of 1 April 2012 (n15) section 56(1).
[77] EEG of 2009 (n52) Section 6(1).
[78] EEG of 1 April 2012 (n15) section 6.

Installation operators and operators of combined heat and power (CHP) are required to install technical facilities if their installations have an installed capacity of more than 100 kilowatts, to ensure that at any time the grid system operator can ‘reduce output by remote means in the event of grid overload’ and ‘call up the current electricity feed-in at any given point in time’.[79] The same obligation is imposed on operators of solar radiation installations in respect of installations that have an installed capacity of between 30kW and 100kW.[80] Contravention of these provisions may result in the forfeit of payment for as long as the contravention continues.[81]

Grid system operators are empowered to ‘assume technical control over installations’ and CHP installations connected to their grid system, in order to reduce output where a grid overload arises, provided certain conditions are present, including where ‘a grid bottleneck would otherwise arise in the respective grid system area’.[82]

This provision was previously problematic and it led to some renewable energy generators losing revenue.[83] However, this has been rectified and the EEG now includes a ‘hardship clause’, which provides for the compensation of operators who are affected by this measure.[84]

5.2.4.7 Costs of connection and upgrading

Installation operators are responsible for the costs associated with connecting their installations and metering devices to the relevant grid connection point;[85] and grid system operators are responsible for the costs of ‘optimising, strengthening and expanding the grid system’.[86]

[79] Ibid, section 6(1).
[80] Ibid, section 6(2).
[81] Ibid, section 6(6) read with section 17(1).
[82] Ibid, section 11(1)1.
[83] Klessmann et al ‘Pros and Cons of Exposing Renewables to Electricity Market Risks’ (n19) 3651.
[84] EEG of 1 April 2012 (n15) section 12(1). This hardship clause was introduced by the EEG of 1 January 2012 (n62).
[85] EEG of 1 April 2012 (n15) section 13(1).
[86] Ibid, section 14.

The costs of upgrading may be passed on to consumers. However, the costs of upgrading may not be included in the equalisation scheme (which is dealt with below).[87]

5.2.4.8 Tariffs

The tariffs and bonuses set out in the current version of the EEG applied in respect of electricity from installations commissioned before 1 January 2013, after which the annual rates of reduction or degression apply.[88] The tariffs and bonuses that apply as at the date of commissioning of the relevant installation apply for the entire contract period.[89] Therefore, tariffs do not decrease during the contract period of an existing installation, but only decrease for installations built in later years.[90]

The tariffs are only payable when electricity is generated entirely from renewable energy sources or mine gas, and this electricity has been fed into the grid system.[91] Tariffs are payable for 20 years.[92] The additional costs, i.e. the 'price difference between feed-in tariffs and market prices', are ultimately paid for by the final consumers.[93]

The EEG makes provision for the entitlement to the payment of tariffs to be reduced to zero or to the 'actual monthly average of the market value of the specific energy source' if certain sections of the Act are contravened.[94]

The tariffs that were paid to renewable energy generators under the original EEG are set out in Table 5.1 below. These tariffs are included in order to provide a point of comparison for the current tariffs, and also because it is considered that this initial system of tariffs would be more relevant in the South African context, compared to

[87] Klessmann et al 'Pros and Cons of Exposing Renewables to Electricity Market Risks' (n19) footnote 5, 3651.
[88] EEG of 1 April 2012 (n15) section 20(1) and (2).
[89] Ibid, section 20(1).
[90] See M Weitzel 'Comment on "Comparing the Feed-In Tariff Incentives for Renewable Electricity in Ontario and Germany" by Mabee, Mannion, and Carpenter' 2012 (44) *Energy Policy* 485-486, 485 and W Mabee and T Carpenter 'Response to Weitzel on our Paper "Comparing the Feed-In Tariff Incentives for Renewable Electricity in Ontario and Germany" by Mabee, Mannion, and Carpenter' 2012 (44) *Energy Policy* 487-488, 488.
[91] EEG of 1 April 2012 (n15) section 21(1).
[92] Ibid, section 21(2).
[93] Klessmann et al 'Pros and Cons of Exposing Renewables to Electricity Market Risks' (n19) 3650.
[94] EEG of 1 April 2012 (n15) section 17(1), (2) and (3).

the complex system of tariffs and disaggregated rates that exists today, and which is reflected in Table 5.2 further below.

Table 5.1 Tariffs paid to renewable energy generators in terms of the original EEG[95]

Technology	Capacity	Tariff in German pfennigs per kilowatt hour (kWh)	Tariff in Euro cents per kWh[96]	Annual degression
Hydropower; Gas from landfills, mines, and sewage treatment plants	less than 500kW 500kW – 5MW	15 13	7.67 6.65	
Biomass	less than 500kW 500kW – 5MW more than 5MW	20 18 17	10.23 9.21 8.70	1 %
Geothermal energy	up to 20 MW more than 20 MW	17.5 14	8.95 7.16	
Wind energy[97] **First 5 years** **After 5 years**		 17.8 12.1	 9.10 6.19	1.5 %

[95] Original EEG (n30).
[96] The equivalent tariff in Euro cents has been obtained from Table 2 in Agnolucci 'Use of Economic Instruments in the German Renewable Electricity Policy' (n14) 3540.
[97] Note: The EEG makes provision for different remuneration depending on wind conditions. Thus, if an installation attains 150 per cent of the reference yield (calculated for a reference installation) within five years, the remuneration is only 12.1 Pf/kWh. However, the period of five years is extended by two months for every 0.75 per cent that the renewable energy generated is kept below 150 per cent of the reference yield. Section 7(1). At inland sites, the rate is 17.3 Pf/kWh. Where wind conditions are average, the rate is 16.4 Pf/kWh and where wind conditions are good, rates are reduced to 13.5 Pf/kWh. See Original EEG (n30) *Explanatory Memorandum: B. Special Provisions*; Section 7.

Solar energy[98]		99	50.62	5%

These tariffs were valid for 20 years except in respect of hydropower,[99] for which tariffs were granted for even longer.[100] The high tariff for solar PV (compared to under the StrEG) resulted in a 'boom' in the solar PV market in 2000.[101] The tariff for solar was also increased significantly in 2004, due to the ending of the '100 000 roofs programme' (which promoted solar energy and is discussed further in 5.2.5.5).[102]

Table 5.1 shows that there is a substantial difference between the tariffs for solar energy and the other RETs. These price differences have already been discussed in Chapter 3 above, and are due to the fact that solar energy is not yet a mature technology compared to the other RETs, and has not yet achieved the necessary economies of scale that will lead to prices decreasing substantially.

The current version of the EEG establishes a more complex system of tariffs, and while often providing for a basic tariff for a specific technology, many variations are included. The approach taken here is to reflect as far as possible the basic tariff, with only some of the variations provided for in the current EEG being discussed here.

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[98] Note: The obligation to pay this tariff ceased in respect of installations that were commissioned after 31 December of the year following the year in which energy generated from eligible photovoltaic installations reached a total installed capacity of 350MW. The EEG noted that the German Bundestag (Parliament) would implement a 'follow-up compensation scheme' after the discontinuation of this obligation.

[99] Original EEG (n30) section 9(1).

[100] Agnolucci 'Use of Economic Instruments in the German Renewable Electricity Policy' (n14) 3540.

[101] Ibid, 3545.

[102] Held et al *Feed-In Systems in Germany, Spain and Slovenia* (n17) 4.

Table 5.2 Tariffs to be paid to renewable energy generators in terms of the current version of the EEG[103]

Technology	Capacity	Tariff (in € cents/kWh)	Degression
Hydropower (section 23)	Up to 500 kilowatts	12.7	1 per cent per year from 2013
	500 kW – 2 MW	8.30	
	2 – 5 MW	6.30	
	5 – 10 MW	5.50	
	10 – 20 MW	5.30	
	20 – 50 MW	4.20	
	Over 50 MW	3.40	
Landfill gas (section 24)	Up to 500 kW	8.60	1.5 per cent from 2013
	500 kW – 5 MW	5.89	
Sewage treatment gas (section 25)	Up to 500 kW	6.79	
	500 kW – 5 MW	5.89	
Mine gas (section 26)	Up to 1 MW	6.84	
	1 – 5 MW	4.93	
	Over 5 MW	3.98	
Biomass[104] (section 27)	Up to 150 kW	14.3	2 per cent from 2013
	150 – 500 kW	12.3	
	500 – 5 MW	11.0	
	5 – 20 MW	6.0	
Biowaste fermentation[105] (section 27a)	Up to 500 kW	16.0	2 per cent from
	500 kW – 20 MW	14.0	

103 EEG of 1 April 2012 (n15).
104 Provision is made for the increase of these rates if the substances listed in Annexes 2 and 3 of the Biomass Ordinance are used. EEG of 1 April 2012 (n15) section 27(2). Furthermore, it is required that certain percentages of the electricity generated be from combined heat and power in certain circumstances. Section 27(4).
105 Installations for biowaste fermentation (section 27a) commissioned after 31 December 2013 are only entitled to the above tariffs if the installation's capacity does not exceed 750kW. EEG of 1 April 2012, section 27a(2). This would presumably have provided an incentive to commission large biowaste fermentation facilities before the end of 2013.

Manure fermentation (section 27b)	Up to 75 kW	25.0		2013
Geothermal energy (section 28)	No limit	25.0 (Additional tariff of 5.0 if petrothermal technology used)		5 per cent from 2018
Onshore wind energy (section 29)		**Initial tariff (first five years)**	**Basic tariff**	
	No limit	8.93	4.87	1.5 per cent from 2013
Offshore wind energy (section 31)		**Initial tariff (first 12 years)**	**Basic tariff**	
	No limit	15.0	3.5	7 per cent from 2018

It can be seen that tariffs are differentiated in respect of the different RETs. Furthermore, the EEG establishes higher tariffs for smaller installations, and tariffs decrease as the size of installations increases. This takes into account the fact that larger installations are able to generate energy more cheaply than smaller installations. Furthermore, different degression rates are established for the different RETs.

Interestingly, the EEG provides for the extension of the initial (higher) tariff for wind energy when the yield of an installation is less than 150 per cent of the 'reference yield'.[106] This serves to ensure that installations with lower yields (i.e. in less windy areas) are entitled to a higher tariff for a longer period of time. This provides an incentive to renewable energy generators to distribute the construction of installations, rather than to flock to the areas where the resource is the strongest.

[106] EEG of 1 April 2012 (n15) section 29(2). The reference yield is calculated in accordance with Annex 3 of the Act. See section 29(2). This was introduced with the EEG of 2009 (n52).

The EEG also deems that installations of less than 50 kW have a yield of 60 per cent of the reference yield.[107]

The initial tariff for wind energy may be increased in certain circumstances, including where new installations are permanent replacements for existing installations and *inter alia* have two and half times the capacity of the installations they replace.[108] This provides an incentive to upgrade facilities so that they become more efficient.

In respect of offshore wind energy, provision is made for the initial tariff to be extended in certain circumstances. The length of time for which the initial tariff may be extended is determined with reference to the distance of the installation from the coastline and the depth of the installation.[109]

There has been such interest in solar PV from around 2010 (which has led to increased costs for consumers),[110] that the basic tariffs for solar radiation were decreased from between 31.94 €cents/kWh and 43.01 €cents/kWh in the EEG of 2009 to between 21.11 €cents/kWh and 28.74 €cents/kWh in the EEG of 1 January 2012,[111] and a complex system of degression was established. A basic degression rate of 9 per cent per year applied.[112] Depending on the amount of capacity that was installed in the previous year, the degression level could be adjusted up or down.[113] Thus, if the uptake of solar PV exceeded 3500 MW in a single year the degression rate would be increased and thus tariffs (for future installations) would decrease

[107] EEG of 1 April 2012 (n15) section 29(3). See also See also Federal Ministry for the Environment, Nature Conservation and Nuclear Safety *Tariffs, degression and sample calculations pursuant to the new Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz – EEG) of 4 August 2011 ('EEG 2012')* available at http://www.bmu.de/files/english/pdf/application/pdf/eeg_2012_verguetungsdegression_en_bf.pdf [accessed 21 June 2012] 12. Under the EEG of 2004 (n59), it was required that wind plants were commissioned that they could achieve at least 60 per cent of the reference yield (in terms of article 10(4)), in order to ensure that wind plants were not constructed in areas that were not windy. This provision was maintained in the 2009 amendment, in respect of installations greater than 50kW (EEG of 2009 (n52) Section 29(3)).

[108] EEG of 1 April 2012 (n15) section 30(1). See also section 29(2) read with section 6(5), which establish a system services bonus.

[109] Ibid, section 31(2). These tariffs may not be applied in respect of installations that are built in a part of Germany's exclusive economic zone or coastal waters that has 'been declared a protected part of nature and landscape'. See section 31(5).

[110] C Leepa and M Unfried 'Effects of a Cut-off in Feed-in Tariffs on Photovoltaic Capacity: Evidence from Germany' 2013 (56) *Energy Policy* 536-542, 536-537.

[111] See sections 31 and 32 of the EEG of 1 April 2012 (n15).

[112] Ibid, section 20a(2).

[113] Ibid, section 20a(3) and (4).

further. However, if the uptake of solar PV fell below 2500 MW the degression rate would be decreased and thus tariffs (for future installations) would not decrease as much.[114] The effect of this was to attempt to ensure that the uptake of solar PV fell within a specific desired range, i.e. between 2500 MW and 3500 MW per year.[115]

However, following continued interest in solar radiation (7500 MW of solar PV was reportedly installed in 2011[116]), the EEG was amended again in 2012. The EEG of 1 April 2012 explicitly specifies a 'capacity expansion target' of between 2500 MW and 3500 MW per year.[117] It also places an obligation on the Federal Network Agency to publish on its website, every month, detailed information regarding the new and current capacity levels of solar radiation.[118] Furthermore, the basic tariffs for solar radiation have been reduced to between 13.5 cents/kWh and 19.5 cents/kWh.[119] The basic tariffs are reflected in Table 5.3.

Table 5.3 Tariffs for solar radiation in the EEG of 1 April 2012[120]

Technology	Capacity	Tariff (in € cents/kWh)
Solar radiation (section 32(1))	Up to 10 MW	13.5
Solar radiation exclusively in, attached to or on top of a building or noise protection wall (section 32(2))	Up to 10 kW	19.5
	10 kW – 40 kW	18.5
	40 kW – 1 MW	16.5
	1 MW – 10 MW	13.5

114 See section 20a(3) and (4).
115 This is essentially flexible or responsive degression, which is discussed further in Chapter 8 below.
116 See P Donahue 'Deal reached on German feed-in tariff' *RenewableEnergyWorld.com* (28 June 2012) available at http://www.renewableenergyworld.com/rea/news/article/2012/06/deal-reached-on-german-feed-in-tariff [accessed 31 July 2012]. See also Leepa and Unfried 'Effects of a Cut-off in Feed-in Tariffs on Photovoltaic Capacity' (n110) 537.
117 EEG of 1 April 2012 (n15) section 20a(1).
118 Ibid, section 20a(2) and (3).
119 Ibid, section 32(1) and (2).
120 EEG of 1 April 2012 (n15).

Provision is also made for the tariffs of installations with an installed capacity of between 10 kW and up to 1 MW to be limited 'to 90 percent of the total quantity of electricity generated in the installation in that calendar year'.[121]

An even more complex system of degression has been established in the current version of the EEG. A basic degression rate of 1 per cent per month has been introduced,[122] which may be increased up (up to 2.8 per cent) or down (to zero) depending on the amount of solar radiation installed in a specific period.[123]

Importantly the current version of the EEG establishes a total cap for solar PV of 52 GW. Once this cap is reached, tariffs for solar radiation 'shall be reduced to zero'.[124] It has been reported that thereafter 'a new formula will be found'.[125] It has been projected that the cap of 52 GW will be reached by 2017 or 2018.[126]

These drastic cuts in the tariffs for solar have been criticised, and it has been suggested that the tariff cuts as well as the hard caps on installed capacity that have been implemented in Germany, Spain and Australia

> 'raise the question of whether sometimes the cuts to FIT rates are partly a response to lobbying by incumbent fossil fuel energy generators to ensure that the renewable energy revolution does not proceed too quickly because it will continue to erode their market share and/or reduce peak electricity prices'.[127]

5.2.4.9 Direct selling

The EEG of 2009 introduced the option of direct selling, and this has been maintained in the current version of the EEG, albeit in more detailed terms.[128] The EEG currently provides for installation operators to claim a market premium from the

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[121] Ibid, section 33(1).
[122] Ibid, section 20b(1).
[123] Ibid, section 20b(2)-(9).
[124] Ibid, section 20b(9a).
[125] Donahue 'Deal reached on German feed-in tariff' (n116).
[126] AFP 'Germany pulls plug on solar subsidies' *News24* (8 July 2013) available at http://www.news24.com/Green/News/Germany-pulls-plug-on-solar-subsidies-20130708 [accessed 9 July 2013].
[127] J Prest 'The Future of Feed-in Tariffs: Capacity caps, scheme closures and looming grid parity' 2012 (1) *Renewable Energy Law and Policy Review* 25-41, 40.
[128] Direct selling is dealt with in EEG of 1 April 2012 (n15) sections 33a to 33f.

grid operator in respect of electricity (from renewable energy sources or mine gas) that they sell directly to third parties, on condition that the electricity 'has actually been fed into the grid system and purchased by a third party'.[129] The EEG also sets out how the market premium must be calculated.[130] Provision is also made for installation operators that generate electricity from biogas to claim a flexibility premium if certain conditions have been met.[131]

Direct selling is an alternative to claiming the tariffs that have been set out above.[132] It appears to be possible to alternate between claiming tariffs under the EEG and selling directly, and the EEG requires that installation operators notify grid operators beforehand 'of any switch'.[133]

5.2.4.10 Equalisation scheme

An equalisation scheme was introduced in the original EEG, in terms of which grid operators were obliged to record the amount of renewable energy purchased, for the purpose of ensuring that the costs of renewable energy were equalised amongst all grid operators (across the country),[134] so as to ameliorate the competitive disadvantage experienced by those network operators that had a lot of 'green' electricity in their grids compared to those that had none.[135]

The EEG currently provides for equalisation between grid system operators and transmission system operators (TSOs), and places an obligation on grid system operators to 'immediately deliver to the upstream transmission system operator the electricity for which tariffs are paid in accordance with section 16'[136] and obliges

[129] Ibid, section 33g(1).
[130] Ibid, section 33g(2) and section 33h.
[131] Ibid, section 33i.
[132] Ibid, section 33e.
[133] Ibid, section 33d(2). The impacts of these provisions are discussed in E Gawel and A Purkus 'Promoting the Market and System Integration of Renewable Energies through Premium Schemes – A case study of the German market premium' 2013 (61) *Energy Policy* 599-609.
[134] See Original EEG (n30) section 11(1) and (2).
[135] M Ringel 'Fostering the Use of Renewable Energies in the European Union: The race between feed-in tariffs and green certificates' 2006 (31) *Renewable Energy* 1-17, 16.
[136] EEG of 1 April 2012 (n15) section 34.

upstream TSOs to pay the specified tariffs in respect of the ‘quantity of electricity for which grid system operators have paid tariffs in accordance with section 16’.[137]

The Act also provides for equalisation amongst TSOs, and TSOs are *inter alia* required to: record the amount of electricity for which tariffs have been paid; record the payment of tariffs and premiums (for the purpose of determining the average share); provisionally equalise the amounts of electricity that have been purchased; ‘make monthly advance payments of an appropriate amount for the payments [made]’; and settle such accounts.[138]

TSOs that have purchased electricity in excess of the average share may sell the excess electricity to other transmission system operators until their share is equal to the average share.[139]

TSOs may require electricity suppliers that deliver electricity to the final consumers to pay a share of ‘the necessary expenditure’ in proportion to the electricity they have delivered to final consumers, which is referred to as the EEG surcharge. The EEG surcharge, is ‘determined in such a way that each electricity supplier bears the same costs for each kilowatt-hour of electricity delivered by it to a final consumer’.[140]

TSOs are not entitled to this EEG surcharge in instances where a final consumer generates and consumes its own electricity, provided that the electricity is ‘not transmitted via a grid system; or … is used in the vicinity of the electricity generating installation’.[141]

5.2.4.11 Special equalisation scheme

A special equalisation scheme was introduced in 2004 in respect of manufacturing enterprises or rail operators.[142] The current version of the EEG provides that electricity-intensive enterprises and rail operators that are final consumers may

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137 Ibid, section 35(1)
138 Ibid, section 36(1).
139 Ibid, section 36(3).
140 Ibid, section 37(2).
141 Ibid, section 37(3).
142 EEG of 2004 (n59) Article 16(1).

request that the EEG surcharge be limited for a delivery point. The purpose of the limitation is to

> 'reduce the electricity costs for these enterprises and thereby maintain their international and intermodal competitiveness, insofar as this is compatible with the goals of this Act and the limit imposed is still compatible with the interest of the electricity users as a whole'.[143]

The EEG provides that a limit may be set only if certain conditions are met. Manufacturing enterprises are *inter alia* required to provide proof that they purchased electricity that was at least one GWh at a certain delivery point in the last financial year (in contrast to 10 GWh under the EEG of 2009).[144] The EEG surcharge for rail operators may also be limited to 0.05c/kWh provided certain conditions are met, including that the surcharge may only be limited in respect of the amount of electricity 'exceeding 10 percent of the electricity purchased or used by the rail operators themselves at the relevant delivery point in the period during which a limit applies'.[145]

It has recently been reported that these rules will be investigated by the EU as it is alleged that they breach competition rules.[146]

5.2.4.12 Transparency and provision of information

Those that benefit from the decision to limit the EEG surcharge are required to, upon request, provide the BMU 'with information about all the facts which are necessary … to assess whether the objectives under section 40(1) … [relating to the aim to reduce the electricity costs of these industries to ensure that their competitiveness is not negatively affected] will be met'.[147]

The EEG also ensures transparency by requiring installation operators, grid system operators and electricity suppliers to make the data relating to the nationwide

[143] EEG of 1 April 2012 (n15) section 40.
[144] EEG of 2009 (n52) section 41(1)1.
[145] EEG of 1 April 2012 (n15) section 42(1).
[146] See M Chambers 'EU plans probe on Germany renewable law: Spiegel' (15 July 2013) *PlanetArt* available at http://www.planetark.com/enviro-news/item/69219 [accessed 16 July 2013].
[147] EEG of 1 April 2012 (n15) section 44.

equalisation scheme available to each other.[148] Further requirements regarding the provision of information are imposed on installation operators,[149] grid system operators,[150] TSOs,[151] and electricity suppliers.[152] Grid system operators and electricity suppliers are also required to provide certain data to the Federal Network Agency.[153] Furthermore, grid system operators, electricity suppliers and transmission system operators are required to make certain data public via the internet.[154] Further provision is made for the disclosure of the EEG surcharge to final consumers[155] and for electricity labelling.[156]

5.2.4.13 Other provisions

The EEG deals with legal protection and official procedures including providing for a clearing house,[157] consumer protection,[158] temporary legal protection,[159] tasks of the Federal Network Agency,[160] administrative fines,[161] supervision,[162] and fees and expenses.[163] The EEG also sets out the powers of certain government bodies to issue ordinances and provides for progress reports and monitoring reports, and sets out transitional provisions.[164]

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[148] Ibid, section 45.
[149] Ibid, section 46.
[150] Ibid, section 47.
[151] Ibid, section 48
[152] Ibid, section 49.
[153] Ibid, section 51.
[154] Ibid, section 52.
[155] Ibid, section 53.
[156] Ibid, section 54.
[157] Ibid, section 57.
[158] Ibid, section 58.
[159] Ibid, section 59.
[160] Ibid, section 61.
[161] Ibid, section 62.
[162] Ibid, section 63.
[163] Ibid, section 63a.
[164] Ibid, Part 7.

5.2.5 Impacts of the feed-in tariff

5.2.5.1 Uptake of renewable energy

As identified above Germany has been very successful in progressively increasing the amount of renewable energy in the country's electricity (and energy) supply, and RES-E was increased from just 3.1 per cent in 1990 to 22.9 per cent in 2012.[165] Germany is ranked first in the world in terms of renewable energy capacity on a per capita basis (excluding hydro power)[166] and relies on a variety of renewable energy sources to meet its energy needs.

5.2.5.2 Additional costs

The additional costs of the EEG were relatively low at the outset. For instance, in 2002, it was reported that the feed-in tariff had increased the final cost of electricity by 0.18 to 0.26 Euro cents per kWh.[167] However, by 2010 the German government reported that the 'EEG cost differential for 2010 … [resulted] in an EEG apportionment of about 2.3 cents per kilowatt-hour'.[168] Thus, the additional cost of electricity (directly due to the EEG) was 2.3 €cents/kWh in 2010.[169]

As noted above, more recently the costs arising from the EEG have increased further. However, this has been due primarily to the great interest in solar PV, which has led to caps being imposed on solar PV capacity (as discussed in 5.2.4.8). It has been reported that the surcharge for renewable energy is currently 5.3 €cents/kWh and will increase to between 6.2 and 6.5 c/kWh in 2014.[170] It is clear that it would not

[165] BMU *Development of Renewable Energy Sources in Germany 2012* (n3) 12.
[166] REN21 *Renewables 2013: Global Status Report* (n4) 19.
[167] Mitchell et al 'Effectiveness Through Risk Reduction' (n26) 299. See also Wüstenhagen and Bilharz 'Green Energy Market Development in Germany' (n27) 1689.
[168] BMU *Renewable Energy Sources in Figures* (n6) 39.
[169] However, it should be noted that the total electricity tariff in 2010 was 24€c/kWh. BMU *Renewable Energy Sources in Figures* (n6) 39. Thus, the additional cost due to the EEG accounted for 10 per cent of the total price of electricity. Another study has shown that the feed-in tariff increased consumer costs by 3%. See T Traber and C Kemferg 'Impacts of the German Support for Renewable energy on Electricity Prices, Emissions, and Firms' 2009 (30) *The Energy Journal* 155-178, 169. This is arguably not very significant, as it represents the difference between €1.00 and €1.03.
[170] Spiegel 'Germany's Energy Poverty: How electricity became a luxury good' *Spiegel Online International* (4 September 2013) available at http://www.spiegel.de/international/germany/high-costs-

be viable to add this amount on to the current price of electricity in South Africa. Containing the cost of a FIT policy is discussed in Chapter 8.

External costs saved by the EEG, relating to climate change and other damage, were estimated at €3.4 billion in 2006 and €4 billion in 2007.[171] It has been argued that 'the remuneration under [the EEG] … roughly equals the avoided social costs of coal-generated electricity, which means that in social terms, the extra cost to society appears to be negligible'.[172] Another report states that in 2007 additional costs due to the FIT was €3.3 billion, while €5 billion in 'depressed fossil-fuel costs' was saved.[173]

5.2.5.3 Carbon emission reductions

The development of renewable energy has contributed to Germany's efforts to mitigate its greenhouse gas emissions. In 2010, Germany achieved carbon dioxide emission savings of 115 million tonnes of CO_2, with savings of 54 million tonnes being attributed to the EEG.[174]

5.2.5.4 Economic impacts and employment

The renewable energy sector has become important to Germany's economy, and in 2001 raised revenue of €8.2 billion and created approximately 120 000 direct and

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and-errors-of-german-transition-to-renewable-energy-a-920288.html [accessed 14 November 2013]. Another report has noted however, that the actual increase in the EEG surcharge due to the pure costs of RES-E is only 13 per cent. See H Falk (Bundesverband Erneuerbare Energie e.V.) *The EEG Surcharge for 2014: Background Paper on Components of the Surcharge, Development and Expected Level* 2013 available at http://www.bee-ev.de/_downloads/publikationen/positionen/2013/20130904_EEG-Surcharge-2014_Background-Paper.pdf [accessed 15 November 2013]. See further AG Tveten, TF Bolkesjo, T Martinsen and H Hvarnes 'Solar Feed-In Tariffs and the Merit Order Effect: A study of the German electricity market' 2013 (61) *Energy Policy* 761-770, who find that when the merit order effect is taken into account with regard to the tariffs for solar energy, 'the net cost of solar FITs is found to be 23% lower than the charge listed in the electricity bill'. At 770. The term 'merit order effect' is used to refer to 'the price reducing effect of increased electricity generation from RES on the wholesale electricity price'. At 763.

[171] U Büsgen and W Dürrschmidt 'The Expansion of Electricity Generation from Renewable Energies in Germany: A review based on the Renewable Energy Sources Act Progress Report 2007 and the new German feed-in legislation' 2009 (37) *Energy Policy* 2536-2545, 2539.

[172] Jacobsson and Lauber 'The Politics and Policy of Energy System Transformation' (n2) 271.

[173] BK Sovacool 'The Importance of Comprehensiveness in Renewable Electricity and Energy-Efficiency Policy' 2009 (37) *Energy Policy* 1529-1541, 1535.

[174] BMU *Renewable Energy Sources in Figures* (n6) 24.

indirect jobs.[175] Employment in the renewable energy sector has increased further and by 2012 it was estimated that 380 000 jobs had been created in the renewable energy sector.[176]

5.2.5.5 General comments

The success of the FIT has been attributed partly to the long-term security provided to investors as well as to the strong subsidy programmes.[177] Thus, while the feed-in tariff has been the primary driver of renewable energy in Germany, the role of other instruments in increasing renewable energy in Germany must also be noted.[178]

Such instruments include 'soft loans',[179] investment incentives,[180] the '100MW wind programme' that was introduced in 1989 and upgraded to 250MW in 1991[181] and the '100 000 roof programme', which provided favourable loans from 1999 to 2003 and made solar photovoltaic energy 'commercially viable for the first time'.[182]

A general observation is that the EEG has become more complex over time. A preliminary recommendation for South Africa would be that any feed-in law be relatively basic at its inception, and that it become more nuanced over time. Another recommendation is that policymakers should consider measures to contain the costs of the programme at the outset.

[175] Wüstenhagen and Bilharz 'Green Energy Market Development in Germany' (n27) 1682.
[176] See BMU *Renewable Energy Sources in Figures* (n6) 36; and Renewable Energy Policy Network for the 21st Century (REN21) *Renewables 2012: Global Status Report* 2012 available at http://www.map.ren21.net/GSR/GSR2012.pdf [accessed 12 June 2012] 27.
[177] D Reiche and M Bechberger 'Policy Differences in the Promotion of Renewable Energies in the EU Member States' 2004 (32) *Energy Policy* 843-849, 847.
[178] J Lipp 'Lessons for effective renewable electricity policy' (n2) 5488.
[179] Agnolucci 'Use of Economic Instruments in the German Renewable Electricity Policy' (n14) 3452.
[180] Ibid, 3539.
[181] Wüstenhagen and Bilharz 'Green Energy Market Development in Germany' (n27) 1684.
[182] Ibid, 1684.

5.3 Spain

5.3.1 Introduction

Like Germany, Spain is also regarded as a success story with regard to its use of the feed-in tariff to promote renewable energy.[183] Electricity generated from RES-E increased from 980 GWh in 1990 to 32 714 GWh in 2007.[184]

In 2012 Spain had 31 GW of renewable power capacity (excluding 17 GW of hydropower), which was made up of 23 GW wind power, 1 GW biomass, 5.1 GW solar PV, 2 GW concentrating solar power and a nominal amount of ocean (tidal) power.[185]

It should be noted at the outset that following numerous tariff reductions in 2011, a Royal Decree was issued in January 2012, halting all further financial support for new renewable energy projects,[186] with effect from 1 January 2013.[187] Nevertheless, the approach taken here is to describe the system that applied before these changes. Only the main features of the Spanish FIT are set out.[188] Institutional and operational aspects are first briefly outlined.

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[183] See for example P del Rio Gonzalez 'Ten years of Renewable Electricity Policies in Spain: An analysis of successive feed-in tariff reforms' 2008 (36) *Energy Policy* 2917-2929, 2917; Reiche and M Bechberger 'Policy Differences in the Promotion of Renewable Energies' (n177) 847 and Mendonça *Feed-In Tariffs* (n1) 53-55.

[184] Del Rio Gonzalez 'Ten years of Renewable Electricity Policies in Spain' (n183) Table 1 at 2918.

[185] REN21 *Renewables 2013: Global Status Report* (n4) Table R2 at 98.

[186] REN21 *Renewables 2012: Global Status Report* (n4) 68. See also R Stancich 'Spain's FIT moratorium: CSP sector dealt a blow' *CSP Today* (9 February 2012) available at http://social.csptoday.com/markets/spain%E2%80%99s-fit-moratorium-csp-sector-dealt-blow [accessed 9 July 2012].

[187] See further B Diaz 'Spain abolishes FITs entirely' *PV Magazine* (15 July 2013) available at http://www.pv-magazine.com/news/details/beitrag/spain-abolishes-fits-entirely_100012050/#axzz2khw7frA3 [accessed 15 November 2013], who notes that the feed-in tariffs will no longer be payable. Instead, a 'reasonable profitability' rate of 7.5 per cent will be paid. This is one measure that the Spanish government has taken to try to recover an energy tariff deficit of €26 billion.

[188] A thorough discussion of the relevant laws in Spain regulating the FIT is contained in Held et al 'Feed-In Systems in Germany, Spain and Slovenia' (n17) 8-21. The Spanish FIT is also discussed in P del Rio and MA Gaul 'An Integrated Assessment of the Feed-In Tariff System in Spain' 2007 (35) *Energy Policy* 994-1012; Del Rio Gonzalez 'Ten years of Renewable Electricity Policies in Spain' (n183) and GS de Miera, P del Rio Gonzalez and I Vizcaino 'Analysing the Impact of Renewable Electricity Support Schemes on Power Prices: The case of wind electricity in Spain' 2008 (36) *Energy Policy* 3345-3359. In addition, all of Spain's relevant policies are available at http://www.feed-in-

5.3.2 Institutional and operational aspects

Relevant institutions include the General Secretary of Energy, Ministry of Industry, Energy and Tourism as well as the National Energy Commission. Other roleplayers are electricity companies and the transmission system operator, Red Eléctrica.[189]

With regard to the integration of RES-E into the market, under the fixed tariff option (discussed below) electricity is sold to the utility, which integrates the electricity into its portfolio and then sells the electricity directly to its customers.[190] Under the premium tariff option, no particular regulation is required and renewable energy generators simply sell their electricity on the electricity market.[191]

5.3.3 Overview of Spain's feed-in tariff

The FIT was introduced through the Electric Power Act 54 of 1997 (Jefatura del Estado, 1997) and has been subsequently refined through numerous Royal Decrees. The Spanish system is complex and has become more complex with each amendment.[192]

Like Germany, the Spanish FIT guarantees grid access to renewable energy generators,[193] and obliges grid operators to enter into a contract of at least five years with renewable energy generators.[194]

The Spanish system offered the option of either a fixed tariff or a (market-based) premium on top of the regular price of electricity from early on.[195] However, this was changed in 2004 to an option between a tariff as a percentage of the average

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cooperation.org/wDefault_7/content/documents/spain_documents_index.php. However, the documents are only available in Spanish.

[189] See Held et al 'Feed-In Systems in Germany, Spain and Slovenia' (n17) 20.

[190] Klessmann et al 'Pros and Cons of Exposing Renewables to Electricity Market Risks' (n19) 3652.

[191] Ibid, 3652.

[192] See for example Table 2 in Del Rio Gonzalez 'Ten years of Renewable Electricity Policies in Spain' (n183) 2920-2921.

[193] Del Rio and Gaul 'An Integrated Assessment of the Feed-In Tariff System in Spain' (n188) 998.

[194] Del Rio Gonzalez 'Ten years of Renewable Electricity Policies in Spain' (n183) 2921.

[195] However, solar photovoltaic and hydroelectricity between 10MW and 50MW are exceptions. Solar photovoltaic is only eligible for a fixed tariff and the hydroelectricity is only eligible for a premium tariff. See J Schallenberg-Rodriguez and R Haas 'Fixed Feed-In Tariff Versus Premium: A review of the current Spanish system' 2012 (16) *Renewable and Sustainable Energy Reviews* 293-305, 294-295.

electricity price and a premium. This was changed back to a choice between a fixed tariff and a premium in 2007.[196] The choice between a fixed tariff and premium is valid for one year at a time.[197]

The premium tariff is adjusted according to the time of day.[198] Premiums tariffs 'remain at a fixed percentage throughout the useful life of the plant',[199] while premiums (for new plants) are required to be revised every four years in relation *inter alia* to the development of the market price for electricity.[200]

While renewable energy projects are supported throughout their lifetime, support decreases after some time depending on the RET, for example, 25 years in the case of solar energy. This can be seen more clearly in Table 5.4 below. Furthermore, tariffs are revised annually.[201] However, it has been noted that annual changes are limited and so do not lead to uncertainty.[202] Degression only applies in respect of solar PV.[203]

There is also a forecast obligation and renewable energy generators are required to inform the distributor 30 hours in advance regarding the amount of electricity that they intend to supply to the grid.[204] RES-E generators may correct this forecasted amount up to an hour beforehand. This obligation applies under the fixed tariff option only in respect of projects that are larger than 10MW, however, applies in respect of all projects under the premium tariff option.[205] If the forecasts deviate by a certain percentage (which differs depending on the RET), renewable energy generators are liable to pay an 'imbalance price' or a penalty.[206]

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[196] See Del Rio Gonzalez 'Ten years of Renewable Electricity Policies in Spain' (n183) Table 2 at 2920.
[197] Held et al 'Feed-In Systems in Germany, Spain and Slovenia' (n17) 10.
[198] Schallenberg-Rodriguez and Haas 'Fixed Feed-In Tariff Versus Premium' (n195) 296.
[199] Mendonça *Accelerating Feed-In Tariffs* (n1) 53-54.
[200] Del Rio and Gaul 'An Integrated Assessment of the Feed-In Tariff System in Spain' (n188) 998. This was in terms of Royal Decree 436/2004.
[201] Ibid, 998. See also Del Rio Gonzalez 'Ten years of Renewable Electricity Policies in Spain' (n183) 2920.
[202] Held et al 'Feed-In Systems in Germany, Spain and Slovenia' (n17) 34-35.
[203] Ibid, 34.
[204] Ibid, 11.
[205] TD Couture, K Cory, C Kreycik and E Williams *A Policymaker's Guide to Feed-in Tariff Policy Design* (for the national Renewable Energy Laboratory, US Department of Energy) 2010 available at http://www.nrel.gov/docs/fy10osti/44849.pdf [accessed 24 April 2012] 85.
[206] Klessmann et al 'Pros and Cons of Exposing Renewables to Electricity Market Risks' (n19) 3652.

It is also possible for renewable energy generators to sell electricity directly on the open market. In this case, in addition to the premium, an incentive amount of '10 per cent of the average electricity tariff' is provided .[207]

Following increased costs for consumers and windfall profits for generators under the premium option, cap-and-floor prices were introduced in 2007. This was done to ensure that generators were guaranteed to a minimum price, but also that the prices received were capped at a maximum price, so that generators did not earn windfall profits at the expense of consumers.[208]

The tariffs that applied in 2010 are reflected in Table 5.4.

Table 5.4 Feed-in tariffs applicable in Spain in 2010[209]

				Fixed price	**Market option**		
Technology category		**Installed power**	**Period (years)**	**Fixed tariff (€ cents/kWh)**	**Reference premium (€ cents/kWh)**	**Cap (€ cents/kWh)**	**Floor (€ cents/kWh)**
Solar	PV registered before 29-09-2008	Up to 0.1MW	1-25	46.5897			
			More than 25	37.2718			
		0.1MW-10MW	1-25	44.169			
			More than 25	33.3352			
		10MW-50MW	1-25	24.3077			
			More than 25	19.4462			
	PV registered after 29-09-2008	Roof/buildings; up to 20kW	25	34			
		Roof/buildings; 20kW-20MW	25	32			
		Free-standing;	25	32			

[207] Mendonça *Accelerating Feed-In Tariffs* (n1) 53.
[208] Held et al 'Feed-In Systems in Germany, Spain and Slovenia' (n17) 12. This amendment was made in terms of Royal Decree 661/2007.
[209] This table has been compiled based on data in Held et al 'Feed-In Systems in Germany, Spain and Slovenia' (n17) Table 2 at 15-16.

		up to 20MW					
	Solar thermal		1-25	28.4983	26.8717	36.3906	26.8757
			More than 25	22.7984	21.4973		
Wind	Onshore		1-20	7.7471	3.0988	8.9866	7.5405
			More than 20	6.4746			
	Offshore				8.9184	17.3502	
Geothermal and ocean			1-20	7.2892	4.0672		
			More than 20	6.8872	3.2373		
Small-scale hydro		Less than 10MW	1-25	8.2519	2.6495	9.0137	6.8978
			More than 25	7.4268	1.4233		
Large-scale hydro		10MW-50MW	1-25		2.2263	8.4635	6.4746
			More than 25		1.4223		
Biomass	Energy crops	Up to 2MW	1-15	16.8096	12.6723	17.5936	16.3029
			More than 15	12.4764			
		More than 2MW	1-15	15.5084	11.1562	15.9643	15.0968
			More than 15	13.0624			
	Agricultural wastes	Up to 2MW	1-15	13.2994	9.1620	14.0812	12.7905
			More than 15	8.9663			
		More than 2MW	1-15	11.3771	7.0249	11.8384	10.9804
			More than 15	8.5334			
	Forestry wastes	Up to 2MW	1-15	13.2994	9.1620	14.0812	12.7905
			More than 15	8.9663			
		More than 2MW	1-15	12.5148	8.1633	12.9704	12.1028
			More than 15	8.5334			
Biomass	Landfill gas		1-15	8.4551	4.4721	9.4792	7.8711
			More than 15	6.8872			
	Gas from anaerobic digestion	Up to 0.5MW	1-15	13.8262	10.8104	16.2182	13.0656
			More than 15	6.8872			
		More than 0.5MW	1-15	10.2409	6.5870	11.6691	10.1033
			More than 15	6.8872			
	Liquids, biofuels, manure		1-15	5.6706	3.7380	8.8126	5.3955
			More than 15	5.6706			
Biomass	Agricult	Up to 2MW	1-15	13.2994	9.1620	14.0812	12.7905

from industrial processes	ural wastes		More than 15	8.9633			
		More than 2MW	1-15	11.3771	7.0249	11.8384	10.9804
			More than 15	8.5334			
	Forestry wastes	Up to 2MW	1-15	9.8177	5.6814	10.6006	902993
			More than 15	6.8872			
		More than 2MW	1-15	6.8851	2.5329	7.3421	6.4746
			More than 15	6.8851			
	Black liquor	Up to 2MW	1-15	9.8177	5.9439	10.6006	9.2993
			More than 15	6.8872			
		More than 2MW	1-15	8.4635	3.8813	9.5215	7.9346
			More than 15	6.8851			

Table 5.4 shows that higher tariffs are granted during the 'lifetime' of an installation, after which tariffs are decreased. Furthermore, as in Germany, lower tariffs are offered as installation size increases. As noted above, degression only applies in respect of solar PV.

In 2009 the Spanish government introduced capacity limits for wind and solar thermal power plants of 1700 MW per year and 500 MW per year respectively.[210] In 2010, following agreements with the wind and solar thermal industry associations, tariffs for wind and solar energy were decreased. In the case of wind energy, premium tariffs were reduced by 35 per cent, but only if the electricity price exceeded € 45/MWh[211] (45€c/kWh). It has been reported that investment in renewable energy in Spain 'slumped' following the cuts in tariffs for solar energy.[212] A limit was also placed on the hours for which tariffs would be paid for solar thermal energy.[213]

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[210] In terms of Resolution of 19 November 2009. See Held et al 'Feed-In Systems in Germany, Spain and Slovenia' (n17) 19.
[211] Ibid, 19. This was done in terms of Royal Decree 1565/2010 and Royal Decree 1614/2010.
[212] United Nations Environment Programme (UNEP) and Bloomberg New Energy Finance *Global Trends in Renewable Energy Investment 2011: Analysis of Trends and Issues in the Financing of Renewable Energy* 2011 available at http://www.unep.org/pdf/BNEF_global_trends_in_renewable_energy_investment_2011_report.pdf [accessed 13 July 2011] 22.
[213] Held et al 'Feed-In Systems in Germany, Spain and Slovenia' (n17) 19-20.

5.3.4 General comments

While the Spanish feed-in tariff has been very successful in promoting wind energy (and hydro power), it has not been as successful in promoting other RETs. Indeed, non-wind and non-hydro sources accounted for only 17 per cent of renewable energy capacity in 2012.[214]

It is arguable that less certainty has been created under the Spanish FIT than under the German FIT, due to the various changes introduced as the feed-in tariff developed, such as the removal of the option of a fixed tariff in 2004, only for it to be re-introduced in 2007; the introduction of cap-and-floor prices in 2007; significant reductions in tariffs in 2010, followed by the temporary suspension of the FIT in 2012, and its complete suspension in 2013. This drastic measure was taken by the Spanish government as one measure to recover an energy tariff deficit of €26 billion.[215]

Spain's FIT was intended to contribute to achieving the target of 12 per cent of renewable energy and 29 per cent of RES-E by 2010.[216] However, this target was not attained and Spain implemented 11.3 per cent of renewable energy by 2010.[217] The government has reduced the 2020 target for total renewable energy from 22.7 per cent to 20.8 per cent.[218] In light of the suspension of the feed-in tariff system it is not clear if the revised target will be attained.

Key elements of the FIT policies in Germany and Spain are now briefly summarised, and some preliminary lessons for South Africa are highlighted.

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[214] This was calculated with reference to REN21 *Renewables 2013: Global Status Report* (n4) Table R2 at 98.
[215] Diaz 'Spain abolishes FITs entirely' (n187).
[216] Held et al 'Feed-In Systems in Germany, Spain and Slovenia' (n17) 8.
[217] Asociacion de Productores de Energias Renovables *Study of the Macroeconomic Impact of Renewable Energies in Spain* 2010 available at http://www.appa.es/descargas/Estudio_APPA_2011_ENG.pdf [accessed 9 July 2012] 5.
[218] REN21 *Renewables 2012: Global Status Report* (n4) 65.

5.4 Discussion of the FIT in Germany and Spain and implications for South Africa

5.4.1 The FIT in Germany and Spain

In Germany, an obligation is placed on grid operators to connect renewable energy installations and to purchase all renewable energy generated. Grid operators are also required to upgrade their grids to ensure that all of the electricity generated can be fed into the grid, provided that the costs of this are not unreasonable. The costs of connection and upgrading are split between installation operators (i.e. RES-E generators) and grid operators, with RES-E generators being responsible for the costs of connecting and grid operators being responsible for the costs of upgrading. The EEG takes account of the fact that grids may become overloaded and makes provision for the implementation of facilities to reduce output in the event of a grid overload.

Furthermore, fixed tariffs are guaranteed for 20 years and the tariffs may not be reduced during the contract time, which arguably provides security to investors. Rates are differentiated according to the renewable energy technology, thus acknowledging that some RETs are more expensive than others. Rates are also disaggregated, thus acknowledging that larger installations are cheaper to operate (on a per kilowatt hour basis) than smaller installations.

It appears that the level of the tariffs in Germany has generally been appropriate. Significant renewable energy investment has been encouraged, yet prices for consumers have not increased too significantly. This has most likely been assisted by the existence of the equalisation scheme. It appears that the establishment of the special equalisation scheme has assisted in ensuring that the competitiveness of energy-intensive industries has not been harmed. However, as noted above, prices have increased more significantly in the past few years, due to the greater than anticipated uptake of solar PV.

Importantly, the EEG has established specific renewable energy targets that have become more ambitious over time. Thus far, the targets are being met and, even exceeded.

In Spain, an obligation is also placed on grid operators to connect renewable energy generators to the grid and to purchase the renewable energy generated. While tariffs are ensured for a significant period of time, they may be reviewed annually. While this could create uncertainty for investors, it has been noted that the changes may only be moderate.[219] The annual review takes the place of fixed degression rates.

This is in contrast to Germany's feed-in tariff, for which annual degression rates for new projects are determined in advance, rather than being determined on an annual basis. This has allowed the Spanish government to adjust tariffs, if for instance, too large a (financial) burden is placed on consumers.[220] This also provides flexibility as tariffs can potentially be changed with reference to the market.[221]

On the other hand, the premium rate in Spain is fixed 'throughout the useful life of the plant'.[222] While premium tariffs provide less certainty than fixed tariffs, they have proved popular in Spain and have resulted in renewable energy generators earning windfall profits at the expense of consumers, which led to the introduction of cap-and-floor prices in 2007.

Spain's option of a premium tariff was previously a distinguishing factor between the German and Spanish FITs. However, Germany has also introduced the more market-oriented option of a premium tariff, albeit only in certain circumstances (as discussed in 5.2.4.9 above). As the option of a market premium has only been relatively recently introduced in Germany, its impacts are not yet entirely clear.[223]

A significant difference between the German and Spanish FIT policies is that in Spain there is a forecast obligation, which is more onerous for RES-E generators. It

[219] Held et al 'Feed-In Systems in Germany, Spain and Slovenia' (n17) 34-35.
[220] Del Rio and Gaul 'An Integrated Assessment of the Feed-In Tariff System in Spain' (n188) 999.
[221] Held et al 'Feed-In Systems in Germany, Spain and Slovenia' (n17) 36-37.
[222] Mendonça *Accelerating Feed-In Tariffs* (n1) 53-54.
[223] Some preliminary observations have been noted in E Gawel and A Purkus 'Promoting the Market and System Integration of Renewable Energies through Premium Schemes – A case study of the German market premium' 2013 (61) *Energy Policy* 599-609, including that the market premium has led to increased programme costs.

has been estimated that under the fixed tariff option, the forecast obligation has resulted in an extra cost of €1.5/MWh[224] (1.5€c/kWh).

While the (German) EEG has certainly evolved and the tariffs have become very disaggregated, it appears that the general principles of the FIT have not changed too much. On the other hand, the Spanish FIT appears to have fluctuated a lot more, with the additions of new Royal Decrees. It has been argued that 'the Spanish Government has undermined the stability in the system',[225] which appears to have had an impact on renewable energy investment.

It has been observed that in Germany the focus has been on technology development, while in Spain the focus has been on deployment of RES-E.[226]

5.4.2 Implications for South Africa

As noted above, a feed-in tariff was already introduced in South Africa in 2009 (before being replaced by a renewable tendering programme in 2011). At the time, the National Energy Regulator of South Africa (NERSA) stated that the FIT 'is preferred as the most effective means for creating sustainable market conditions for the growth of a renewable energy industry'.[227]

In considering the implementation of a FIT policy in South Africa in the future, it would be important that the general elements of a feed-in tariff, which were discussed in Chapter 4 and which are largely present in Germany's FIT, also be present in a recommended FIT policy in South Africa.

This includes an obligation on grid operators to connect renewable energy installations to the grid and to purchase the energy generated. There should also be an obligation to upgrade the grid to be able to accommodate the RES-E that is generated. This latter obligation would arguably not be problematic in light of the

[224] Klessmann et al 'Pros and Cons of Exposing Renewables to Electricity Market Risks' (n19) 3652.
[225] Schallenberg-Rodriguez and Haas 'Fixed Feed-In Tariff Versus Premium' (n195) 303.
[226] P Fernández Fernández, EV Ortiz and JX Bernat 'The Deployment of Electricity Generation from Renewable Energies in Germany and Spain: A comparative analysis based on a simple model' 2013 (57) *Energy Policy* 552-562, 561.
[227] National Energy Regulator of South Africa (NERSA) *South Africa Renewable Energy Feed-in Tariff (REFIT): Regulatory Guidelines* in GN 382 of 2009 in *Government Gazette* 32122 dated 17 April 2009, 27.

planned expansion of South Africa's electricity grid from approximately 44.5 GW in 2010 to approximately 89.5 GW in 2030.[228]

A mandatory obligation on grid operators to purchase all of the renewable energy fed into the grid might be problematic in South Africa as this could lead to significantly increased electricity prices, which would impact negatively on low-income households and on energy-intensive industries. It would thus be necessary to consider ways to address such concerns. This will be taken up further in Chapter 8.

It would also be important that tariffs are set at the correct level. In this regard, high tariffs are not necessarily an indicator of success. In Italy 'a tariff more generous than the German, introduced in 1992 …, had comparatively little impact on the Italian RES-E equipment industry'.[229] It is not recommended that Germany or Spain's highly disaggregated systems of tariffs be implemented in South Africa, at least at the outset.

Regarding the option between fixed and premium tariffs, while taken up further in Chapter 8, it appears that both options can be effective in promoting RES-E. However, fixed tariffs are considered to be more appropriate with regard to encouraging the development of less mature RETs and the inclusion of smaller investors,[230] which would arguably be important in the South African context.

All of these issues are taken up further in Chapter 8.

The feed-in tariffs that have been implemented in India and China are now briefly outlined.

5.5 The feed-in tariff in India and China

Feed-in tariff regulations were introduced in India in 2009. In China, the law providing for FITs was implemented in 2006. However, in both countries, the actual feed-in tariffs have been implemented at different stages and in respect of different RETs. It

[228] In terms of the *Integrated Resource Plan for Electricity 2010-2030* GN R400 in *Government Gazette* No 34263 dated 6 May 2011, Table 3 at 17.
[229] Lauber 'REFIT and RPS' (n32) 1410.
[230] Schallenberg-Rodriguez and Haas 'Fixed Feed-In Tariff Versus Premium' (n195) 301.

is therefore relatively early to determine the effectiveness of the feed-in tariffs in promoting renewable energy in these countries. Furthermore, in both countries, the FIT policies operate alongside the renewable obligation and renewables tendering,[231] making it additionally difficult to determine the specific impact of the feed-in tariff. The FIT policies of India and China are thus merely outlined to illustrate the efforts of other developing countries in implementing feed-in laws.

5.5.1 India

5.5.1.1 Introduction

India's overall carbon emissions are very high in comparison to the rest of the world and were 1745.06 Mt CO_2 in 2011. Yet its per capita emissions are very low, and at 1.41 tCO_2/capita are well below the world average of 4.5 tCO_2/capita.[232] However, India's carbon emissions have been increasingly rapidly, due to its rapid economic expansion. Since about 25 per cent of India's population had no access to electricity, as of 2010,[233] it is projected that India needs to more than double its energy generation capacity to over 300GW by 2017.[234]

It has been reported that

> 'India's substantial and sustained economic growth is placing enormous demand on its energy resources. The demand and supply imbalance in energy sources is pervasive requiring serious efforts by [the Government of

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[231] Table 3 in REN21 *Renewables 2012: Global Status Report* (n4) 71-72.
[232] International Energy Agency *Key World Energy Statistics* 2013 available at http://www.iea.org/publications/freepublications/publication/KeyWorld2013_FINAL_WEB.pdf [accessed 2 October 2013] 49 and 52-53.
[233] B Becker and D Fischer 'Promoting Renewable Electricity Generation in Emerging Economies' 2013 (56) *Energy Policy* 446-455, 450.
[234] DS Arora, S Busche, S Cowlin, T Engelmeier, H Jaritz, A Milbrandt, S Wang *Indian Renewable Energy Status Report: Background Report for DIREC 2010* (NREL/TP-6A20-48948) 2010 available at www.nrel.gov/docs/fy11osti/48948.pdf [accessed 27 July 2012] 1.

> India] to augment energy supplies. India imports about 80% of its coal… The country thus faces possible severe energy supply constraints'.[235]

As a result, renewable energy is assuming a more important role in India and will play a key role in meeting the country's energy demands in the future.[236]

At the beginning of 2013, India's electricity capacity was made up of 57.1 per cent coal, 18.5 per cent hydro, 8.9 per cent of gas, 0.6 per cent diesel, 12.7 per cent renewables and 2.2 per cent nuclear.[237]

In 2011, India ranked fifth in the world in terms of investment in new renewable energy capacity. Furthermore, with 62 GW of renewable energy in 2011, India was ranked fourth or fifth in the world in terms of renewable energy capacity (depending on whether or not large hydro is taken into account). About 80 per cent of the non-hydro portion is supplied by wind power.[238] However, it appears that some momentum has been lost,[239] and investment in renewable energy decreased from $13 billion in 2011 to $6.5 billion in 2012.[240]

5.5.1.2 Institutions

There are numerous institutions that are involved in renewable energy development in India, including the Ministry of Power, the Ministry for New and Renewable Energy (MNRE), the (national) Central Electricity Regulatory Commission (CERC), (regional) State Electricity Regulatory Commissions (SERCs) and the Indian Renewable Energy Development Agency (IREDA). State governments, state nodal agencies and regional electricity corporations also play a role.

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[235] Ministry of New and Renewable Energy *Strategic Plan for New and Renewable Energy for the Period 2011-17* 2011 available at http://mnre.gov.in/file-manager/UserFiles/strategic_plan_mnre_2011_17.pdf [accessed 2 July 2012] 7.
[236] Ibid, 8.
[237] RM Shereef and SA Khaparde 'Current Status of REC Mechanism in India and Possible Policy Modifications to Way Forward' 2013 (61) *Energy Policy* 1443-1451, Table 1 at 1444.
[238] REN21 *Renewables 2012: Global Status Report* (n4) 19 and Table R2 at 98. India's large reliance on hydro power is controversial. See for example AFP 'Indian "sadhus" protest dam projects on holy Ganges" *The New Age* (18 July 2012) available at http://www.thenewage.co.za/53859-1026-53-Indian_sadhus_protest_dam_projects_on_holy_Ganges [accessed 20 July 2012].
[239] Indeed, India fell out of the top five ranking in 2012. See REN21 *Renewables 2013: Global Status Report* (n4) 17.
[240] Frankfurt School and United Nations Environment Programme *Global Trends in Renewable Energy Investment* 2013 available at http://fs-unep-centre.org/publications/global-trends-renewable-energy-investment-2013 [accessed 13 June 2013] 22.

Furthermore, central or state transmission utilities and regional or load dispatch centres and distribution licensees are responsible for transmission, system operations and distribution.[241]

It has been argued that

> '[t]he lack of coordination among … [these institutions] leaves critical implementation gaps. The Ministry of Power is responsible for national electricity policy and national tariff policy, both of which play a key role in promoting procurement of renewable energy-based power. The MNRE has a direct mandate for renewable energy in all policy and programmatic aspects. The SERCs, which have the most direct impact on feed-in tariffs, RPOs [which are ROs], and open-access charges, are loosely bound by the directives and guidelines of the CERC. All central agencies have a state counterpart, which has the final say on how renewable energy projects are developed'.[242]

The roles of the various institutions thus appear quite confused, and it seems that better coordination is required.

5.5.1.3 Policies relating to the feed-in tariff specifically

India's Electricity Act 36 of 2003 (the Electricity Act) makes provision for the establishment of a renewable obligation (RO), and the 'determination of preferential feed-in tariffs'.[243]

The Electricity Act provides that

> '[t]he Appropriate Commission shall, subject to the provisions of this Act, - specify the terms and conditions for the determination of tariff [sic], and in doing

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[241] G Schmid 'The Development of Renewable Energy Power in India: Which policies have been effective?' 2012 (45) *Energy Policy* 317-326, 325.

[242] G Sargsyan, M Bhatia, SG Banerjee, K Raghunathan and R Soni *Unleashing the Potential of Renewable Energy in India* (South Asia Energy Unit, Sustainable Development Department, The World Bank) 2010 available at http://siteresources.worldbank.org/EXTENERGY2/Resources/Unleashing_potential_of_renewables_in_India.pdf [accessed 9 July 2012] 37.

[243] Schmid 'The Development of Renewable Energy Power in India' (n241) 319. It should be noted that the Electricity Act does not define renewable energy.

> so, shall be guided by the following, namely:- … the promotion of co-generation and generation of electricity from renewable sources of energy'.[244]

It has been argued that this empowers the CERC to establish preferential tariffs (or feed-in tariffs) for renewable energy.[245]

Furthermore, SERCs are *inter alia* charged with

> '[promoting cogeneration] and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and also specify[ing], for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licence'.[246]

This provides for the establishment of a RO.

The Tariff Policy[247] was published in terms of the Electricity Act in 2006. It provides that the Appropriate Commission

> 'shall fix a minimum percentage for purchase of energy from such sources taking into account availability of such resources in the region and its impact on retail tariffs'.[248]

This also provides for a RO. It furthermore provided that this should be determined by 1 April 2006.[249] It was subsequently recommended in the National Action Plan on Climate Change (discussed below) that the percentage should be set at five per cent starting in 2009, increasing by one per cent per year for ten years; and it was provided that SERCs may set higher targets.[250]

The Tariff Policy also provides that due to the time necessary for non-conventional energy sources to compete with conventional sources, that 'procurement by distribution companies shall be done at preferential tariffs

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[244] Electricity Act 36 of 2003, section 61(h).
[245] Arora et al *Indian Renewable Energy Status Report* (n234) 22.
[246] Electricity Act (n244) section 86(1)(e).
[247] Ministry of Power *Tariff Policy* 2006 (No. 23/2/2005-R&R(Vol.III)) available at http://www.powermin.nic.in/JSP_SERVLETS/internal.jsp [accessed 29 June 2012].
[248] Ibid, section 6.4(1).
[249] Ibid.
[250] Prime Minister's Council on Climate Change *National Action Plan on Climate Change* 2008 available at *pmindia.nic.in/Climate%20Change.doc* [accessed 29 June 2012] *44.*

determined by the Appropriate Commission'.[251] This clearly provides for preferential tariffs or feed-in tariffs for renewable energy.

The Tariff Policy also provides that as far as possible, Distribution Licences for future requirements should be awarded through a 'competitive bidding process' in respect of non-conventional sources.[252] This appears to provide for a renewables tendering process.

By 2010, 18 of India's 28 states had implemented ROs ranging from one per cent to 15 per cent.[253] Furthermore, a tradable renewable energy certificate system (TREC) was announced in 2010.[254]

National feed-in tariff regulations were promulgated in 2009,[255] and were amended in 2012.[256] The regulations apply to wind power, small hydro, certain biomass projects, co-generation projects (non-fossil fuel-based), solar PV and solar thermal, biomass gasifier-based projects and biogas-based projects.[257]

For each RET, the regulations provide various guidelines regarding *inter alia* the capital cost, capital utilisation factor and operation and maintenance expenses.[258] While these regulations establish 'a uniform feed-in tariff determination methodology for each renewable energy technology',[259] it is left to the individual states to

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[251] Ministry of Power *Tariff Policy* 2006 (n247) section 6.4(1).
[252] Ibid, section 6.4(2).
[253] Arora et al *Indian Renewable Energy Status Report* (n234) 25.
[254] Ibid, 26. See R Kumar and A Agarwala 'Renewable Energy Certificate and Perform, Achieve, Trade Mechanisms to Enhance the Energy Security for India' 2013 (55) *Energy Policy* 669-676 and Shereef and Khaparde 'Current Status of REC Mechanism in India' (n237) which discuss the implementation of the renewable obligation and renewable energy certificate programme in India thus far.
[255] Central Electricity Regulation Commission *Terms and Conditions for Tariff determination from Renewable Energy Sources* 2009 (No. L-7/186(201)/2009-CERC) available at www.cercind.gov.in/Regulations/CERC-RE-Tariff-Regulations_17_sept_09.pdf [accessed 2 July 2012]. It should be noted that a feed-in tariff was initially implemented in 1993, however, was 'substantially discontinued'. See Renewable Energy Policy Network for the 21st Century (REN21) *Renewables Global Status Report: 2009 Update* available at http://www.unep.fr/shared/docs/publications/RE_GSR_2009_Update.pdf [accessed 9 July 2012] 26.
[256] Central Electricity Regulation Commission New Delhi *CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations*, 2012 (No.: L-1/94/CERC/2011) available at http://www.cercind.gov.in/index.html [accessed 9 July 2012].
[257] Ibid, Section 4.
[258] Ibid, Chapters 3 – 7, which set out the capital cost and calculation methods for the capital cost indexation, capacity utilisation factor and operation and maintenance for wind energy, small hydro, biomass and solar PV projects.
[259] Sargsyan et al *Unleashing the Potential of Renewable Energy in India* (n242) 36.

determine the actual tariffs based on these factors.[260] Thus, while guidelines for feed-in tariffs are designed and developed by the CERC at the national level, feed-in tariff methodologies for different renewable energy technologies are developed at the state level by the SERCs.[261] Therefore, the SERCs ‘which have the most direct impact on feed-in tariffs … are loosely bound by the directives and guidelines of the CERC’,[262] and it has been argued that the tariffs implemented in different states do not comply with the tariff regulations of the CERC.[263]

The regulations do not appear to establish fixed degression rates. However, they do provide for a review period, and provide that the benchmark capital cost of solar PV and solar thermal projects may be reviewed annually and that the price for biomass may be reviewed after three years.[264]

Different tariff periods are set for the different technologies. The tariff period for small hydro (below 5MW) is 35 years. The tariff period for solar PV and solar thermal is 25 years. The tariff period for biomass gasifier and biogas is 20 years. The tariff periods for the remaining technologies are not less than 13 years.[265]

States have taken different approaches in implementing feed-in tariffs, often implementing tariffs for only one renewable energy technology (RET) at a time. As of 2012, about half of the Indian states had implemented FITs.[266] Furthermore, tariff conditions vary across states. In regard to wind energy, some states provide for fixed tariffs for a certain length of time, while in other states tariffs may be decreased or increased. Various states have also imposed caps for wind energy ranging from 50MW to 500MW.[267]

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[260] See S Dey ‘Select states to revisit renewable energy tariff’ *The Economic Times* (14 February 2009) available at http://articles.economictimes.indiatimes.com/2009-02-14/news/28449304_1_renewable-power-power-tariffs-uniform-tariff [accessed 12 July 2012] who notes that ‘States decide the tariff based on several factors such as project cost, interest rates for the debt and capacity utilisation. However, the capacity utilisation factor varies depending on the availability of the renewable energy source.’
[261] See Sargsyan et al *Unleashing the Potential of Renewable Energy in India* (n242) 37.
[262] Ibid.
[263] Shereef and Khaparde ‘Current Status of REC Mechanism in India’ (n237) 1448.
[264] CERC *Terms and Conditions for Tariff determination from Renewable Energy Sources* 2012 (n256) Section 5.
[265] Ibid, Section 6.
[266] See REN21 *Renewables 2012: Global Status Report* (n4) Table R12 at 118.
[267] Arora et al *Indian Renewable Energy Status Report* (n234) 32

Furthermore, in 2009 the MNRE approved a (national) generation-based incentive (GBI) for wind energy that provided an 'incentive tariff' of INR 0.50/kWh (US$ 0.01/kWh), in respect of projects commissioned before the end of March 2012.[268] This was in addition to state-level FITs. However, because of the deadline, this did not provide an ongoing incentive.[269] In respect of the actual tariffs, in 2010, tariffs for wind energy ranged from INR 3.14/kWh (US$ 0.057/kWh) to INR 4.08/kWh (US$ 0.073/kWh).[270]

In 2010 the CERC announced a tariff of INR 17.91/kWh (US$ 0.36/kWh) in respect of solar PV and INR 15.31/kWh (US$ 0.31/kWh) in respect of concentrating solar power (CSP),[271] to support the Jawaharlal Nehru National Solar Mission (JNNSM). The object of the JNNSM is to 'establish India as a global leader in solar energy', and it sets the target of 20 000 MW (20 GW) of solar energy by 2022, to be implemented in three stages.[272] Power purchase agreements must be entered into for 25 years and tariffs are to be revised every year.[273]

It was decided that 500 MW would be implemented in the first phase of the JNNSM, from 2010-2013, and the 500 MW was allocated in two rounds, with 150 MW being allocated in the first round and 350 MW being allocated in the second round.[274] However, it was also decided that tendering would apply if applications exceeded these capacity caps.[275] In both cases applications exceeded the capacity caps and bidding took place. It appears that almost all of the projects selected in the first bidding round have secured financing. However, it is not clear how many of these projects have actually been implemented.[276]

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268 See Global Wind Energy Council *India: Total installed capacity* available at http://www.gwec.net/index.php?id=124 [accessed 21 July 2012].
269 Arora et al *Indian Renewable Energy Status Report* (n234) 32.
270 Ibid, 32.
271 Pricewaterhouse Coopers *Financial Engineering as a Means to Support Jawaharlal Nehru National Solar Mission* 2012 available at http://www.indiaenvironmentportal.org.in/files/file/final%20report_pwc.pdf [accessed 22 July 2012] 14.
272 Ministry of New and Renewable Energy *Jawaharlal Nehru National Solar Mission* 2010 available at http://india.gov.in/allimpfrms/alldocs/15657.pdf [accessed 12 July 2012] 2-3.
273 Arora et al *Indian Renewable Energy Status Report* (n234) 40.
274 Ibid, 40-41.
275 See Arora et al *Indian Renewable Energy Status Report* (n234) 40-41 and Becker and Fischer 'Promoting Renewable Electricity Generation in Emerging Economies' (n233) 451.
276 Becker and Fischer 'Promoting Renewable Electricity Generation in Emerging Economies' (n233) 451.

The CERC has established preferential tariffs for small hydro that range from INR 3.35/kWh (US$ 0.07/kWh) to INR 4.62/kWh (US$ 0.09/kWh). The CERC has also established preferential tariffs for biomass ranging from INR 3.35/kWh (US$ 0.07/kWh) to INR 4.62/kWh (US$ 0.09/kWh).[277]

It should be noted that these tariffs generally appear to be very low comparatively. For example, the CERC rates for biomass (when converted to Euros) range from € 0.05/kWh to € 0.067/kWh, compared to Germany's rates for biomass, which range from € 0.06/kWh to € 0.14/kWh.

5.5.1.4 General renewable energy-related policies

The Indian government has implemented a number of laws and policies that are relevant to renewable energy in the past decade. These include the National Electricity Policy that was approved in 2005;[278] the 12th Five Year Plan of the Planning Commission (for the years 2012-2017);[279] and the National Action Plan on Climate Change,[280] which is based on eight 'national missions'. One of these is the Jawaharlal Nehru National Solar Mission,[281] which was launched in 2010.[282] As identified above, the CERC approved tariffs for solar PV and solar thermal in 2010 to support the JNNSM. The JNNSM has been described as 'India's most ambitious renewable energy initiative'.[283] It foresees that solar energy will reach grid parity by 2022.[284]

In addition, the MNRE published the Strategic Plan for New and Renewable Energy for the Period 2011-17 (the 'Strategic Plan') in 2011.[285] The Strategic Plan is concerned with solar, wind, biomass and small hydro power and establishes targets

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277 Arora et al *Indian Renewable Energy Status Report* (n234) 62 and 74.
278 Ministry of Power *National Electricity Policy* 2005 (No. 23/40/2004-R&R (Vol. II)) available at http://www.powermin.nic.in/whats_new/national_electricity_policy.htm [accessed 10 July 2012].
279 Planning Commission *Twelfth Five Year Plan 2012-2017* (2013) available at http://planningcommission.gov.in/plans/planrel/12thplan/welcome.html [accessed 3 December 2013]. It should be noted that this replaced the Planning Commission *Eleventh Five Year Plan 2007-12* available at http://www.planningcommission.nic.in/plans/planrel/fiveyr/welcome.html [accessed 11 July 2012].
280 Prime Minister's Council on Climate Change *National Action Plan on Climate Change* (n250).
281 Ibid, 19.
282 MNRE *Jawaharlal Nehru National Solar Mission* (n272).
283 Arora et al *Indian Renewable Energy Status Report* (n234) xiii.
284 Ibid, 42.
285 MNRE *Strategic Plan for New and Renewable Energy for the Period 2011-17* (n235).

for each of these technologies and aims to install a total of 41 400 MW (41.4 GW) of renewable energy by 2017.[286] However, the aim of the government is for renewable energy to contribute only six per cent to the total energy mix by 2022.[287] While the Strategic Plan represents the government's future plans, it does not reflect much on the implementation of current policies and measures, and therefore does not deal with the effectiveness, or otherwise, of the FIT.

5.5.1.5 General comments

India has a number of polices and instruments in place that are relevant to promoting renewable energy. However, there is no overarching law or policy that deals with the development of renewable energy, and it has been argued that policies 'have been issued as and when necessary' and are not integrated with other legislation.[288]

Furthermore, it is difficult to precisely identify the feed-in tariffs that have been implemented, as these differ across India's states, at least in those states that have actually implemented FITs. It has also been reported that '[e]ven basic data on the actual generation volume of renewable energy by technologies are not available in the public domain'.[289]

Furthermore, there is not much information – official or academic – regarding the actual impact of the FIT. It has however been reported that '[f]or specific technologies, central government policies and guidelines have been implemented to different degrees by individual states, which can result in inconsistencies between states'.[290] Furthermore, one study found that there was 'no significant positive correlation between the introduction of preferential feed-in tariffs and the development of [renewable energy]'.[291]

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[286] Ibid, Table 4, at 19.
[287] Ibid, 16.
[288] M Gulati and P Tiwari 'Development of Renewable Energy in India: Role and effectiveness of electricity regulators' 2011 (2) *Renewable Energy Law and Policy Review* 107-119, 111.
[289] Sargsyan et al *Unleashing the Potential of Renewable Energy in India* (n242) 41.
[290] Arora et al *Indian Renewable Energy Status Report* (n234) 24.
[291] Schmid 'The Development of Renewable Energy Power in India' (n241) 323-324. In contrast, various studies have considered the effectiveness thus far of the renewable obligation and the renewable energy certificate system in India. See for example Shereef and Khaparde 'Current Status of REC Mechanism in India' (n237); Kumar and Agarwala 'Renewable Energy Certificate and Perform,

While the national FIT regulations did commence relatively recently and it is perhaps too early to conclusively determine the impacts of the feed-in tariff, it has been noted that a more coordinated approach is required with regard to renewable energy policy in general. Furthermore, it has been stated that

> 'India offers every possible type of incentive, including feed-in tariffs; generation-based incentives; RPOs; central, state, and regional capital subsidies; accelerated depreciation; and tax incentives… The effect is unintended overlaps, reduced transparency and fiscal discipline, unnecessary complexity in claiming subsidies, and ineffective leverage for the amount spent on renewable energy development. An integrated and coordinated approach for financial incentives is urgently needed'.[292]

5.5.2 China

5.5.2.1 Introduction

China's greenhouse gas emissions are increasingly rapidly and, with 7954.55 Mt CO_2 emitted in 2011, China is the world's largest emitter. Its per capita emissions, which were previously very low are also rising and were 5.92 tCO_2/capita in 2011,[293] thereby significantly surpassing the per capita emissions of other developing countries (apart from South Africa).

Its electricity mix is made up of 73.6 per cent fossil fuels, 22 per cent hydro, three per cent wind, one per cent of nuclear and 0.1 per cent of solar power.[294]

Renewable energy capacity is increasing and China is currently the world leader with regard to total renewable energy capacity. In 2004 China had 37 GW of renewable energy (including hydro), but only 3 GW of renewable energy excluding

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Achieve, Trade Mechanisms' (n254); G Shrimali and S Tirumalachetty 'Renewable Energy Certificate Markets in India – A review' 2013 (26) *Renewable and Sustainable Energy Reviews* 702-716.

[292] Sargsyan et al *Unleashing the Potential of Renewable Energy in India* (n242) 39.

[293] IEA *Key World Energy Statistics* 2013 (n232) 51.

[294] J Yu and J Zheng 'Offshore Wind Development in China and its Future with the Existing Renewable Energy Policy' 2011 (39) *Energy Policy* 7917-7921, Fig 1 at 7918.

hydro.[295] This has increased rapidly to 90 GW by 2012 (excluding hydropower of 229 GW). The non-hydro contribution is made up of 8 GW biomass, 7 GW solar PV and 75 GW wind power.[296] Therefore, excluding hydropower, most of China's RES-E capacity is comprised of wind energy. In 2009, renewable energy (including large hydropower) accounted for 17 per cent of national electricity production.[297] Furthermore, about 1.6 million jobs had been created in the renewable energy sector by 2009.[298]

There were various barriers facing renewable energy in China. These included the high costs of renewable energy, problems with connecting to the grid, and fragmentation due to the fact that responsibility for renewable energy policy formulation was spread over a number of different institutions.[299] The Chinese government did attempt to address these problems. For example, regulations were issued in 1994 and 1999 requiring grid operators to connect wind generators to the grid and purchase the electricity. However, these were not effective in practice as grid operators struggled to 'gain approval from Government for the increase in sales price corresponding to the higher cost of renewable energy'.[300] The Renewable Energy Law, discussed in 5.5.2.3, was intended to address these barriers.[301] First, China's relevant institutions are briefly outlined.

5.5.2.2 Institutions

There are many institutions involved in regulating China's energy sector, including the State Council, the National People's Congress, the National Development and Reform Commission (NDRC), the State Electricity Regulatory Commission (SERC),

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[295] This was comprised of 0.7 GW wind energy, less than 0.1GW geothermal energy and 2.2 GW biomass. JA Cherni and J Kentish 'Renewable Energy Policy and Electricity Market Reforms in China' 2007 (35) *Energy Policy* 3616-3628, Table 1 at 3618.
[296] REN *Renewables 2013: Global Status Report* (n4) Table R2 at 98.
[297] International Energy Agency *Integration of Renewables: Status and Challenges in China* 2011 available at http://www.iea.org/papers/2011/Integration_of_Renewables.pdf [accessed 30 April 2012] Figure 2 at 8.
[298] REN21 *Renewables 2012: Global Status Report* (n4) Table 1 at 27.
[299] See Cherni and Kentish 'Renewable Energy Policy and Electricity Market Reforms in China' (n295) 3620-3624.
[300] Ibid, 3622.
[301] Ibid, 3624.

the National Energy Bureau (NEB), the State Environment Protection Bureau (SEPB) and the National Energy Commission (NEC).

The State Council has overall control over the development and operation of the energy sector. The SERC is empowered by the State Council to supervise the electricity sector. Furthermore, the NDRC is *inter alia* responsible for matters related to approving and setting electricity tariffs.[302] There are also central power plants and local power plants, and there are differences in the tariffs of these power plants.[303] In addition, China's electricity grid is 'fragmented into six regional power grid clusters, all of which operate rather independently'.[304] Electricity companies are state-owned.[305]

5.5.2.3 Policies relating to the feed-in tariff specifically

The Renewable Energy Law came into effect in 2006,[306] and was amended in 2010.[307] It defines renewable energy as 'non-fossil energy of wind energy, solar energy, water energy, biomass energy, geothermal energy, and ocean energy, etc'.[308]

The Act refers to a 'middle and long-term total volume target of renewable energy' and requires that energy authorities prepare a 'national renewable energy development and utilization plan', on the basis of such targets.[309] Energy authorities at the provincial and municipal levels are also required to develop 'renewable energy development and utilization plans' based on the national plan and the relevant targets.[310] It has been argued that this 'provides the basis for implementation of a

[302] See J Ma 'On-Grid Electricity Tariffs in China: Development, reform and prospects' 2011 (39) *Energy Policy* 2633-2645, 2638.
[303] Ibid.
[304] IEA *Integration of Renewables: Status and Challenges in China* (297) 12.
[305] Cherni and Kentish 'Renewable Energy Policy and Electricity Market Reforms in China' (n295) 3618.
[306] Renewable Energy Law of the People's Republic of China.
[307] Renewable Energy Law of the People's Republic of China (as amended).
[308] Ibid, Article 2.
[309] Ibid, Article 8.
[310] Ibid, Article 8

[renewable obligation]'.[311] The Act furthermore requires appropriate departments of the State Council to establish plans concerned with realising this target.[312]

The Renewable Energy Law itself does not contain any medium- or long-term targets. Rather, these are set out in the Medium- and Long-Term Development Plan for Renewable Energy, which is dealt with further below.

The Renewable Energy Law states that 'Government encourages and supports various types of grid-connected renewable power generation'[313] and appears to provide for both tendering and a FIT. It does this by providing that renewable energy power generation projects may only be constructed after obtaining the necessary licence. However, 'if there is more than one applicant for [a] project license, the licensee shall be determined through a tender'[314] and it is the 'bid-winning price' that will be implemented.[315] The Act provides that in other cases the price of renewable energy must be determined by the 'price authorities of the State Council', which price must be made public.[316] The former provisions thus appear to provide for tendering, while it has been argued that the latter provisions imply a feed-in tariff.[317]

The Act provides for 'a system of safeguards for the purchase of the full amount of power generated from renewable energy'[318] and provides that once an administrative licence has been obtained, grid operators must enter into a grid connection agreement with the relevant licensee and 'purchase the total amount of grid-connected electricity from renewable energy generation projects which are within their power-grid coverage area and which conform to grid-connection technical standards'.[319] Grid operators are also obliged to strengthen their grids and *inter alia* 'raise capacity to absorb renewable energy electric power'.[320]

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[311] Cherni and Kentish 'Renewable Energy Policy and Electricity Market Reforms in China' (n295) 3624.
[312] Renewable Energy Law (as amended) (n307) Article 8.
[313] Ibid, Article 13.
[314] Ibid, Article 13.
[315] Ibid, Article 19.
[316] Ibid, Article 19.
[317] Cherni and Kentish 'Renewable Energy Policy and Electricity Market Reforms in China' (n295) 3625.
[318] Renewable Energy Law (as amended) (n307) Article 14.
[319] Ibid.
[320] Ibid.

If a grid operator fails to enter into a grid connection agreement with a renewable energy generator and buy the total amount of renewable energy available, which causes economic loss to the renewable energy generator, such grid operator 'shall be liable for compensation'.[321]

Furthermore, an obligation is imposed on the relevant authorities to

> 'ensure that renewable energy targets as a proportion of the total amount of electric power generation shall be reached; and establish specific measures for power-grid enterprises to prioritize dispatching and fully purchase power generated from renewable energy'.[322]

Importantly, the Act provides that the additional renewable energy costs are 'compensated by a nationwide levy on the sale of electricity'.[323] Furthermore, expenses relating to grid connection and other reasonable expenses paid for by grid operators may be added to the selling price.[324]

The Act creates a renewable energy development fund,[325] and if grid operators are not able to recover grid connection and other related expenses through the sale of energy, they may apply for subsidisation from this fund.[326]

While the Renewable Energy Law is a framework law, the details regarding implementation are provided in ministerial regulations and other measures.[327] Such regulations *inter alia* provide for an obligation to connect renewable energy installations to the grid, a cost-sharing mechanism in terms of which 'the additional costs of renewable electricity generation [are to] be shared by the end-users of electricity nationwide', and the establishment of a Renewable Energy Development Fund.[328]

As highlighted above, the Renewable Energy Law makes provision for the establishment of three renewable energy support instruments and a number of

[321] Ibid, Article 29.
[322] Ibid, Article 14.
[323] Ibid, Article 20.
[324] Ibid, Article 21.
[325] Ibid, Article 24.
[326] Ibid.
[327] Ma 'On-Grid Electricity Tariffs in China' (n302) 2637.
[328] See Ma 'On-Grid Electricity Tariffs in China' (n302) 2637. Unfortunately it has not been possible to access English versions of these documents.

renewable energy technologies (RETs) have actually gone through complete changes of financial support instruments.

Initially a tendering system was in place for wind power. However, the tariffs offered by the winning tenders were too low and not viable. Thereafter the rules were modified, but this did not resolve the problem. It has been reported that most of the tenders were won by the country's five largest power companies, 'which use[d] the profits made in coal-fired power generation to subsidize their wind power projects – with some winning bids setting a tariff price lower than the cost of generation'.[329] It is also significant that the tendering programme included local content requirements of 50 per cent, which increased to 70 per cent, but which were later removed as they was considered to breach the rules of the World Trade Organisation.[330]

The tender system was subsequently replaced by FITs for onshore wind energy, in terms of the Improvement of Wind Power Tariff Regulations, which were issued in 2009.[331] Under this policy, the country was divided into four regions and 'benchmark prices' were set for each region.[332] It should be noted that these prices were derived through a system of competitive bidding.[333] In 2009 the fixed tariffs ranged from RMB 0.51 (US$ 0.074) per kilowatt hour to RMB 0.61/kWh (US$ 0.089/kWh).[334] While these tariffs were determined through competitive bidding, once set, they 'effectively function like FITs elsewhere in the world'.[335] It has been argued that the adoption of tariffs simplified the pricing and approval processes, which was 'likely to further stimulate developers' interests in exploiting wind power resources'.[336]

In respect of solar PV, before 2009, there was an approved FIT rate that ranged from US$0.58/kWh to US$1.32/kWh (RMB 4-9/kWh). However, this was replaced by

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329 Mendonça *Feed-In Tariffs* (n1) 83
330 Y Song and N Berrah *China: East or West Wind: Getting the Incentives Right* (Policy Research Working paper 6486) (The World Bank) available at http://elibrary.worldbank.org/doi/pdf/10.1596/1813-9450-6486 [accessed 19 September 2013] 3.
331 Renewable Energy Policy Network for the 21st Century (REN21) *Recommendations for Improving the Effectiveness of Renewable Energy Policies in China* 2009 available at www.ren21.net/portals/97/documents/Publications/Recommendations_for_RE_Policies_in_China.pdf [accessed 29 May 2011] 10.
332 Ibid.
333 See C Kreycik, TD Couture and KS Cory *Innovative Feed-In Tariff Designs that Limit Policy Costs* (National Renewable Energy Laboratory: Technical Report NREL/TP-6A20-50225) 2011 available at http://www.nrel.gov/docs/fy11osti/50225.pdf [accessed 8 April 2013] 30.
334 REN21 *Recommendations for Improving the Effectiveness of Renewable Energy Policies in China* (n331) 22.
335 Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n333) 30.
336 Ma 'On-Grid Electricity Tariffs in China' (n302) 2643.

a bidding programme in the Dunhuang region in 2009. The first round of bidding resulted in a price of US$0.16/kWh (RMB 1.09/kWh).[337] This is notably lower than the tariffs for solar PV in other jurisdictions, such as Germany, which had a basic rate of €0.32/kWh in 2009, and Spain, which had an average initial rate of €0.34927/kWh in 2010. It has been noted that while these auctions resulted in a low price for solar PV, '[i]ncomplete installations of low quality were the frequent outcome of projects appointed according to auctions'.[338]

In late 2011 a national feed-in tariff of about US$0.15/kWh was introduced for solar energy.[339] However, this FIT has also been criticised including because the tariff is considered to be too low for the less sunny parts of the country, there is a lack of investment certainty due to there being no guaranteed tariff duration, and because 'the low tariff rate tends to attract low quality installations, which are mostly produced by state-owned enterprises'.[340]

The justification provided by the NDRC for moving to a system of fixed tariffs in respect of certain technologies, such as wind and solar PV, was that this 'would change current inconsistent pricing, foster clear expectations and facilitate investments in the sector'.[341]

A premium tariff of US$ 0.051 (RMB 0.35) per kilowatt hour was in place for biomass.[342] This was subsequently changed to a fixed tariff of US$ 0.11 (RMB 0.75) per kilowatt hour in 2010.[343] In contrast, coal-generated electricity costs about US$0.05 (RMB 0.35) per kilowatt hour.[344] Hydropower is actually cheaper than coal-

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[337] REN21 *Recommendations for Improving the Effectiveness of Renewable Energy Policies in China* (n331) 22.
[338] Becker and Fischer 'Promoting Renewable Electricity Generation in Emerging Economies' (n233) 450.
[339] See C Liu 'China uses feed-in tariff to build domestic solar market' *The New York Times* (14 September 2011) available at http://www.nytimes.com/cwire/2011/09/14/14climatewire-china-uses-feed-in-tariff-to-build-domestic-25559.html?pagewanted=all [accessed 29 July 2012].
[340] Becker and Fischer 'Promoting Renewable Electricity Generation in Emerging Economies' (n233) 450.
[341] Reuters 'UPDATE 2-China sets benchmark on-grid wind power rates' 2009 available at http://uk.reuters.com/article/2009/07/24/china-power-wind-idUKPEK37446520090724 *op cit* Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n333) 30-31.
[342] REN21 *Recommendations for Improving the Effectiveness of Renewable Energy Policies in China* (n331) 23.
[343] Ma 'On-Grid Electricity Tariffs in China' (n302) 2643.
[344] IEA *Integration of Renewables: Status and Challenges in China* (297) 23.

generated electricity and cost about US$ 0.04 (RMB 0.27) per kilowatt hour in 2008.[345]

As highlighted above, the Renewable Energy Law provides for a levy to be imposed on electricity to cover the costs of renewable energy. The levy was introduced at a rate of RMB 0.001/kWh (US$ 0.0001) in 2006 and has been increased incrementally and was most recently set at RMB 0.008/kWh (US$ 0.001) in 2011. This levy has not been sufficient to cover the costs of renewable energy generation and there were shortfalls of RMB 1.4 billion (US$ 0.2 billion) and RMB 22 billion (US$ 3.1 billion) in 2010 and 2011 respectively.[346]

5.5.2.4 General renewable energy-related policies

In 2007 the NDRC published the Medium and Long-Term Development Plan for Renewable Energy in China[347] (the Development Plan). The Development Plan, together with the Renewable Energy Law, have been attributed for the significant growth in China's 'renewable energy industry and its domestic market'.[348] The guiding principles of the plan include the implementation of the Renewable Energy Law as well as to 'continuously increase the share of renewable energy in China's overall energy consumption mix'.[349]

The Development Plan sets out the overall objectives for China's renewable energy development for the following 15 years, which are to:

> 'increase the proportion of renewable energy in total energy consumption, to resolve the problem of lack of electricity of people living in remote off-grid areas and the shortage of fuel for daily life needs in rural areas, to stimulate the

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[345] Ma 'On-Grid Electricity Tariffs in China' (n302) 2641.
[346] S Schuman and A Lin 'China's Renewable Energy Law and its Impact on Renewable Power in China: Progress, challenges and recommendations for improving implementation' 2012 (51) *Energy Policy* 89-109, 97.
[347] National Development and Reform Commission (NDRC) *Medium and Long-Term Development Plan for Renewable Energy in China* (abbreviated version) 2007 available at http://www.cresp.org.cn/uploadfiles/2/967/medium%20and%20long-term%20development%20plan%20for%20re%20in%20china%20eng.pdf [accessed 30 May 2012].
[348] REN21 *Recommendations for Improving the Effectiveness of Renewable Energy Policies in China* (n331) 7.
[349] NDRC *Medium and Long-Term Development Plan for Renewable Energy in China* (n347) 2.

utilization of organic wastes for energy, and to promote the development of renewable energy industries'.[350]

It also establishes specific objectives, including to increase the share of renewable energy in the total primary energy supply to ten per cent by 2010 and to 15 per cent by 2020.[351] Specific targets are also established for various RETs including wind energy, solar energy, biomass and hydropower.[352] For example, a target was set of 5 GW wind energy by 2010.[353] This target was increased to 10 GW in 2008 and was exceeded. Indeed, by the end of 2008, 12 GW of capacity had been installed.[354] The Development Plan also sets out policies and measures including setting 'mandated market share' policies (MMS) (which is effectively the RO) which establish the amount of energy that must be generated from renewable sources (excluding hydropower).[355]

Furthermore, China's Twelfth Five-Year Plan (2011-2015) sees wind power increasing by 70 GW and solar PV increasing by 5 GW (and hydropower increasing by 12 GW) by 2015.[356]

5.5.2.5 General comments

Renewable energy (primarily wind energy) has increased significantly in China. The Renewable Energy Law has been described as 'serv[ing] as a milestone for elevating renewables to a strategic position in China, and provid[ing] the framework for legislative initiatives designed to secure the development of renewable energy'.[357]

However, while the Renewable Energy Law was intended to address previous barriers, various problems remain. For example, the Act makes provision for the

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[350] Ibid, 3.1
[351] Ibid, 3.2.1.
[352] Ibid, 4.1 to 4.6.
[353] Ibid, 4.3.
[354] REN21 *Recommendations for Improving the Effectiveness of Renewable Energy Policies in China* (n331) 10.
[355] NDRC *Medium and Long-Term Development Plan for Renewable Energy in China* (n347) 5(1).
[356] China's Twelfth Five-Year Plan (2011-2015) available at http://cbi.typepad.com/china_direct/2011/05/chinas-twelfth-five-new-plan-the-full-english-version.html [accessed 24 April 2013] Chapter 11, Section 3.
[357] Ma 'On-Grid Electricity Tariffs in China' (n302) 2636.

implementation of three instruments, namely the FIT, RO and tendering, but does not specify how these should be combined.[358]

The Renewable Energy Law also does not provide for a decrease in tariffs over time.[359] Nevertheless, it should be noted that prices have decreased. For example, in 2008 the price of solar PV halved from RMB 3/kWh to RMB 1.5/kWh (US$0.44/kWh to US$0.22/kWh).[360]

While there has been rapid growth in wind energy, grid capacity has not been developed sufficiently, which has resulted in problems with congestion and grid integration, and consequent efficiency losses.[361] Furthermore, in 2011 the rate of wind energy curtailed, or not taken up, due to electricity supply being greater than demand ranged from one per cent to 25 per cent in ten different provinces, which resulted in lost revenue for wind energy generators.[362]

China's feed-in tariff has also been criticised on the basis that it is 'too complicated and it takes considerable time for investors, especially international and small private investors to understand how it works'.[363] Furthermore, while a penalty is provided for in the event of the failure of a grid operator to purchase the full amount of renewable energy, this is 'relatively weak'.[364] It has also been argued that the new regulator, the SERC, 'lacks the independence and power necessary to maintain a fair and transparent system'.[365]

Although not a result of the renewable energy laws, it has been noted that electricity prices are heavily subsidised and that there is thus little incentive to save electricity.[366] Furthermore, there is a 'disconnect between pricing and demand' with regard to coal-generated energy.[367] Indeed, 'electricity prices are kept low by

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[358] Cherni and Kentish 'Renewable Energy Policy and Electricity Market Reforms in China' (n295) 3627.
[359] Ibid, 3625.
[360] REN21 *Recommendations for Improving the Effectiveness of Renewable Energy Policies in China* (n331) 11.
[361] Song and Berrah *China: East or West Wind* (n330) 7.
[362] Schuman and Lin 'China's Renewable Energy Law' (n346) 94.
[363] IEA *Integration of Renewables: Status and Challenges in China* (n297) 27.
[364] Cherni and Kentish 'Renewable Energy Policy and Electricity Market Reforms in China' (n295) 3627.
[365] Ibid.
[366] IEA *Integration of Renewables: Status and Challenges in China* (297) 22.
[367] Ibid, 23.

government … [which] often forces utilities to incur considerable costs'.[368] Another problem is enforcement and some generators have struggled to gain access to the grid and obtain a 'government-approved price'.[369]

It has also been acknowledged that China's energy sector requires reform,[370] clear guidance is lacking, and that 'the multiplicity of actors on the regulatory side has made reforms in the power sector uneasy and slow'.[371] Furthermore, clear targets are required from government to provide long-term confidence and certainty.[372]

With regard to the feed-in tariff specifically, it has been recommended that 'policymakers in China [should] improve the renewable energy price structure and clarify the feed-in tariff system. The most effective solution would be to establish a fixed-price structure for each technology based on its specific characteristics'.[373]

5.5.3 Discussion of the FIT in India and China

In general, it has emerged that both India and China are experiencing problems with regard to institutional control and administration, such as uncoordinated policies or overlapping capacities or mandates of different institutions. While renewable energy capacity is increasing rapidly in both India and China, it appears that both countries have been going through a 'trial and error' approach and that changes have been made to the feed-in tariff policies as problems arose.

With regard to India, its national FIT regulations provide for the establishment of long-term tariffs, which arguably contributes to certainty. However, as the national regulations are only intended to act as guidelines, the actual tariffs differ across states. It has also been noted that actual tariff conditions such as duration of tariffs vary across states. As highlighted above, the regional SERCs are only 'loosely

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[368] Ibid.
[369] REN21 *Recommendations for Improving the Effectiveness of Renewable Energy Policies in China* (n331) 26.
[370] Ibid, 2643.
[371] Ibid.
[372] IEA *Integration of Renewables: Status and Challenges in China* (297) 27.
[373] Ibid.

bound by the directives and guidelines of the [national] CERC',[374] and it is not clear how effective the implementation of the FIT regulations has been in individual states. India's national regulations provide for the review of tariffs, but they do not appear to establish an obligation to connect renewable energy installations, nor to purchase the renewable energy generated.

China's Renewable Energy Law establishes obligations to connect renewable energy installations, to purchase all renewable energy generated and to upgrade the grid to accommodate the renewable energy capacity. However, it does not provide for the establishment of long-term tariffs. Furthermore, China has not introduced degression rates for the various renewable energy technologies. Rather, it appears that prices are adjusted quite sporadically and various RETs have even undergone entire policy changes, for example, from tendering to the FIT, or vice versa. This clearly would not promote investor security, in the way that has occurred in Germany.

Another observation is that the tariffs in both China and India appear to be relatively low in comparison to Germany and Spain. However, it is not possible to conclude that higher tariffs would result in a greater expansion of renewable energy in these countries,[375] and as highlighted previously, the generous tariffs introduced in Italy in 1992 'had comparatively little impact on the Italian RES-E equipment industry'.[376] However, it was observed that unrealistically low tariffs for solar PV in China have affected the quality of such installations.

It is notable that wind energy, which is an intermittent energy source, dominates renewable energy capacity in both India and China. However, the feed-in tariffs established under the Jawaharlal Nehru National Solar Mission in India appear promising.

While in Germany, the FIT policy has been in a place for some time and the German government has been able to isolate the specific impacts of the EEG, this is not yet the case in China and India. In the first place, their feed-in laws have been

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[374] Sargsyan et al *Unleashing the Potential of Renewable Energy in India* (n242) 37.
[375] In this regard it should be noted that the per capita levels of renewable energy in China and India are 0.05 kW/capita and 0.02 kW/capita respectively, compared to 0.75 kW/capita in Germany and 0.60 kW/capita in Spain. See REN21 *Renewables 2012: Global Status Report* (n4) Table R2 at 98.
[376] Lauber 'REFIT and RPS' (n32) 1410.

implemented relatively recently. Secondly, due to the existence of other instruments such as the RO or tendering, their governments have either not attempted, or been able, to isolate the specific impacts of their feed-in laws. It is thus not possible at this stage to determine the actual impact of the feed-in tariffs in China and India. However, in light of their experiences with regard to the uncoordinated implementation of a number of instruments, a preliminary suggestion would be that South Africa does not implement more than one primary financial support instrument for renewable energy.

5.6 Concluding remarks

This chapter has focused on the feed-in tariff in Germany and has described Germany's feed-in laws in detail. It has also briefly described the feed-in tariff in Spain to illustrate that the design of FIT policies may vary. Furthermore, the feed-in tariff policies of India and China have been described briefly to illustrate the approach being taken in other developing countries.

Some preliminary suggestions have been made regarding the elements that should ideally be present in a FIT policy in South Africa, including a purchase obligation, the establishment of appropriate tariffs, the differentiation of tariffs according to the type of RET and the adjustment of tariffs in respect of new projects. It has also been recommended that the policy should be relatively basic at its inception, and furthermore, that it is ideal if policymakers consider cost containment mechanisms at the outset. Chapter 8 will expand on the discussions above and consider more thoroughly the elements of a feed-in tariff framework in the South African context.

It is first necessary to set out the laws and policies that are relevant to renewable energy in South Africa (in Chapter 6) as well as the market-based instruments that are in place to promote renewable energy in South Africa (in Chapter 7).

Chapter 6

Policy and legislation relating to renewable energy in South Africa

6.1 Introduction

This chapter discusses South Africa's energy-related laws and policies as well as those that are relevant to climate change, in light of the close link between energy generation and climate change discussed in Chapter 3 above.

This chapter first briefly outlines the relevant institutions (in 6.2). It goes on to set out the constitutional and environmental law context (in 6.3). Thereafter, it considers energy-related legislation and policies (in 6.4) and climate change-related policies (in 6.5). It also considers other legislation and policy documents that may be relevant to the promotion of renewable energy (in 6.6).

The approach taken in this chapter is to discuss the relevant legislation and policies in chronological order, with no distinction being made between legislation and policies in order to illustrate the development of government policy on renewable energy. It is strongly emphasised that the legislation and policy documents discussed here are, for the most part, only discussed to the extent that they are relevant to renewable energy and its promotion, with the overall object being to establish the legal and policy basis for promoting renewable energy in South Africa.

6.2 Institutions

The national Department of Energy is the lead government department with regard to energy in South Africa and is responsible for renewable energy policy.[1] A Branch for Clean and Renewable Energy has been established within the Department of

[1] Department of Minerals and Energy *White Paper on the Renewable Energy Policy of the Republic of South Africa* GN 513 in *Government Gazette* No. 26169 dated 14 May 2004, 17.

Energy.[2] The Department of Energy is also running the Renewable Energy Independent Power Producer Procurement Programme (discussed in 7.4.1.1 below).

As identified in Chapter 3, state-owned Eskom holds a monopoly with regard to the generation, transmission and distribution of electricity, insofar as it generates 95 per cent of South Africa's electricity[3] (with the remainder being provided by independent power producers), and owns the entire transmission infrastructure and half of the distribution network (with the other half being owned by municipalities).[4] Eskom is also responsible for the buying and selling of electricity, either to municipalities (who then sell to consumers) or directly to end consumers. Eskom has thus far shown little interest in promoting renewable energy.[5]

With regard to Eskom's monopoly, the Department of Energy has prepared the Independent System and Market Operator Establishment Bill[6] (the ISMO Bill), which, when it comes into effect, will establish the Independent System and Market Operator (ISMO), which would be a separate entity responsible for the buying and selling of electricity (currently undertaken by Eskom).[7] It would *inter alia* also be responsible for the dispatch of electricity through the national transmission system and the balancing of electricity generation and demand.[8] While the ISMO Bill is not discussed fully here, its finalisation is eagerly anticipated as it would *inter alia* promote the entry of independent power producers (IPPs) thus reducing Eskom's monopoly. There have been a number of delays in the approval process[9] and it has been argued that 'Eskom, despite its public face, would prefer the status quo and

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[2] See D Peters (Minister of Energy) *2011 Budget Speech* 2011 available at http://www.energy.gov.za/files/media/speeches/2011/Budget%20Vote%20Speech%20-%20%20Minister%20of%20Energy%27s%20Budget%20Vote%20Speech.pdf [accessed 13 December 2012] 16.
[3] P O' Flaherty (Eskom) *Presentation to Portfolio Committee on Energy: Update of Eskom's Capital Expansion Programme* 2011, 4.
[4] J Krupa and S Burch 'A New Energy Future for South Africa: The political ecology of South African renewable energy' 2011 (39) *Energy Policy* 6254-6261, 6256.
[5] See Eskom *Integrated Report for the year ended 31 March 2012* 2012 available at http://www.pads.eezeepage.co.za/i/69717 [accessed 15 January 2013] 52; and AB Sebitosi and P Pillay 'Renewable Energy and the Environment in South Africa: A way forward' 2008 (36) *Energy Policy* 3312-3316, 3314.
[6] In terms of GN 290 in *Government Gazette* No. 34289 dated 13 May 2011.
[7] See generally Department of Energy *Independent System and Market Operator Establishment Bill* in GN 290 in *Government Gazette* No. 34289 dated 13 May 2011, sections 2, 3, 16, 17 and 18. The ISMO Bill is also discussed at 8.2.3.9.
[8] Ibid, section 17(a) and (e).
[9] See for example L Donnelly 'Bill to open up energy market stalls' (5 July 2013) *Mail & Guardian Online* available at http://mg.co.za/article/2013-07-05-00-bill-to-open-up-energy-market-stalls [accessed 9 July 2013].

[Minister of Public Enterprises] Gigaba has weighed in behind the scenes'.[10] Parliamentary debate on the ISMO Bill, scheduled for mid-November 2013, was postponed thus ruling out its promulgation in 2013.[11]

The National Energy Regulator of South Africa (the NERSA), established in terms of the National Energy Regulator Act,[12] also plays an important role. As discussed in 6.4.4 below, the NERSA is *inter alia* responsible for the licensing of electricity generation, transmission and distribution facilities, the regulation of prices and tariffs, as well as issuing rules to implement the government's electricity policy framework, the Integrated Resource Plan (discussed in 6.4.6 below) and the Electricity Regulation Act.[13]

The Central Energy Fund (CEF) is a private company that was established in terms of the Central Energy Fund Act 38 of 1977. Two of the objectives that have been identified for the 'CEF Group' are to invest in energy efficiency and 'renewable and alternative energy sources',[14] and to reduce environmental impacts and promote sustainable development.[15]

The South African National Energy Research Institute and the National Energy Efficiency Agency, which were initially established as divisions of the CEF, have been subsumed by the South African National Energy Development Institute[16] (SANEDI), which is *inter alia* responsible for promoting energy efficiency as well as energy research and development.[17]

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[10] D Pressly 'Eskom seen as main hurdle as Ismo Bill is stuck in limbo' *Business Report* (9 September 2013) available at http://www.iol.co.za/business/news/eskom-seen-as-main-hurdle-as-ismo-bill-is-stuck-in-limbo-1.1574742#.Uu5Uu7S7JUE [accessed 19 November 2013].
[11] See 'Power operator Bill delayed yet again' *Legalbrief Today* (14 November 2013) and SAPA 'Power bill off debate schedule' (13 November 2013) available at http://www.iol.co.za/business/companies/power-bill-off-debate-schedule-1.1606703#.UotpTOIw81c [accessed 19 November 2013].
[12] National Energy Regulator Act 40 of 2004.
[13] Electricity Regulation Act 4 of 2006, section 4.
[14] Department of Energy *Revised Strategic Plan 2011/12 – 2015/16* 2012 available at http://www.energy.gov.za/files/aboutus/DoE_RevisedStrategicPlan_2011_12-2015_16%20.pdf [accessed 10 July 2012] 40.
[15] Ibid. The NERSA and CEF are classified as 'associated institutions' by the Department of Energy. See Department of Energy *Organisational Structure* available at http://www.energy.gov.za/files/aboutus/Departmental%20Organogram_new1.pdf [accessed 2 February 2014].
[16] National Energy Act 34 of 2008, section 13(2).
[17] Ibid, section 7(2).

The Renewable Energy Finance and Subsidy Office (REFSO) was established by the (former) Department of Minerals and Energy in 2005[18] and is *inter alia* responsible for managing renewable energy subsidies and advising developers on renewable energy finance and subsidies.[19] Projects that have a minimum generation capacity of 1MW and that cost less than R100 million may receive a subsidy of up to 20 per cent of the project costs.[20] The REFSO has not played a very significant role in the development of renewable energy and, since its establishment, has only provided subsidies to six projects with a total installed capacity of 23.9MW.[21] As discussed further in 7.4.2.2 below, it appears that no projects have been funded since 2009/2010.

The South Africa Renewables Initiative (SARI) is a partnership between the South African government and the governments of Denmark, Germany, Norway and the United Kingdom. It is concerned with supporting the rapid promotion of renewable energy.[22]

Furthermore, a financial bill that *inter alia* imposes national taxes or levies with regard to energy would need to be introduced in Parliament by the Minister of Finance.[23]

It therefore appears (including from the discussions in Chapter 3) that the main roleplayers in South Africa's energy sector are the Department of Energy, the NERSA and Eskom, and that the remaining institutions play a more peripheral role.

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[18] H Winkler *Cleaner Energy Cooler Climate: Developing Sustainable Energy Solutions for South Africa* 2009, 20.

[19] Department of Energy *Renewable Energy Finance and Subsidy Office* available at http://www.energy.gov.za/files/esources/renewables/r_refso.html [accessed 13 March 2013].

[20] S Fakir and D Nicol *Investigation: Obstacles and Barriers to Renewable Energy in South Africa* 2008 (a study prepared for the National Environmental Advisory Forum, Department of Environmental Affairs and Tourism) available at http://www.environment.gov.za/Branches/COO/neaf_2005/Documents/Obstacles%20&%20barriers%20to%20renewable%20energy%20in%20SA.pdf [accessed 12 May 2011] 19. See also Winkler *Cleaner Energy Cooler Climate* (n18) 134.

[21] Department of Energy *REFSO* (n19).

[22] See *The South African Renewables Initiative* available at http://sarenewablesinitiative.wordpress.com/ [accessed 13 March 2013].

[23] See Constitution of the Republic of South Africa, 1996, section 77(1)(b) and National Treasury: Tax Policy Chief Directorate *Draft Policy Paper: A Framework for Considering Market-Based Instruments to Support Environmental Fiscal Reform in South Africa* (April 2006) available at http://www.treasury.gov.za/public%20comments/Draft%20Environmental%20Fiscal%20Reform%20Policy%20Paper%206%20April%202006.pdf [accessed 10 May 2009] 31.

Once the ISMO is established, it will arguably also be a relatively prominent roleplayer.

6.3 The constitutional and environmental law context

6.3.1 The Constitution of the Republic of South Africa, 1996

The Constitution of the Republic of South Africa, 1996 (the Constitution) does not contain any provisions relating specifically to energy generation nor the promotion of renewable energy. The Constitution does, however, enshrine the right to an environment that is not harmful to one's health or well-being, as well as the right to 'have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –

(i) prevent pollution and ecological degradation;
(ii) promote conservation; and
(iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development'.[24]

The Constitution also contains several socio-economic rights such as the right of access to health care services, sufficient food and water and social security,[25] as well as the right of access to adequate housing.[26]

On the other hand, it is significant that no right of access to energy is included, especially considering (as noted in Chapter 3) that soon after the end of apartheid only 58 per cent of South Africa's population had access to electricity, with the statistics being skewed along racial lines.[27]

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[24] Constitution of the Republic of South Africa (n23) section 24, hereafter referred to as 'the constitutional environmental right'.
[25] Ibid, section 27.
[26] Ibid, section 26.
[27] Indeed, only 25 per cent of non-urban black households were electrified in 1996 compared to 97 per cent of non-urban white households. B Bekker, A Eberhard, T Gaunt and A Marquard 'South Africa's Rapid Electrification Programme: Policy, institutional, planning, financing and technical innovations' 2008 (36) *Energy Policy* 3125-3137, 3125. In *Joseph and Others v City of Johannesburg and Others* 2010 (4) SA 55 (CC), the Constitutional Court was concerned (very generally) with the

With regard to legislative competence, 'energy' does not fall under Schedules 4 or 5 of the Constitution, which set out the functional areas of concurrent national and provincial legislative competence and the functional areas of exclusive provincial legislative competence respectively. Therefore, energy is a matter of national legislative competence, which means that the national Department of Energy is primarily responsible for the passing of energy-related legislation. 'Electricity and gas reticulation' falls under Part B of Schedule 4, and is thus a matter of local government competence.[28]

6.3.2 Environmental legislation

There is no environmental legislation that deals specifically with climate change or the generation of energy or renewable energy. However, it is clear in light of the discussion contained in Chapters 2 and 3 that climate change and energy generation are environmental concerns.

In addition, it is arguable that the constitutional imperative for the state to protect the environment through reasonable legislative and other measures that *inter alia* 'prevent pollution and ecological degradation'[29] and that 'secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development',[30] is relevant to the issue of energy generation, especially if one considers that the generation of energy from non-renewable fossil fuels depletes natural resources and causes pollution. It is thus important that the principle of sustainable development (discussed further below) is considered with regard to energy generation and decisions relating thereto.

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question of whether the applicants were entitled to procedural fairness before their electricity supply was terminated by the second respondent. The Constitutional Court had regard to the duty of municipalities to provide basic municipal services, including the provision of electricity, in terms of the Constitution and various Acts, and held that the applicants' receipt of electricity was in terms of their 'corresponding public-law right to receive this basic municipal service' (at para 47). By depriving them of this service, which they were 'receiving as a matter of right', the second respondent was obliged to afford the applicants procedural fairness before making a decision that materially and adversely affected this right (at para 47). While significant, it is not clear whether this decision establishes a clear right to electricity.

[28] The Electricity Regulation Act (n13) defines 'reticulation' as 'trading or distribution of electricity and includes services associated therewith'. See section 1.

[29] Constitution of the Republic of South Africa (n23) section 24(b)(i).

[30] Ibid, section 24(b)(iii).

Various environmental laws that are potentially relevant to energy generation are considered next.

6.3.2.1 National Environmental Management Act

The National Environmental Management Act[31] (the NEMA) was enacted in pursuance of the constitutional environmental right and is South Africa's framework environmental legislation. It does not contain any provisions relating specifically to climate change, energy or renewable energy. However, it sets out a number of 'national environmental management principles' (discussed further below), which apply to 'the actions of all organs of state that may significantly affect the environment'[32] and which *inter alia* 'serve as guidelines by reference to which any organ of state must exercise any function when taking any decision in terms of [the NEMA]… or any statutory provision concerning the protection of the environment'.[33]

The NEMA is underpinned by the principle of sustainable development, which is defined as 'the integration of social, economic and environmental factors into planning, implementation and decision-making so as to ensure that development serves present and future generations',[34] and requires that development be 'socially, environmentally and economically sustainable'.[35]

Section 2(4)(a) states that '[s]ustainable development requires the consideration of all relevant factors', including that:

- 'pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied'[36] (the preventative principle);

[31] National Environmental Management Act 107 of 1998.
[32] Ibid, section 2(1).
[33] Ibid, section 2(1)(c).
[34] Ibid, section 1.
[35] Ibid, section 2(3). For further information on the NEMA, see J Glazewski 'The National Enviromental Management Act' in J Glazewski and L du Toit (eds) *Environmental Law in South Africa* (Loose-Leaf Edition, Issue 1) 2013.
[36] NEMA (n31) section 2(4)(a)(ii).

- 'the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource';[37]
- 'the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised';[38]
- 'a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions'[39] (the precautionary principle); and
- 'negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied'.[40]

The national environmental management principles include that:

- '[e]nvironmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option';[41]
- the 'social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment';[42]
- '[g]lobal and international responsibilities relating to the environment must be discharged in the national interest';[43] and
- the 'costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health

[37] Ibid, section 2(4)(a)(v).
[38] Ibid, section 2(4)(a)(vi).
[39] Ibid, section 2(4)(a)(vii).
[40] Ibid, section 2(4)(a)(viii).
[41] Ibid, section 2(4)(b).
[42] Ibid, section 2(4)(i).
[43] Ibid, section 2(4)(n).

> effects must be paid for by those responsible for harming the environment'[44] (the 'polluter pays' principle).

While none of these principles specifically refers to energy generation, actions and decisions of decision-makers that may significantly affect the environment would need to be considered in light of these principles. In light of the considerable environmental and social impacts arising from coal-fired power stations, it is arguable that decisions regarding the construction of coal-fired power plants are actions that may significantly affect the environment. Thus, it would be necessary to ensure compliance with the national environmental principles, including that the use and exploitation of coal (a non-renewable natural resource) 'takes into account the consequences of the depletion of the resource'[45] and that pollution and environmental degradation are, in the first place, avoided and, in the second place, minimised and remedied.[46]

a) Environmental assessment

In order to promote integrated environmental management, the NEMA requires that the potential environmental impacts of specified activities that are listed in regulations under the NEMA[47] be 'considered, investigated, assessed and reported on' before an environmental authorisation can be granted.[48] Commencing a listed activity without the necessary authorisation is a criminal offence.[49]

It is significant that Listing Notice 1 (issued by the Department of Environmental Affairs), which lists the activities that require a basic environmental assessment

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[44] Ibid, section 2(4)(p).
[45] In terms of NEMA, section 2(4)(a)(v).
[46] In terms of NEMA, section 2(4)(a)(ii).
[47] Department of Environmental Affairs *National Environmental Management Act (107/1998): Listing Notice 1: List of Activities and Competent Authorities identified in terms of Sections 24(2) and 24D* GN 544 in *Government Gazette* No. 33306 dated 18 June 2010; Department of Environmental Affairs *National Environmental Management Act (107/1998): Listing Notice 2: List of Activities and Competent Authorities identified in terms of Sections 24(2) and 24D* GN 545 in *Government Gazette* No. 33306 dated 18 June 2010; Department of Environmental Affairs *National Environmental Management Act (107/1998): Listing Notice 3: List of Activities and Competent Authorities identified in terms of Sections 24(2) and 24D* GN 546 in *Government Gazette* No. 33306 dated 18 June 2010.
[48] NEMA (n31) section 24(1).
[49] Ibid, section 24F. The environmental impact assessment process is discussed in further detail in J Glazewski and S Brownlie 'Environmental Assessment' in J Glazewski and L du Toit (eds) *Environmental Law in South Africa* (Loose-Leaf Edition, Issue 1) 2013.

before environmental authorisation can be granted, *inter alia* includes the 'construction of facilities or infrastructure for the generation of electricity' where the electricity output is between 10MW and 20MW.[50] Listing Notice 2 lists the activities that require the more onerous scoping and environmental impact assessment, and *inter alia* includes the 'construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more'.[51]

Thus, the construction of a power station (coal-fired and renewable) of 10MW or more capacity will require some kind of environmental assessment before such activity may commence.[52] It should be noted that under the REIPPP Programme (discussed in Chapter 7) an environmental impact assessment must be completed in respect of all prospective RES-E projects, irrespective of their size.

6.3.2.2 National Environmental Management: Air Quality Act

The National Environmental Management: Air Quality Act[53] (the NEMAQA) includes among its objects the promotion of air quality in South Africa, the prevention of air pollution and ecological degradation, securing 'ecologically sustainable development while promoting justifiable economic and social development', and giving effect to the constitutional environmental right 'in order to enhance the quality of ambient air for the sake of securing an environment that is not harmful to the health and well-being of people'.[54]

The NEMAQA puts in place various measures to achieve the Act's objects, including a national framework,[55] and national, provincial and local standards for

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[50] NEMA Listing Notice 1 (n47) Appendix 1, Activity number 1. See also Appendix 1, Activity number 10.

[51] NEMA Listing Notice 2 (n47) Appendix 1, Activity number 1. See also Appendix 1, Activity number 8.

[52] Interestingly, the environmental authorisation issued in respect of the imminent (coal-fired) Kusile power plant includes a specific condition that requires the Kusile power plant to be 'carbon capture ready', meaning that the Kusile plant must include measures to capture carbon dioxide and store it underground. See J Glazewski, A Gilder and E Swanepoel *Carbon Capture and Storage (CCS): Towards a Regulatory and Legal Regime in South Africa* 2012 (Institute of Marine and Environmental Law and African Climate and Development Initiative, University of Cape Town).

[53] National Environmental Management: Air Quality Act 39 of 2004.

[54] Ibid, section 2.

[55] Ibid, section 7.

ambient air quality or emissions,[56] as well as the declaration of an area as a priority area by the Minister or MEC if certain requirements are met, including that the Minister or MEC believes that 'ambient air quality standards are being, or may be exceeded in the area, or any other situation exists which is causing, or may cause, a significant negative impact on air quality in the area'.[57] As noted in Chapter 2, it is significant that the Highveld Priority Area, which was declared under the NEMAQA in 2007,[58] occupies roughly the same geographical area as the area where most of Eskom's coal power plants are located.[59]

The Minister and MEC are also empowered to publish a list of activities that result in atmospheric emissions and that are reasonably believed to have or potentially have 'a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage',[60] for which an atmospheric emission licence is required before such an activity may be carried out.[61]

While the NEMAQA notes that 'atmospheric emissions of ozone-depleting substances, greenhouse gases and other substances have deleterious effects on the environment both locally and globally'[62] and defines 'greenhouse gas' (GHG) to include carbon dioxide, methane and nitrous oxide,[63] it is not actually concerned with regulating these GHGs. It does however, establish national ambient air quality standards for sulphur dioxide, nitrogen dioxide, particulate matter, ozone, benzene, lead and carbon monoxide.[64]

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[56] Ibid, sections 9-11.
[57] Ibid, section 18(1)(a). See also section 18(1)(b).
[58] Department of Environmental Affairs and Tourism *National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004): Declaration of the Highveld as a Priority Area in terms of Section 18(1) of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)* GN 1123 in *Government Gazette* No. 30518 dated 23 November 2007.
[59] Ibid. See also and Eskom *Integrated Report 2011* available at http://financialresults.co.za/2011/eskom_ar2011/downloads/eskom-ar2011.pdf [accessed 15 January 2013] 5.
[60] NEMAQA (n53) section 21(1)(a). Such a list of activities has been published in terms of GN 893 in *Government Gazette* No. 37054 dated 22 November 2013.
[61] NEMAQA (n53) section 22.
[62] Ibid, Preamble.
[63] Ibid, section 1(1).
[64] Department of Environmental Affairs National Environmental Management: Air Quality Act (39/2004): *National Ambient Air Quality Standards* GN 1210 in *Government Gazette* No. 32816 dated 24 December 2009.

While a case could be made for using the NEMAQA to regulate climate change and carbon emissions, this approach has not been taken by government. Rather, climate change responses have been left to separate devices such as the preparation of the National Climate Change Response White Paper.[65]

6.3.2.3 Other environmental legislation

Other environmental legislation may be indirectly relevant to energy generation, including the National Environmental Management: Waste Act,[66] which is concerned with managing (primarily solid) waste in South Africa, and the National Water Act.[67] Indeed, it has been noted that 'any hydropower development will require authorisation in terms of the National Water Act'.[68] Other environmental legislation would potentially also need to be complied with. However, as such Acts are not directly relevant, they are not considered further.

The next section considers energy-related legislation and policy documents, to the extent that they are relevant to the promotion of renewable energy. As noted above, these are discussed in chronological order to illustrate the development of government policy on renewable energy.

6.4 Energy-related legislation and policy documents

6.4.1 White Paper on the Energy Policy of the Republic of South Africa (1998)

The White Paper on the Energy Policy of the Republic of South Africa[69] (the EWP) was published by the (former) Department of Minerals and Energy well over a

[65] This is discussed in 6.5.5 below.
[66] National Environmental Management: Waste Act 59 of 2008.
[67] National Water Act 36 of 1998.
[68] Renewable Energy White Paper (n1) 37.
[69] Department of Minerals and Energy *White Paper on the Energy Policy of the Republic of South Africa* in GN 3007 in *Government Gazette* No. 19606 dated 17 December 1998.

decade ago (before the load-shedding of 2007/2008, which was discussed in 3.3.1.2) in order to 'clarify government policy regarding the supply and consumption of energy for the next decade'.[70] It was drafted from the point of view of Government's 'main goal' being the 'socio-economic development of all our people'.[71] While it has been overtaken by more recent events and policy documents, it is described as the 'premier policy document which guides all subsequent policies, strategies and legislation within the energy sector'.[72]

The EWP sets out five energy sector policy objectives, namely to increase access to affordable energy services, improve energy governance, stimulate economic development, manage energy-related environmental and health impacts and secure supply through diversity.[73]

With regard to renewable energy, the EWP recognises the potential role for renewable energy and states that renewable energy sources

> 'can increasingly contribute towards a long-term sustainable energy future. The development of government's renewable energy policy is guided by a rationale that South Africa disposes of very attractive renewable resources, particularly solar and wind and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account'.[74]

The EWP also notes the perception that renewable energy in South Africa is only suitable in respect of small-scale applications, where it would be cheaper than conventional sources of energy, and states that '[c]losed mind-sets are therefore a barrier to the adoption of renewable energy technologies'.[75]

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[70] Ibid, 3.
[71] Ibid, 4.
[72] Department of Energy *Draft 2012 Integrated Energy Planning Report* in GN 513 in *Government Gazette* No. 36690 dated 24 July 2013, 45.
[73] Energy White Paper (n69) 8-9.
[74] Ibid, 79.
[75] Ibid, 80.

6.4.2 Integrated Energy Plan (2003)

The purpose of the Integrated Energy Plan for the Republic of South Africa[76] (the IEP), which was published by the (former) Department of Minerals and Energy, was 'to balance energy demand with supply resources in concert with safety, health and environmental considerations'[77] with the aim of developing a 'framework within which specific energy policy and development decisions can be made'.[78]

The IEP considers four different scenarios and maps electricity and oil capacity expansion plans under each of these scenarios.[79] With regard to renewable energy specifically, while the IEP notes that it is important to promote renewable energy for 'environmental reasons and for diversification of supply',[80] it places much emphasis on the higher initial costs of renewable energy and the fact that wind and solar energy are intermittent energy sources with the result that additional storage becomes necessary, thus increasing costs. On the other hand, the IEP considers biomass to be an 'economic' renewable energy source.[81]

While the IEP is still in place, since it was published a decade ago it has been overtaken by more recent government publications including the Integrated Resource Plan 2010-2030 (discussed in 6.4.6 below). It should also be noted that the National Energy Act 34 of 2008 (discussed in 6.4.5 below) requires the publication of an Integrated Energy Plan. While this has not yet been done, the Department of Energy has published a draft Integrated Energy Planning Report,[82] which forms part of the process of preparing a final Integrated Energy Plan, which is

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[76] Department of Minerals and Energy *Integrated Energy Plan for the Republic of South Africa* 2003 available at http://www.info.gov.za/view/DownloadFileAction?id=124574 [accessed 30 October 2012].
[77] Ibid, 5.
[78] Ibid, 25.
[79] Ibid, 25-26.
[80] Ibid, 25.
[81] Ibid 25.
[82] Draft 2012 Integrated Energy Planning Report (n72).

expected to be completed in 2014.[83] The IRP 2010-2030 will reportedly 'be updated in parallel'.[84]

6.4.3 White Paper on the Renewable Energy Policy of the Republic of South Africa (2004)

The (former) Department of Minerals and Energy published the White Paper on the Renewable Energy Policy of the Republic of South Africa[85] (the REWP) in 2004. It is still relevant today. The REWP sets out Government's vision with regard to renewable energy, namely '[a]n energy economy in which modern renewable energy increases its share of energy consumed and provides affordable access to energy throughout South Africa, thus contributing to sustainable development and environmental conservation'.[86]

It also sets out government's long-term goal in regard to renewable energy, namely

> 'the establishment of a sustainable renewable energy industry with an equitable BEE [black economic empowerment] share and job market that will offer in future years a fully sustainable, non-subsidised alternative to fossil fuel dependence'.[87]

The REWP also considers the promotion of renewable energy as a response to climate change and states that 'alternative means of producing energy such as renewable energy sources, which have less impact on the environment compared to fossil fuels have to be considered'.[88]

Significantly, the REWP establishes the target of

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[83] In the Draft Integrated Energy Planning Report it is noted that the draft report '***does not provide recommendations but presents model output from the Base Case and various Test Cases. This output gives insight on the possible implications of pursuing alternative energy policy options***… final recommendations will be made in the form of the Final IEP Report'. At 43.

[84] See T Creamer 'Draft energy roadmap to be released for public comment this month' *Engineering News* (2 July 2013) available at http://www.engineeringnews.co.za/article/draft-energy-roadmap-to-be-released-for-public-comment-this-month-2013-07-02 [accessed 9 July 2013].

[85] Renewable Energy White Paper (n1).

[86] Ibid, 18.

[87] Ibid, 20.

[88] Ibid, 20.

> '10 000 GWh (0.8 Mtoe [million tonnes of oil equivalent]) renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro. The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and bio-fuels. This is approximately 4% (1667 MW) of the projected electricity demand for 2013 (41539 MW).'[89]

At the time of writing, this target had not yet been achieved.

The REWP acknowledges the cost barrier to renewable energy and states that there is a need

> 'for Government to create an enabling environment through the introduction of fiscal and financial support mechanisms within an appropriate legal and regulatory framework to allow renewable energy technologies to compete with fossil-based technologies… Market conditions for renewable energy generation can be optimised by reducing the barriers to the increased production of electricity from this source through the development and implementation of an appropriate financial and legislative framework. There is a need for Government support for renewable energy to help establish initial market share and demonstrate the viability of renewable sources, after which economies of scale and technological development take over'.[90]

The REWP identifies four key strategic areas with regard to promoting renewable energy including financial instruments and legal instruments.[91] It notes that financial instruments need to be developed essentially in order to 'facilitate the creation of an investment climate for the development of the renewable energy sector, which will attract foreign and local investors'.[92] With regard to legal instruments, the REWP *inter alia* identifies the need to 'develop, implement, maintain and continuously improve an effective legislative system to promote the implementation of renewable energy'.[93]

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[89] Ibid, 13.
[90] Ibid, 14.
[91] Ibid, 15.
[92] Ibid, 15.
[93] Ibid, 16.

It is significant that the South African government identified 'the establishment of a sustainable renewable energy industry' as part of its long-term goal for renewable energy. [94] It is also notable that government identified the financial barrier to renewable energy a decade ago as well as the need for financial and legal instruments to promote renewable energy.

6.4.4 Electricity Regulation Act 4 of 2006

The Electricity Regulation Act 4 of 2006 (the Electricity Regulation Act) is concerned with regulating the electricity supply industry and includes among its objects the 'efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure in South Africa',[95] ensuring that 'the interests and needs of present and future electricity customers and end users are safeguarded and met' *inter alia* having regard to the 'long-term sustainability of the electricity supply industry',[96] facilitating 'universal access to electricity',[97] promoting 'the use of diverse energy sources and energy efficiency'[98] and promoting 'competitiveness and customer and end user choice'.[99]

The NERSA (discussed in 6.2 above) is appointed as the 'custodian and enforcer of the regulatory framework' established under the Electricity Regulation Act.[100] It is charged with various responsibilities including: considering applications for, and issuing, licences *inter alia* for the 'operation of generation, transmission or distribution facilities' and the import and export of electricity;[101] regulating prices and tariffs;[102] and issuing rules to implement the government's electricity policy framework, the Integrated Resource Plan (discussed in 6.4.6 below) and the Electricity Regulation Act.[103]

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[94] Ibid, 20.
[95] Electricity Regulation Act (n13) section 2(a).
[96] Ibid, section 2(b).
[97] Ibid, section 2(d).
[98] Ibid, section 2(e).
[99] Ibid, section 2(f).
[100] Ibid, section 3.
[101] Ibid, section 4(a)(i).
[102] Ibid, section 4(a)(ii).
[103] Ibid, section 4(a)(iv).

One may only operate a generation, transmission or distribution facility, import or export electricity or trade electricity if one is in possession of a licence issued by the NERSA,[104] except in certain specified circumstances.[105] The NERSA is empowered to make any licence subject to various conditions, including regarding 'the types of energy sources from which electricity must or may be generated, bought or sold'.[106] A licence condition that relates to 'the setting or approval of prices, charges and tariffs …must enable an efficient licensee to recover the full cost of its licensed activities, including a reasonable margin or return'.[107]

Most relevant to the present topic, the Electricity Regulation Act empowers the Minister of Energy, in consultation with the NERSA, to determine that new generation capacity is required 'to ensure the continued uninterrupted supply of electricity',[108] and to 'determine the types of energy sources from which electricity must be generated, and the percentages of electricity that must be generated from such sources',[109] and to make regulations in this regard.[110] Such regulations were made when the Minister of Energy published the Integrated Resource Plan (discussed in 6.4.6 below).

The Minister is also empowered to determine that the generation capacity must 'be established through a tendering process which is fair, equitable, transparent, competitive and cost-effective'.[111] The Electricity Regulation Act sets out the powers of the Minister in regard to the tendering process, including entering into the necessary contracts to 'facilitate the tendering process',[112] applying *inter alia* for permits under the NEMA or other relevant laws, and transfering such permits etc. to successful tenderers.[113] It appears that the current renewable energy tendering programme (discussed in detail in Chapter 7) is authorised in terms of these provisions.

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[104] Ibid, section 7(1).
[105] See section 7(2) read with Schedule II and section 9(1) read with section 8.
[106] Ibid, section 14(1)(r).
[107] Ibid, section 15(1)(a).
[108] Ibid, section 34(1)(a).
[109] Ibid, section 34(1)(b).
[110] Ibid, section 35(4)(j), section 35(4)(k) and section 35(4)(l).
[111] Ibid, section 34(1)(e)(i).
[112] Ibid, section 34(2)(a).
[113] Ibid, section 34(2)(c).

Various regulations have been made under the Electricity Regulation Act, including the Integrated Resource Plan 2010-2030, which is discussed further in 6.4.6.

6.4.5 National Energy Act 34 of 2008

The National Energy Act 34 of 2008 (the Energy Act) is South Africa's framework legislation regulating energy supply in South Africa (while the Electricity Regulation Act is only concerned with the regulation of electricity). It includes among its objects ensuring 'uninterrupted supply of energy' in South Africa,[114] promoting 'diversity of supply of energy and its sources',[115] facilitating 'effective management of energy demand and its conservation',[116] promoting energy research,[117] providing for 'certain safety, health and environment matters that pertain to energy',[118] facilitating 'energy access for improvement of the quality of life',[119] and contributing to 'sustainable development of South Africa's economy'.[120]

It defines 'renewable energy' as 'energy generated from natural non-depleting resources including solar energy, wind energy, biomass energy, biological waste energy, hydro energy, geothermal energy and ocean and tidal energy'.[121] The Energy Act does not establish any concrete obligations regarding the promotion of renewable energy.

The Energy Act requires the Minister of Energy to adopt measures to ensure 'universal access to appropriate forms of energy or energy services … at affordable prices'.[122] Such measures must *inter alia* take into account 'the safety, health and environmental suitability of such energy',[123] 'the availability of energy resources',[124]

[114] National Energy Act (n16) section 2(a).
[115] Ibid, section 2(b).
[116] Ibid, section 2(c).
[117] Ibid, section 2(d).
[118] Ibid, section 2(h).
[119] Ibid, section 2(i).
[120] Ibid, section 2(l).
[121] Ibid, section 1.
[122] Ibid, section 5(1).
[123] Ibid, section 5(2)(a).
[124] Ibid, section 5(2)(b).

'the sustainability of the energy provision',[125] affordability and cost-effectiveness,[126] and 'the State's commitment to provide free basic electricity to poor households'.[127]

The Minister is also required to develop an Integrated Energy Plan (IEP), which must be reviewed and published annually. The IEP must 'deal with issues relating to the supply, transformation, transport, storage of and demand for energy' so as to *inter alia* take account of security of supply,[128] affordability, universal access to electricity and free basic electricity,[129] the environment,[130] international commitments,[131] the 'contribution of energy supply to socio-economic development',[132] as well as plans relating to the mitigation of GHGs in the energy sector.[133] The IEP must also take account of 'all viable energy supply options'.[134]

As noted above, an Integrated Energy Plan was prepared in 2003. However, this was not done in terms of the present legislation and it is outdated. As also noted, the Department of Energy is in the process of preparing a new Integrated Energy Plan,[135] which is expected to be published in 2014. Presumably the final Integrated Energy Plan will replace the 2003 IEP.

The Energy Act also establishes the SANEDI,[136] which as noted in 6.2 above, is *inter alia* responsible for promoting energy efficiency as well as energy research and development.[137] The South African National Energy Research Institute and the National Energy Efficiency Agency, which existed before the commencement of the Energy Act as divisions of the Central Energy Fund, are subsumed by the SANEDI.[138]

The Energy Act empowers the Minister to make regulations regarding various matters including 'minimum contributions to national energy supply from renewable

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[125] Ibid, section 5(2)(f).
[126] Ibid, section 5(2)(g) and (h).
[127] Ibid, section 5(2)(i).
[128] Ibid, section 6(2)(a).
[129] Ibid, section 6(2)(d).
[130] Ibid, section 6(2)(g).
[131] Ibid, section 6(2)(h).
[132] Ibid, section 6(2)(j).
[133] Ibid, section 6(3)(a).
[134] Ibid, section 6(6).
[135] Draft 2012 Integrated Energy Planning Report (n72).
[136] In terms of the National Energy Act (n16) section 7(1).
[137] Ibid, section 7(2).
[138] Ibid, section 13(2).

energy sources'[139] and 'the nature of the sources that may be used for renewable energy contributions to the national energy supply',[140] as well as 'measures and incentives designed to promote the production, consumption, investment, research and development of renewable energy'.[141] Such regulations have not been made.

It could be argued that the Integrated Resource Plan (dealt with in 6.4.6) effectively establishes minimum contributions of renewable energy. However, it is submitted that the Integrated Resource Plan, which is concerned with setting out South Africa's electricity capacity expansion programme until 2030, does not hold quite the same weight as the establishment of minimum contributions of renewable energy under the National Energy Act, which would presumably be binding.

South Africa's framework energy legislation thus does not contain any provisions that make the promotion of renewable energy compulsory. Rather, this is left to the Minister's discretion.

6.4.6 The Integrated Resource Plan 1 (2010) and Integrated Resource Plan 2 (2011)

The Integrated Resource Plan 1 (IRP 1) was published in 2010 when the Minister of Energy determined that new generation was required in terms of section 34 of the Electricity Regulation Act.[142] As noted in Chapter 3, this followed the load-shedding that occurred in 2007/2008.

The IRP 1 aimed to give effect to the 10 000 GWh renewable energy target and to provide for energy efficiency as well as the installation of one million solar water heaters.[143] The IRP 1 intended that the renewable energy target would be met

[139] Ibid, section 19(1)(d).
[140] Ibid, section 19(1)(e).
[141] Ibid, section 19(1)(f).
[142] Department of Energy *Electricity Regulation Act, 2006: Determination regarding the Integrated Resource Plan and new generation capacity* GN 25 in *Government Gazette* No. 32898 dated 29 January 2010, which repealed the former Integrated Resource Plan 1, which was contained in Department of Energy *Electricity Regulation Act, 2006: Determination regarding the Integrated Resource Plan and new generation capacity* GN 1243 in *Government Gazette* No. 32837 dated 31 December 2009.
[143] Department of Energy *Electricity Regulation Act, 2006: Determination regarding the Integrated Resource Plan and new generation capacity* GN 25 in *Government Gazette* No. 32898 dated 29 January 2010, Schedule A. An additional R4.7 billion was recently allocated to ensure that this target

through the implementation of the Renewable Energy Feed-In Tariff (discussed in Chapter 7) and several other projects, which together would provide renewable energy capacity of 1595 MW.[144]

The IRP 1 was overtaken by the Integrated Resource Plan 2010-2030[145] (IRP 2010-2030), which was published in 2011. The IRP 2010-2030 considers a range of scenarios in relation to the 'base case' ('business as usual') scenario and endorses the 'policy adjusted scenario', which envisages that the national electricity grid will be expanded from the 2010 level of 44 535 megawatts (MW) to 89 532 MW by 2030.[146] The IRP 2010-2030 sets out the capacity that has been allocated to different electricity technologies, which is reflected in Table 6.1.

Table 6.1 New capacity (uncommitted) to be added from 2010 to 2030[147]

Electricity technology	**Capacity to be added from 2010 to 2030**	
	MW	**% of total new capacity**
Coal	6250	14.7
OCGT (open cycle gas turbine)	2910	9.2
CCGT (combined cycle gas turbine)	2370	5.6
Pumped storage	0	0
Nuclear	9600	22.6
Hydro	2609	6.1
Wind	8400	19.7

is achieved. See D Peters (Minister of Energy) *Budget Vote Speech* 2013 available at www.pmg.org.za [accessed 14 May 2013].

144 IRP 1 (n143) Schedule B.

145 Department of Energy *Electricity Regulation Act No.4 of 2006: Electricity Regulations on the Integrated Resource Plan 2010-2030* GNR 400 in *Government Gazette* No. 34263 dated 6 May 2011. It should be noted that the IRP 2010-2030 replaced the 'draft IRP 2010-2030' that was published for comment in October 2010. *Draft Integrated Resource Plan for Electricity* 2010 (Revision 2) (8 October 2010) available at http://www.energy.gov.za/IRP/irp%20files/INTEGRATED_RESOURCE_PLAN_ELECTRICITY_2010_v8.pdf [accessed 21 November 2010].

146 Figures obtained from Table 3 in IRP 2010-2030 (n145) 17.

147 Figures obtained from Table 4 at 17.

CSP	1000	2.4
Solar PV	8400	19.7
Other	0	0
Total	**42539**	**100**

New renewable energy will thus amount to 42 per cent of total new capacity. The IRP 2010-2030 envisages that 30 per cent of the new capacity will be provided by independent power producers.[148] This electricity capacity expansion programme will result in total capacity of 21 per cent renewables and about 46 per cent of coal by 2030, which is reflected in Table 6.2.

Table 6.2 Total (electricity) capacity in 2030[149]

Electricity technology	Total capacity in 2030	
	MW	**% of total capacity**
Coal	41071	45.9
OCGT	7330	8.2
CCGT	2370	2.6
Pumped storage	2912	3.3
Nuclear	11400	12.7
Hydro	4759	5.3
Wind	9200	10.3
CSP	1200	1.3
Solar PV	8400	9.4
Other	890	1
Total	**89532**	**100**

As argued in 6.4.5 above, the establishment of an electricity capacity expansion plan in terms of the IRP 2010-2030 does not hold the same weight as the setting of targets or minimum contributions for renewable energy, as provided for by the

[148] Ibid, 24.
[149] Figures obtained from Table 4 at 17.

National Energy Act. Furthermore, the use of the term 'minimum contributions' implies that this is the amount of renewable energy that will actually be generated or supplied to the grid, which is distinct from merely specifying the amount of renewable energy capacity that should be available, as provided for by the IRP 2010-2030. This distinction between *supply* and *capacity* was discussed in 3.2.1 above.

As discussed in Chapter 3, the IRP 2010-2030 envisages that the contribution (or supply) of coal will decrease from about 90 per cent presently to about 65 per cent in 2030. However, it appears that the shortfall will, for the most part, simply be made up by nuclear power. All renewables together (excluding hydro) will only contribute 9 per cent to total electricity supply by 2030.

The IRP 2010-2030 also provides that

> '[n]et metering, which allows for consumers to feed energy they produce into the grid and offset this energy against consumed energy, should be considered for all consumers (including residential and commercial consumers) in order to realise the benefits of distributed generation'.[150]

It also states that 'the IRP should not be restrictive in terms of own generation'.[151] It has however been reported that municipalities, which are responsible for selling electricity to consumers, are strongly opposed to net metering due to the fact that 'selling electricity is one of the major sources of income for municipalities', which income is used to cross-subsidise other services provided by municipalities.[152]

It has been reported that the implementation of the IRP 2010-2030 will result in emissions in the electricity sector being reduced by 19 per cent below the baseline (or 'business as usual' levels) by 2025,[153] while total emission reductions will only amount to 8.6 per cent.[154] This therefore falls well below the Copenhagen

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[150] IRP 2010-2030 (n145) 24.
[151] Ibid, 24.
[152] M Gosling 'Solar energy consumers gridlocked' (13 February 2013) *Cape Times*.
[153] T Alton, C Arndt, R Davies, F Hartley, K Makrelov, J Thurlow and D Ubogu *The Economic Implications of Introducing Carbon Taxes in South Africa* (United Nations University – World Institute for Development Economics Research) (Working Paper No. 2012/46) available at http://www.wider.unu.edu/publications/working-papers/2012/en_GB/wp2012-046/ [accessed 7 May 2013] 5.
[154] Ibid, 13.

commitment target of 34 per cent below business as usual levels by 2025.[155] On the other hand, it has been reported that the supply of 27 per cent of renewable energy (RES-E) by 2030, as opposed to just 9 per cent, is required in order to attain the emission trajectory endorsed by Government.[156]

The IRP 2010-2030 also calculates the projected costs of the different scenarios modelled. However, the costs of externalities have not been included in the cost calculations, and the IRP 2010-2030 notes that '[i]dentifying the externalities and associated costs should be the subject of future research for future iterations'.[157]

A report commissioned by the National Planning Commission (NPC), and which was published in 2013, states that electricity demand is not developing as projected in the IRP 2010-2030, and that the projection of electricity demand of about 89 GW by 2030 will actually be closer to about 61 GW, due *inter alia* to the decreased use of electricity as a result of increasing electricity prices.[158] The report states that due to the lower than expected electricity growth and the increased costs of nuclear energy, there is no reason to invest in costly nuclear energy for the next 15 to 25 years, and that other options should be explored first. The report furthermore states that, if investment decisions continue to be based on the current IRP 2010-2030, this 'will result in a sub-optimal mix of generation plants, and higher electricity prices. It is

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[155] This was discussed in 2.3.3 above. However, the emission reductions are not actually clearly specified in the IRP 2010-2030, which only presents the reduction in 'carbon intensity', which differs from a reduction in actual carbon emissions. The implementation of the IRP 2010-2030 will result in carbon intensity being reduced by 34 per cent. IRP 2010-2030 (n145) Figure 5 at 30.

[156] See M Edkins, A Marquard and H Winkler 'Assessing the Effectiveness of National Solar and Wind Energy Policies in South Africa' 2010 (Final Report for the United Nations Environment Programme Research Programme: *Enhancing information for renewable energy technology deployment in Brazil, China and South Africa*) available at http://www.erc.uct.ac.za/Research/publications/10Edkinesetal-Solar_and_wind_policies.pdf [accessed 27 March 2011] 9.

[157] IRP 2010-2030 (n145) 39. See also M Edkins, H Winkler, A Marquard and R Spalding-Fecher 'External Cost of Electricity Generation: Contribution to the Integrated Resource Plan 2 for Electricity' 2010 (for the Department of Water and Environmental Affairs) available at http://www.erc.uct.ac.za/Research/publications/10Edkinsetal-External_costs_IRP2.pdf [accessed 27 March 2011] 3.

[158] Energy Research Centre, University of Cape Town *Towards a New Power Plan* (for the National Planning Commission) 2013 available at http://www.erc.uct.ac.za/Research/publications/13ERC-Towards_new_power_plan.pdf [accessed 25 April 2013]. This decreasing energy demand was also discussed in the presentation of S Fakir at 'Strategic Energy Policy Developments in Germany and South Africa' *German South African Lecture Series: 'Energy Sciences'* (12 March 2013) (STIAS, Mostertsdrift, Stellenbosch).

therefore critical that the IRP assumptions are revised and that a new plan is developed'.[159]

In accordance with the requirement to revise the IRP,[160] the Department of Energy has started to review the IRP 2010-2030[161] and in November 2013 published an Update to the IRP 2010-2030. As the IRP 2010-2030 'remains the official government plan for new generation capacity until replaced by a full iteration',[162] the focus here remains on the IRP 2010-2030. Nevertheless, the Update 'is intended to provide insight into critical changes for consideration on key decisions in the interim'.[163] The Update projects that electricity demand in 2030 will range between 345 and 416 TWh (81.4 GW) as opposed to the 454 TWh (89.5 GW) projected in the IRP 2010-2030.[164] A new IRP will be finalised following the finalisation of the Integrated Energy Plan.[165]

6.4.7 Electricity Regulations on New Generation Capacity (2010-2012)

The Minister of Energy published Electricity Regulations on New Generation Capacity under the Electricity Regulation Act in 2010,[166] which *inter alia* set out the procedure with regard to developing the Integrated Resource Plan,[167] procuring new generation capacity under an Independent Power Producer (IPP) bid programme[168] and procuring new generation capacity under the Renewable Energy Feed-In Tariff

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159 ERC *Towards a New Power Plan* (n158).
160 IRP 2010-2030 (n145) 10. It is required that the IRP should be revised every two years. As the IRP was published in May 2011, this would require that the IRP should have been revised by May 2013, which was not done.
161 Department of Energy *IRP 2010 Update* (26 September 2013).
162 Department of Energy *Integrated Resource Plan for Electricity (IRP) 2010-2030: Update Report 2013* (2013) available at http://www.doe-irp.co.za/content/IRP2010_updatea.pdf [accessed 9 December 2013] 10.
163 Ibid, 10.
164 Ibid, 8 and Table 2 at 20.
165 Ibid, 10.
166 Department of Energy *Electricity Regulation Act No. 4 of 2006: Electricity Regulations on New Generation Capacity* GNR. 1130 in *Government Gazette* No. 33819 dated 30 November 2010. It should be noted that these Regulations repealed further regulations on new generation capacity, namely Department of Energy *Electricity Regulation Act (4/2006): Electricity Regulations on New Generation Capacity* GNR. 721 in *Government Gazette* No. 32378 dated 5 August 2009.
167 Department of Energy *Regulations on New Generation Capacity* 2010 (n166) Regulation 4.
168 Ibid, Regulation 7. The IPP bid programme refers to a procurement programme undertaken to procure new generation capacity from independent power producers, but excludes procurement under the REFIT programme, which is discussed in 7.3 below.

(REFIT) programme.[169] Further regulations on new generation capacity were made in 2011,[170] which *inter alia* deal with the development of the integrated resource plan,[171] the procurement process under the IPP procurement programme[172] and the conclusion of the power purchase agreement.[173]

In terms of the 2011 Regulations and section 34(1) of the Electricity Regulation Act, the Minister of Energy in consultation with the NERSA, determined in 2012 that additional renewable energy capacity was required in order to 'contribute towards energy security and to facilitate [the] achievement of the renewable energy targets of the Republic of South Africa',[174] and as noted in Chapter 3, determined that an additional 3200 MW of renewable energy should be procured.[175] This additional 3200 MW will also be procured through the REIPPP Programme.[176] The regulations allocate this renewable energy capacity as follows:

Table 6.3 Additional renewable energy capacity to be procured through tendering[177]

Technology	**Additional capacity (MW)**
Onshore wind	1470
Concentrated solar power	400
Solar PV	1075
Small hydro (≤ 40MW)	60
Biomass	47.5
Biogas	47.5

169 Department of Energy *Regulations on New Generation Capacity* 2010 (n166) Regulation 8.
170 Department of Energy *Electricity Regulation Act No. 4 of 2006: Electricity Regulations on New Generation Capacity* GNR. 399 in *Government Gazette* 34262 dated 4 May 2011.
171 Ibid, Regulation 4.
172 Ibid, Regulation 7.
173 Ibid, Regulation 9. The power purchase agreement is defined as 'an agreement concluded between a generator and the buyer for the sale and purchase of new electricity generation capacity or electricity derived therefrom, or both'. See Regulation 1.
174 Department of Energy *IPP Procurement Programme 2012: Determination under section 34(1) of the Electricity Regulation Act 4 of 2006* GN 1074 in *Government Gazette* No. 36005 dated 19 December 2012, Part A, Regulation 1.
175 Ibid.
176 Ibid, Part A, Regulation 1 and Regulation 3.
177 Data obtained from Department of Energy *IPP Procurement Programme 2012* (n174) Part A, Regulation 5.

Small projects	100
Total	**3200**

It should be noted that the ‘additional’ renewable energy capacity allocated is in accordance with the renewable energy capacity that was allocated under the IRP 2010-2030 (as set out in Table 6.1), and the ‘additional’ renewable energy capacity allocated simply relates to the fact that more renewable energy is to be procured through the tendering (REIPPP) programme.[178] The procurer is the Department of Energy, which is charged with conducting the procurement programme, and the electricity is to be purchased from IPPs by Eskom.[179] The REIPPP Programme is discussed in detail in Chapter 7.

6.4.8 General comments

The preceding discussion has provided an overview of relevant legislation and policy documents with the object of establishing the legal and policy basis for promoting renewable energy. It is clear from the above that renewable energy has moved up higher on government’s agenda from 1998 to the present day. Nevertheless, some points of discussion emerge.

It is significant that South Africa’s framework law regulating energy, the National Energy Act, does not contain more stringent provisions regarding the uptake of renewable energy. This is in contrast to the National Energy Bill that was published for comment in 2004,[180] which included a section devoted entirely to renewable energy that specifically provided that the Minister ‘must optimise the contribution of renewable energy to the national energy supply’[181] and furthermore that the Minister ‘must establish a national programme to promote renewable energy’.[182] It is thus arguable that more stringent provisions could have been included under the National Energy Act regarding the uptake of renewable energy.

[178] Ibid, Part A, Regulations 1 and 3.
[179] Ibid, Part A, Regulations 7-10.
[180] In terms of GN 2151 in *Government Gazette* No. 26848 dated 8 October 2004.
[181] Ibid, section 17(1).
[182] Ibid, section 17(3).

The IRP 2010-2030 is important in that it sees an increased role for renewable energy. However, the contribution of 9 per cent renewable energy to electricity supply is arguably not very significant, especially in light of the studies discussed in Chapter 3. It was seen in Chapter 3 that one study considered that achieving 15 per cent RES-E by 2030 'is possible with hardly any change in public and private investments'.[183] This therefore runs counter to the argument that a greater contribution of renewable energy in South Africa (than provided for in the IRP 2010-2030) would be too expensive.

It was also noted in 6.4.6 above that the IRP 2010-2030 is not aligned with the emission trajectory endorsed by government and that the costs of externalities were not included in the modelling. However, it could have been instructive to have included the externality costs in the modelling exercises, especially in light of the argument that renewable energy is costly.

While South Africa is a developing country with numerous pressing priorities, in light of the above, it is arguable that government could take stronger action to promote renewable energy in order to achieve the establishment of a sustainable renewable energy industry (as set out in the REWP).

6.5 Climate change-related policies

Due to the close link between energy generation and climate change, climate change-related policies will have implications for energy policy in South Africa and vice versa. Climate change-related policies are discussed below in chronological order in order to illustrate the development of government policy on climate change. These policy documents are not binding and are discussed only to the extent that they are relevant to renewable energy.

[183] M Edkins, A Marquard and H Winkler 'South Africa's Renewable Energy Policy Roadmaps' 2010 (Final Report for the United Nations Environment Programme Research Programme: *Enhancing information for renewable energy technology deployment in Brazil, China and South Africa*) available at http://www.erc.uct.ac.za/Research/publications/10Edkinesetal-Renewables_roadmaps.pdf [accessed 27 March 2011] 25.

6.5.1 Initial National Communication under the United Nations Framework Convention on Climate Change (2000)

South Africa's Initial National Communication under the United Nations Framework Convention on Climate Change[184] (the Initial Communication) was prepared by the (former) Department of Environmental Affairs and Tourism in terms of Article 12 of the United Nations Framework Convention on Climate Change (UNFCCC), and was South Africa's first official publication dealing specifically with climate change.

At the time that the Initial Communication was drafted, it was considered that the approach to GHG mitigation was 'only at an exploratory phase' due to other national priorities such as poverty alleviation and 'providing access to basic facilities'.[185] The Initial Communication did nevertheless consider two potential scenarios to mitigate GHG emissions, namely increased demand side management (DSM), i.e. reducing energy demand, and using more efficient energy technologies, which envisaged the increased role of nuclear energy, gas, hydropower and renewable sources. However, this scenario envisaged that renewable energy would only contribute one per cent to electricity supply by 2025.[186]

6.5.2 National Climate Change Response Strategy (2004)

The National Climate Change Response Strategy[187] (the Climate Change Response Strategy) was published in 2004 by the (former) Department of Environmental Affairs and Tourism. At this time, climate change was still not high on the agenda. Indeed, the Climate Change Response Strategy emphasises the national position of viewing the climate change response as an opportunity to promote government priorities,

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[184] *Initial National Communication under the United Nations Framework Convention on Climate Change* 2000 available at http://unfccc.int/resource/docs/natc/zafnc01.pdf [accessed 16 May 2008].
[185] Ibid, 70.
[186] Ibid, 72-73.
[187] Department of Environmental Affairs and Tourism *A National Climate Change Response Strategy for South Africa* 2004 available at http://unfccc.int/files/meetings/seminar/application/pdf/sem_sup3_south_africa.pdf [accessed 10 April 2008].

including the provision of basic services and housing, infrastructure development and the alleviation of poverty.[188]

The Climate Change Response Strategy also emphasises that South Africa is not bound to reduce its GHG emissions (due to its developing country status), but considers mitigation options that could be implemented in the future.[189] It acknowledges that introducing renewable energy could play a role in mitigating GHG emissions.[190] However, this idea was not taken further and the Climate Change Response Strategy argues that the 'burden of proof' with regard to proving that renewable energy and energy efficiency programmes 'would be successful on a large scale rests with the proponents of such schemes'.[191]

6.5.3 Long Term Mitigation Scenarios: Strategic Options for South Africa (2007)

The Long Term Mitigation Scenarios: Strategic Options for South Africa[192] (LTMS) was published by the (former) Department of Environmental Affairs and Tourism in 2007. The aim in commissioning the LTMS was to produce a document that would enable Cabinet to 'draw up a long-term climate policy' and to inform South Africa's climate change negotiating position.[193]

The LTMS is more pertinent than previous policy documents on climate change. Instead of being a vision document that simply sets out actions that could be taken by government, it is a study that, through modelling, determines strategies that would need to be implemented if South Africa were to reduce its GHG emissions by 30 to 40 per cent below 2003 levels by 2050. This is referred to as the 'Required by Science Scenario' (RBS), and it sees South Africa join 'the world community in

[188] Ibid, 8 and 12.
[189] Ibid, 22.
[190] Ibid, 22-23.
[191] Ibid, 24.
[192] Scenario Building Team *Long Term Mitigation Scenarios: Strategic Options for South Africa* (Technical Summary, Department of Environmental Affairs and Tourism) 2007.
[193] Ibid, 1.

taking action to stabilise GHG concentrations, and negotiate… a target as its fair contribution to this shared vision'.[194]

The RBS Scenario is considered to be more 'robust' and 'compelling' than the 'Growth without Constraints Scenario' scenario (GWC), which 'presents an economy and society based very much on the patterns and dynamics that dominate South Africa today' and sees GHG emissions increasing fourfold by 2050.[195] In order to achieve the RBS Scenario, the LTMS recommends the implementation of four strategies, namely 'Start Now', 'Scale Up', 'Use the Market' and 'Reach for the Goal', and specific actions are recommended in respect of each of these strategies.

With regard to renewable energy specifically, the LTMS recommends that there be 'a move away from coal-fired electricity, with renewables, nuclear and cleaner coal each providing 27% of electricity generated by 2050'[196] (under 'Start Now'). In the 'Scale Up' strategy, which requires the expansion of the actions under 'Start Now', renewable energy and nuclear power each supply 50 per cent of electricity by 2050.[197] The 'key driver' of the 'Use the Market' strategy is a carbon tax that starts at R100 per tonne of carbon dioxide equivalent (tCO_2eq) and increases to R750/tCO_2e.[198] The revenue generated by the tax could be used to provide incentives, for example for solar water heaters and RES-E, and results in RES-E becoming cheaper.[199] These three strategic options lead to emission reductions of 76 per cent below 2003 levels.[200]

The fourth strategy, Reach for the Goal, would serve to close this gap and requires the implementation of measures that are not yet known such as investing in new technologies and incentivising behaviour change.[201]

The scenarios and strategic options presented in the LTMS are considered to be 'positive and ambitious but realistic pathways which can meet the expected demands

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[194] Ibid, 9.
[195] Ibid, 8.
[196] Ibid, 14.
[197] Ibid, 16.
[198] Ibid, 18.
[199] Ibid.
[200] Ibid, 24.
[201] Ibid, 21.

of multinational negotiations'.[202] The LTMS continues to inform government policy on climate change.[203]

6.5.4 The 'Copenhagen commitment' (2009)

At the 15th Conference of the Parties under the UNFCCC (and the 5th Conference of the Parties serving as the Meeting of the Parties under the Kyoto Protocol), President Jacob Zuma committed to reducing GHG emissions in South Africa by 34 per cent below 'business as usual' (BAU) levels by 2020 and by 42 per cent below BAU levels by 2025. However, this is not binding and, as noted in Chapter 2, is subject to the receipt of financial support from developed country parties.[204]

6.5.5 National Climate Change Response White Paper (2011)

The National Climate Change Response White Paper[205] (the Climate Change White Paper) was published by the Department of Environmental Affairs in 2011, following the publication of the National Climate Change Response Green Paper in 2010.[206] Since the former represents government's more recent position on climate change, only the Climate Change White Paper is discussed here.

The Climate Change White Paper sets out South Africa's two climate change objectives, namely to:

- 'Effectively manage inevitable climate change impacts through interventions that build and sustain South Africa's social, economic and environmental resilience and emergency response capacity [and]

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[202] Ibid, 30.
[203] See for example Department of Environmental Affairs *South Africa's Second National Communication under the United Nations Framework Convention on Climate Change* 2011 available at http://unfccc.int/resource/docs/natc/zafnc02.pdf [accessed 24 November 2011] 182.
[204] See the letter from the Deputy Director General: International Cooperation, Department of Environmental Affairs to the Executive Secretary of the UNFCCC (29 January 2010). Such support would be in terms of developed countries' obligations under the UNFCCC and Kyoto Protocol, as discussed in Chapter 2.
[205] Department of Environmental Affairs *National Climate Change Response White Paper* GN 757 in *Government Gazette* No. 34695 dated 19 October 2011.
[206] Department of Environmental Affairs *National Climate Change Response Green Paper 2010* GN 1083 in *Government Gazette* No. 33801 dated 28 November 2010.

- Make a fair contribution to the global effort to stabilise … [GHG] concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe that enables economic, social and environmental development to proceed in a sustainable manner'.[207]

The achievement of these objectives is to be guided by various principles including the principle of 'common but differentiated responsibilities and respective capabilities', the equity principle, the precautionary principle, the polluter pays principle, and the principle of sustainable development.[208]

The Climate Change White Paper states that mitigation is a national priority.[209] In line with the commitment to 'contributing its fair share to global GHG mitigation efforts in order to keep the temperature increase well below 2°C',[210] the Climate Change White Paper reiterates the commitment made at Copenhagen to reduce emissions by 34 per cent below business as usual levels by 2020 and by 42 per cent by 2025.[211] However, this is subject to the receipt of financial and other support from developed country parties.[212]

In light of the fact that most of South Africa's GHG emissions are generated by the energy sector, the Climate Change White Paper recognises that 'large mitigation contributions will have to come from reduced emissions from energy generation and use',[213] and states that 'the most promising mitigation options are primarily energy efficiency and demand side management, coupled with increasing investment in a renewable energy programme in the electricity sector'.[214]

This language is weaker than that contained in the Climate Change Green Paper, in which it was explicitly acknowledged that

> 'it is clear that successful climate change mitigation in South Africa must focus on the energy sector. In this regard, energy efficiency measures, the roll out of

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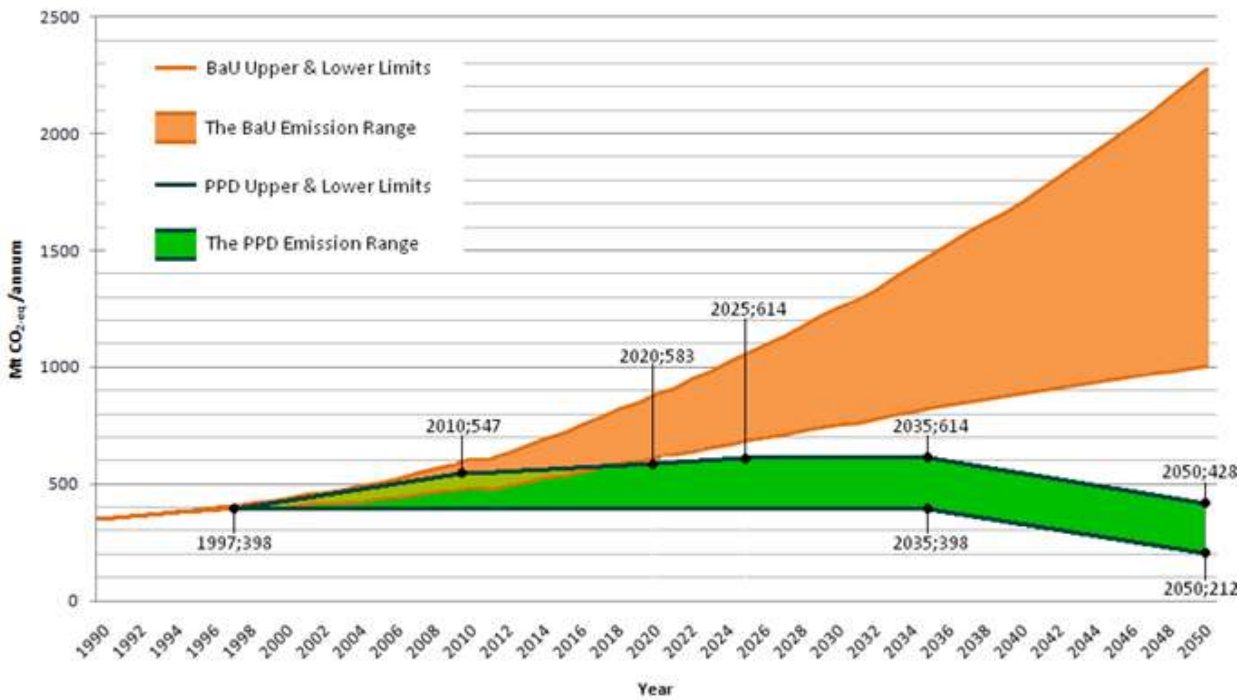
207 National Climate Change Response White Paper (n205) 14.
208 Ibid, 14. These principles have been discussed in 2.2.3.1 and 6.3.2.1 above.
209 Ibid, 27.
210 Ibid, 27-28.
211 Ibid, 28.
212 Ibid.
213 Ibid, 29.
214 Ibid.

renewable forms of energy and also a nuclear energy roll out would result in the largest emission reductions'.[215]

The Climate Change White Paper endorses the 'benchmark national GHG emissions trajectory range', which represents South Africa's emission trajectory until 2050. This is the 'Peak, Plateau and Decline trajectory' (reflected in Figure 6.1 below), which sees GHG emissions peaking between 2020 and 2025, plateauing until 2035 and thereafter declining until 2050.[216]

Figure 6.1 The desired South African climate change mitigation outcome – the 'Peak, Plateau and Decline' (PPD) greenhouse gas emission trajectory[217]



The Climate Change White Paper also endorses a 'carbon budget approach', in order to provide a flexible approach to mitigation. In terms of this approach 'carbon budgets', which are in line with the emissions trajectory, would be prepared for the relevant economic sectors within two years of the publication of the Climate Change

[215] National Climate Change Response Green Paper (n206) 15.
[216] National Climate Change Response White Paper (n205) 30.
[217] Department of Environmental Affairs (Branch: Climate Change) *Defining South Africa's Peak, Plateau and Decline Greenhouse Gas Emission Trajectory* 2011, Figure 3 at 7.

White Paper,[218] i.e. by October 2013. Thus, the entire GHG emissions allowance in terms of the emissions trajectory will be divided up and allocated amongst the different sectors. At the time of writing no carbon budgets had yet been established.

The Climate Change White Paper establishes a number of ‘Near-term Priority Flagship Programmes’, including the Climate Change Response Public Works Flagship Programme and the Renewable Energy Flagship Programme.[219] The Renewable Energy Flagship Programme includes the expanded renewable energy programme based on the IRP 2010-2030 and could rely on the SARI (referred to in 6.2 above).[220] Frameworks for the various programmes are to be established by the relevant Ministers.[221] It does not appear that a framework has yet been established for the Renewable Energy Flagship Programme.

The Climate Change White Paper also considers carbon pricing (discussed more fully in Chapter 7) and discusses the factors that need to be considered in designing the carbon tax, such as the tax level, distributional impacts and competitiveness.[222] However, it does not establish any concrete principles or policies.

With regard to financial incentives, the Climate Change White Paper states that

> ‘Government recognises the important role of market-based instruments that create fiscal incentives and disincentives to support climate change policy objectives. Thus, South Africa will employ market-based instruments as part of a suite of policy interventions to support the transition to a lower-carbon economy’.[223]

It has been argued that while the Climate Change White Paper ‘provides a high-level mitigation policy direction, … much of the detail on the instrument interaction and implementation remains to be developed’.[224] It has also been noted that the carbon budget approach would impose a limit on total emissions, as opposed to the

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[218] National Climate Change Response White Paper (n205) 31.
[219] Ibid, 33-35.
[220] Ibid, 34.
[221] Ibid, 33.
[222] Ibid, 43.
[223] Ibid, 44.
[224] B Cloete and E Tyler *Carbon Tax Design Options – A Discussion Document* 2012 (WWF South Africa) available at http://awsassets.wwf.org.za/downloads/carbon_tax_design_options_a_discussion_document_final_launch_product_1.pdf [accessed 2 April 2012] 13.

carbon tax approach, in which the price (rather than quantity) is established; and that the Climate Change White Paper does not clarify '[h]ow these two instruments are intended to interact'.[225]

6.5.6 Second National Communication under the UNFCCC (2011)

The Second National Communication under the UNFCCC[226] (the Second National Communication) was published by the Department of Environmental Affairs just ahead of the 17th Conference of the Parties under the UNFCCC, which was held in Durban, South Africa, at the end of 2011.

The Second National Communication sets out South Africa's climate change response objectives, namely to:

- Contribute to the global goal of stabilising GHG emissions 'at a level that would prevent dangerous anthropogenic interference with the climate system'; and
- Effectively adapt to 'already unavoidable and potential projected climate change impacts through interventions that build and sustain South Africa's social, economic, and environmental resilience and emergency response capacity'.[227]

With regard to climate change mitigation, the Second National Communication notes that

> '[g]iven that 79% of South Africa's greenhouse gas (GHG) emissions are attributable to energy supply and use; the focus of the tension between national development and climate change mitigation objectives is therefore the energy system, and this is the point at which this tension can be resolved through innovative policies and measures'.[228]

[225] Ibid. This relates to the distinction between price and quantity instruments that was referred to in Chapter 4.
[226] South Africa's Second National Communication (n203).
[227] Ibid 59.
[228] Ibid 181.

The Second National Communication highlights mitigation measures that have been formulated and focuses on measures in the energy sector and notes that '[d]evelopments in two areas of energy policy are particularly significant – measures to promote renewable energy, and [the] promotion of energy efficiency'.[229]

The Second National Communication briefly discusses the REWP, the National Industrial Biofuels Strategy[230] and the National Energy Efficiency Strategy.[231] The focus however, is on the LTMS, which is described as 'one of the key documents on which national climate policy and strategies are based'.[232] It is interesting to note that the Second National Communication, the only South African policy document on climate change to be submitted to the international community (apart from the Initial National Communication), does not specifically endorse the 'Copenhagen commitment'.

6.5.7 General comments

The preceding discussion illustrates a shift in government's thinking, from the position where government was primarily concerned with addressing the adverse climate change impacts that would be felt by South Africa, to the position where it has assumed more responsibility with regard to the country's high levels of GHG emissions. Government has more deliberately considered how South Africa can '[m]ake a fair contribution to the global effort' to stabilise GHG emissions,[233] while also taking account of South Africa's developing country status and the important objective of managing, and adapting to, the adverse impacts of climate change.

The LTMS is especially promising in that it modelled the measures necessary to achieve relatively substantial emission reductions by 2050, one of which was the contribution of 27 per cent RES-E by 2050 (under the 'Start Now' strategy) and the

[229] Ibid 181.
[230] Department of Minerals and Energy *Biofuels Industrial Strategy of the Republic of South Africa* 2007 available at http://www.info.gov.za/view/DownloadFileAction?id=77830 [accessed 12 March 2013].
[231] Department of Minerals and Energy *Energy Efficiency Strategy of the Republic of South Africa* 2005 available at http://www.info.gov.za/view/DownloadFileAction?id=88503 [accessed 12 March 2013].
[232] South Africa's Second National Communication (n203) 182.
[233] National Climate Change Response White Paper (n205) 14.

contribution of 50 per cent RES-E by 2050 (under the ‘Scale Up’ strategy). As noted above, these measures, along with all options presented in the LTMS, were considered to be ambitious but realistic.

The Climate Change White Paper is ambitious with regard to action on climate change, especially with regard to its endorsement of the Peak, Plateau and Decline trajectory and the proposed introduction of a carbon budget approach and Flagship Programmes, including the Renewable Energy Flagship Programme. However, implementation will be key and as has been noted, carbon budgets and a framework for the Renewable Energy Flagship Programme are yet to be established.

6.6 Other legislation and policy documents

6.6.1 Legislation

6.6.1.1 Preferential Procurement Policy Framework Act 5 of 2000

Section 217(1) of the Constitution states that

> ‘[w]hen an organ of state in the national, provincial or local sphere of government, or any other institution identified in national legislation, contracts for goods or services, it must do so in accordance with a system which is fair, equitable, transparent, competitive and cost-effective’.

Section 217(2) of the Constitution provides that this does not prevent the relevant organs of state or institutions from implementing a procurement policy that provides for ‘categories of preference in the allocation of contracts’,[234] and ‘the protection or advancement of persons, or categories of persons, disadvantaged by unfair discrimination’.[235]

The Constitution furthermore provides for the enactment of national legislation that prescribes a framework within which this procurement policy must be

[234] Constitution of the Republic of South Africa (n23) section 217(2)(a).
[235] Ibid, section 217(2)(b).

implemented.[236] As a result, the Preferential Procurement Policy Framework Act[237] (the PPPF Act) was enacted.

The PPPF Act provides for organs of state to determine their own preferential procurement policy, which is implemented within the framework set out in the Act. Firstly, a 'preference point system' must be followed. In respect of contracts that have a Rand value above a prescribed amount, 'a maximum of 10 points may be allocated for specific goals [such as contracting with historically disadvantaged persons] … provided that the lowest acceptable tender scores 90 points for price'.[238] In respect of contracts 'with a Rand Value equal to or below a prescribed amount a maximum of 20 points may be allocated for specific goals … [such as contracting with historically disadvantaged persons] provided that the lowest acceptable tender scores 80 points for price'.[239]

An 'acceptable tender'[240] that has a higher price will score fewer points in comparison to the lowest acceptable tender. This is calculated on a pro rata basis and according to a prescribed formula.[241] Specific goals in respect of which points may be awarded must have been 'clearly specified in the invitation to submit a tender'.[242] The tenderer that has scored the highest points will be awarded the relevant contract, unless there are other 'objective criteria … [that] justify the award to another tenderer'.[243] It thus appears that price is the most important criterion and counts for 80 or 90 per cent of the total score, while other factors count for the remaining 20 or 10 per cent.

[236] Ibid, section 217(3).
[237] Preferential Procurement Policy Framework Act 5 of 2000.
[238] Ibid, section 2(1)(b)(i) read with section 2(d)(i).
[239] Ibid, section 2(1)(b)(ii). It should be noted that the Minister of Finance has published regulations in terms of the Preferential Procurement Policy Framework Act in *Government Gazette* No. 34350 dated 8 June 2011 and in *Government Gazette* No. 34832 dated 7 December 2011. The *Preferential Procurement Regulations, 2011* in GN R. 502 in *Government Gazette* No. 34350 dated 8 June 2011 provide that in respect of tenders that have a value of between R 30 000 and R 1 million, the 80/20 preference point system is applicable; and in respect of tenders that have a value of above R 1 million, the 90/10 preference point system is applicable. See Regulations 5 and 6.
[240] An 'acceptable tender' is defined as a tender 'which, in all respects, complies with the specifications and conditions of tender as set out in the tender document'. See section 1 of the Act.
[241] PPPF Act (n237) section 2(1)(c).
[242] Ibid, section 2(1)(e).
[243] Ibid, section 2(1)(f).

Provision is made for the Minister of Finance to exempt an organ of state from the Act's provisions, including if 'the likely tenderers are international suppliers',[244] or if 'it is in the public interest'.[245]

As discussed further in Chapter 7, one of the reasons provided for the abandonment of the REFIT in 2011 was that it did not comply with South Africa's 'preferential procurement policy rules'.[246] While there are differing views regarding the legality of this decision, this is taken up further in Chapter 7.

6.6.2 Policy documents

6.6.2.1 The New Growth Path (2010)

The New Growth Path was published by government in 2010. It provides a framework for economic development and job creation in South Africa, and considers the role of 'green growth' in this regard. It envisages the creation of '300 000 additional direct jobs by 2020 to green the economy, with 80 000 in manufacturing and the rest in construction, operations and maintenance of new environmentally friendly infrastructure'.[247] It furthermore notes that the targets for renewable energy set out in the IRP 2010-2030 provide important opportunities in regard to investment and job creation in manufacturing and construction.[248]

6.6.2.2 National Development Plan (2011)

The National Development Plan[249] (NDP), which was prepared by the National Planning Commission, sets out government's vision for South Africa's development

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[244] Ibid, section 3(b).
[245] Ibid, section 3(c).
[246] Department of Trade and Industry *Industrial Policy Action Plan (IPAP) 2012/13 – 2014/15* 2012 available at http://www.info.gov.za/view/DownloadFileAction?id=162797 [accessed 26 February 2013] 67.
[247] *The New Growth Path: The Framework* 2010 available at http://www.info.gov.za/view/DownloadFileAction?id=135748 [accessed 22 February 2011] 12.
[248] Ibid, 12-13.
[249] National Planning Commission *National Development Plan: Vision for 2030* 2011 available at http://www.npconline.co.za/medialib/downloads/home/NPC%20National%20Development%20Plan%20Vision%202030%20-lo-res.pdf [accessed 24 November 2011].

until 2030. It acknowledges the risks posed by climate change[250] and promotes the development of a 'green economy', which is defined as

> 'a system of economic activities related to the production, distribution and consumption of goods and services that result in improved human well-being over the long-term, while not exposing future generations to significant environmental risks and ecological scarcities'.[251]

The NDP specifically considers the energy sector and notes that

> '[u]ltimately, South Africa's electricity plan needs to balance decarbonisation of the power sector and increased use of new and renewable energy technologies (alongside their associated higher investment costs) with established, cheaper energy sources that offer proven security of supply'.[252]

The NDP sets out potential mitigation responses, including an 'expanded renewable energy programme'.[253] Proposed mitigation instruments include the carbon-budget approach (discussed in 6.5.5 above), committing to a 'domestically established mitigation target' – a target that is not conditional, but binding domestically – and carbon pricing.[254] However, no concrete steps are proposed in the NDP.

6.6.2.3 Industrial Policy Action Plan 2

The Industrial Policy Action Plan 2,[255] published by the Department of Trade and Industry, is a '"living document" that outlines a range and combination of industrial policy interventions and instruments to address the critical challenges of our economy'.[256] It is prepared for three years at a time, but is updated annually. The

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[250] Ibid, 68-70.
[251] United Nations Environment Programme *op cit* National Planning Commission *National Development Plan: Vision for 2030*, 128.
[252] NPC *National Development Plan: Vision for 2030* (n249) 144.
[253] Ibid, 180.
[254] Ibid, 188-190.
[255] *2010/11 – 2012/13 Industrial Policy Action Plan: Economic Sectors and Employment Cluster* 2010 available at http://www.aeroafrica-eu.org/download/ipap_2010.pdf [accessed 23 July 2012].
[256] Dr Rob Davies (Minister of Trade and Industry) *National Assembly Statement on Industrial Policy Action Plan (IPAP2)* (18 February 2010) available at http://www.info.gov.za/speeches/2010/10021909551001.htm [accessed 5 March 2013].

Industrial Policy Action Plan 2 (IPAP 2) was last revised in 2013, and it is only the current formulation that is considered here.

The IPAP 2 explicitly acknowledges the threats posed by climate change and the move worldwide to 'going green'.[257] The IPAP 2 sets out measures that have been taken by the South African government to respond to climate change, including the publication of various policy documents. It also highlights the role of renewable energy in the IRP 2010-2030 as well as the roll-out of renewable energy under the REIPPPP. The IPAP 2 identifies a number of Key Action Programmes across various sectors, including the 'adaptation of South Africa's GHG emission commitments'[258] and the revision of the 'minimum local content requirements for the REIPPP and small-scale programmes'.[259]

6.7 Concluding remarks

While a right of access to energy has not been specifically included in the Constitution, the Constitution guarantees the right to a healthy environment and legislation has been enacted to give effect to this right.[260] Even though there is no environmental legislation that is directly applicable to energy generation and the promotion of renewable energy, the national environmental management principles contained in the NEMA must be taken into account with regard to all decisions by relevant authorities that may significantly affect the environment. In particular, the principle of sustainable development is included in the constitutional environmental right and also underpins the NEMA.

It was noted that the Renewable Energy White Paper set (in 2004) the long-term goal of 'the establishment of a sustainable renewable energy industry … that will offer in future years a fully sustainable, non-subsidised alternative to fossil fuel dependence'.[261] While this goal was initially not pursued very forcefully, the

[257] Department of Trade and Industry *Industrial Policy Action Plan (IPAP) 2013/14 – 2015/16* 2013 available at http://www.thedti.gov.za/news2013/ipap_2013-2016.pdf [accessed 3 December 2013] 119.
[258] Ibid, 119-120.
[259] Ibid, 121-122.
[260] Section 24 of the Constitution of the Republic of South Africa (n23).
[261] Renewable Energy White Paper (n1) 20.

discussion of legislation and policy documents in 6.4 to 6.6 above reflects the increasing importance attached to renewable energy by government in more recent years.

While it is arguable that stronger action could be taken to promote renewable energy, renewable energy has nevertheless moved much higher up on the agenda and its various benefits, including reduced greenhouse gas emissions and contributing to sustainability, have been explicitly acknowledged. Renewable energy policy is reflected most clearly in the IRP 2010-2030, which envisages that nine per cent of electricity (i.e. about 41 TWh) will be supplied by renewable energy sources by 2030.

Furthermore, the REIPPPP has been implemented to support the uptake of RES-E. The REIPPPP and other market-based instruments that are relevant to promoting renewable energy in South Africa are considered more fully in Chapter 7.

Chapter 7

South Africa's market-based instruments of relevance to renewable energy

7.1 Introduction

Market-based instruments (MBIs) are playing an increasingly important role in South Africa's environmental regulatory framework as government recognises that MBIs have certain advantages over, and can complement, command-and-control instruments in the environmental context.[1]

This was especially evident in National Treasury's Draft Policy Paper: A Framework for Considering Market-Based Instruments to Support Environmental Fiscal Reform in South Africa (the MBI policy paper), which provided a thorough consideration of the environmentally-related MBIs that had been implemented in South Africa, and discussed options for environmental fiscal reform.[2]

This chapter begins by briefly considering the MBI policy paper (in 7.2). It goes on to consider the renewable energy feed-in tariff programme (REFIT) that was introduced in 2009. Although the REFIT was replaced by a tendering programme in 2011, due to the advantages of feed-in tariffs and the clear success of feed-in tariffs worldwide (as discussed in Chapter 4), it is important to discuss the erstwhile REFIT (in 7.3). As noted in Chapter 4, a key aspect of feed-in tariff programmes is that

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[1] See National Treasury: Tax Policy Chief Directorate *Draft Policy Paper: A Framework for Considering Market-Based Instruments to Support Environmental Fiscal Reform in South Africa* (April 2006) available at http://www.treasury.gov.za/public%20comments/Draft%20Environmental%20Fiscal%20Reform%20Policy%20Paper%206%20April%202006.pdf [accessed 10 May 2009] i and x.

[2] Ibid. Market-based instruments generally, and the rationale for their implementation, have been discussed in Chapter 4.

prices are fixed by government, while under a tendering programme prices are determined through competitive bidding.

The chapter then deals with South Africa's MBIs that are relevant to renewable energy. In general, a distinction is made between instruments that have already been implemented in South Africa (dealt with in 7.4) and those that have been proposed for implementation (dealt with in 7.5).

With regard to those instruments that have already been implemented, a distinction is made between primary instruments for renewable energy promotion, namely the tendering programme (dealt with in 7.4.1); and secondary or accompanying instruments such as subsidies for solar water heaters and subsidies for renewable energy projects (dealt with in 7.4.2). The focus is on the former as these are considered to be more significant in deploying large amounts of renewable energy.

Thereafter, the chapter considers the MBIs that have been proposed for implementation in South Africa (in 7.5) namely a carbon tax, a tradable renewable energy certificate scheme and carbon trading.

While not all the instruments referred to above are directly concerned with promoting renewable energy, as discussed previously it is arguable that an instrument that discourages carbon-intensive energy sources will necessarily encourage a move to lower-carbon energy sources, including renewable energy.

7.2 Draft Policy Paper: A Framework for Considering Market-Based Instruments to Support Environmental Fiscal Reform in South Africa

The MBI policy paper was published in 2006.[3] It defines market-based instruments as 'a group of policy instruments that seek to correct environmentally-related market failures through the price mechanism'.[4]

The object of the MBI policy paper was to

> 'outline the role that market-based instruments, specifically environmentally-related taxes and charges, *could* play in supporting sustainable development in South Africa, and to outline a framework for considering their potential application'.[5]

The MBI policy paper acknowledges the economic rationale for MBIs and the relationship between market failure and the environment, and states that in the case of market failure

> 'there is a strong rationale for some form of government intervention. By intervening and influencing the institutions that determine how markets operate, government can play an important role in encouraging more efficient resource use'.[6]

The MBI policy paper is primarily concerned with environmentally-related taxes and charges, even though they 'are only one group of instruments capable of achieving environmental outcomes'.[7] An environmental tax is described as 'a tax on an environmentally harmful tax base, which includes transport fuels, motor vehicle taxes, emissions taxes, landfill taxes and, more broadly, energy taxes'.[8] The MBI policy paper states that

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[3] Ibid.
[4] It furthermore recognises that 'market-based instruments could be more efficient [than command-and-control instruments] in addressing certain environmental concerns'. Ibid, 2.
[5] Ibid, i.
[6] Ibid, 41.
[7] Ibid.
[8] Ibid, 3.

'[i]n combination with other measures, such as regulation and voluntary approaches [environmentally-related taxes] can play a role in meeting current and future environmental challenges. In addition, environmentally-related taxes could help to improve the efficiency and equity of the tax system'.[9]

The environmentally-related charges and taxes at the time this policy paper was published included taxes on transport fuels, vehicle taxation, product taxes, an electricity levy and various charges in respect of water.[10] Most of these taxes and charges were introduced in order to raise revenue and were not concerned with 'environmental effects'[11] or with influencing people's behaviour.[12]

The MBI policy paper acknowledges the potential of the 'double dividend hypothesis' (discussed in Chapter 4), namely that 'taxing *bads* (such as environmental pollution) and reducing taxes on *goods* (such as labour)', could lead to environmental benefits as well as improvements in economic efficiency and employment.[13]

Since the publication of the MBI policy paper, the South African government has implemented further environmentally-related MBIs, including a tax on the carbon dioxide emissions of new passenger vehicles,[14] levies on the sale of incandescent (non-energy efficient) lightbulbs,[15] rebates for the installation of solar water heaters (discussed in 7.4.2.1),[16] subsidies for renewable energy (discussed in 7.4.2.2), special tax treatment for the sale of certified emission reductions obtained from clean development mechanism (CDM) projects (discussed in 7.4.2.3),[17] a levy on

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[9] Ibid, 56.
[10] Ibid, Table 3 at 34.
[11] Ibid, 39.
[12] An environmentally-related tax will be more likely to influence people's behaviour, the more 'price elastic' the demand for a good or service is. Ibid, 39. This means that changing the price of a good or service will influence the demand for that good or service and thus, that imposing a tax on that (price elastic) good or service will affect demand and the consequent revenue. For example, the imposition of a tax on plastic bags in Ireland led to a 97 per cent reduction in the consumption of plastic bags. Ibid, 59-60.
[13] Ibid, 40.
[14] See GN R770 in *Government Gazette* No. 33514 dated 31 August 2010.
[15] South African Revenue Service *Budget Tax Proposals 2009/10* available at http://www.treasury.gov.za/documents/national%20budget/2009/guides/Budget%20Proposals%202009.pdf [accessed 22 September 2011] 9.
[16] See Eskom 'Solar water heating supplier list' available at http://www.eskomidm.co.za/residential/residential-technologies/solar-water-heating-supplier-list [accessed 4 October 2011].
[17] SARS *Budget Tax Proposals 2009/10* (n15) 10. Section 12K(2) of the Income Tax Act 58 of 1962.

electricity generated from non-renewable sources (discussed in 7.4.2.4),[18] lower fuel levies on biodiesel as compared to petrol and diesel,[19] and the REFIT which was replaced by the Renewable Energy Independent Power Producer Procurement Programme (the REIPPPP) in 2011. The REFIT is discussed first. Thereafter, market-based instruments that are currently in effect in South Africa are considered (in 7.4).

7.3 The Renewable Energy Feed-In Tariff

7.3.1 Overview

The REFIT was introduced through Regulatory Guidelines that were published by the National Energy Regulator of South Africa (the NERSA) in 2009.[20] These regulatory guidelines recognised the importance of renewable energy and its environmental, social and economic benefits.[21] Factors considered in the development of the REFIT included achieving the renewable energy target of 10 000

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[18] See South African Revenue Service *Budget Tax Proposals 2008/2009* available at http://www.treasury.gov.za/documents/national%20budget/2008/guides/Budget%20Proposals%202008.pdf [accessed 28 December 2009] 10 and P Gordhan *Budget Speech 2011* (23 February 2011) available at http://www.info.gov.za/speeches/budget/speech2011.pdf [accessed 24 February 2011] 32.

[19] See further GNR 322 in Government Gazette 32014 of 20 March 2009, which amended Part 5A of Schedule 1 of the Customs and Excise Act 91 of 1964.

[20] National Energy Regulator of South Africa (NERSA) *South Africa Renewable Energy Feed-in Tariff (REFIT): Regulatory Guidelines* in GN 382 of 2009 in *Government Gazette* 32122 dated 17 April 2009. The publication of these Regulatory Guidelines was preceded by a consultation process, which included the publication of a Consultation Paper in 2008. See National Energy Regulator of South Africa *NERSA Consultation Paper: Renewable Energy Feed-In Tariff* 2008 available at http://www.nersa.org.za/Admin/Document/Editor/file/NERSA%20REFIT%20%20consultation%20paper%2002%20Dec%202008.pdf [accessed 23 April 2013]. Furthermore, the following year the NERSA issued rules regarding selection criteria for public comment in terms of Department of Energy *Electricity Regulation Act (4/2006): Electricity Regulations on New Generation Capacity* GNR. 721 in *Government Gazette* No. 32378 dated 5 August 2009 (which were repealed in 2010). See National Energy Regulator of South Africa *Rules on Selection Criteria for Renewable Energy Projects under the REFIT Programme* 2010 available at http://www.nersa.org.za/Admin/Document/Editor/file/Electricity/Legislation/Regulatory%20Rules/RULES%20FOR%20SELECTION%20CRITERIA%2019%20Feb10.pdf [accessed 13 July 2011]. It is not clear if these rules were finalised.

[21] REFIT Regulatory Guidelines (n20) 13.

gigawatt hours (GWh) by 2013,[22] and the inability of current mechanisms to 'achieve the national renewable energy target'.[23]

7.3.2 Purpose and objectives of the REFIT

The purpose of the REFIT Regulatory Guidelines was to 'set out the regulatory framework for initiating tariffs and licensing conditions for a self-sustaining market for grid connected renewables in South Africa'.[24] The REFIT was also intended to support the renewable energy target of 10 000 GWh by 2013.[25]

In order to fulfil this purpose, a number of objectives and key principles were established, including to 'create an enabling environment' for RES-E in South Africa, 'establish a guaranteed price for … [RES-E] for a fixed period of time that provides a stable income stream and an adequate return on investment', provide grid access and a power purchase obligation, and to 'establish an equal playing field with conventional electricity generation'.[26]

7.3.3 Definitions

Renewable energy was defined, as it was in the White Paper on the Renewable Energy Policy of the Republic of South Africa[27] (the REWP), to include 'naturally occurring non-depletable sources of energy, such as solar, wind, biomass, hydro, tidal, wave, ocean current and geothermal'.[28] Separate and detailed definitions were provided for each of the renewable energy sources.

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[22] Ibid, 11.
[23] Ibid, 28.
[24] Ibid, 13.
[25] Ibid.
[26] Ibid, 14.
[27] Department of Minerals and Energy *White Paper on the Renewable Energy Policy of the Republic of South Africa* GN 513 in *Government Gazette* No. 26169 dated 14 May 2004.
[28] REFIT Regulatory Guidelines (n20) 7.

A ‘distributor’ was defined as ‘a legal entity that owns or operates/distributes electricity through a Distribution System. This includes Eskom, municipalities and private distributors’.[29]

A ‘transmitter’ was defined as ‘a legal entity that owns or operates/distributes electricity through a Transmission System. This includes Eskom, municipalities and private transmitters’.[30]

‘Tariff equalisation’ was defined as the ‘process whereby the amount of financial subsidy required for implementation of a feed-in tariff is borne by all Eskom electricity customers through existing “pass-through” arrangements which are currently in place for IPPs’.[31]

A ‘qualifying renewable energy power generator’ was defined as a renewable energy generator who makes ‘new investments in electricity generation’ using the renewable energy technologies (RETs) qualifying for tariffs[32] (discussed in 7.3.6 below). Installations were also eligible to earn FITs if they had been modernised, repowered, or expanded. However, only the extra capacity would qualify to earn a tariff.[33]

7.3.4 Targets

The REFIT did not establish targets for renewable energy or RES-E but, as noted above, was intended to support the 10 000 GWh renewable energy target.

[29] Ibid, 6.
[30] Ibid, 6.
[31] Ibid, 9. While ‘existing “pass through” arrangements’ are not specifically defined in the Regulatory Guidelines, they appear to refer to the arrangements that are currently in place to distribute the costs of electricity generation to all consumers.
[32] Ibid, 15.
[33] Ibid, 16.

7.3.5 Obligations relating to connection and purchase

RES-E generators were ‘guaranteed access to Distribution and Transmission networks’ subject to certain conditions being complied with.[34]

The REFIT established a Renewable Energy Purchasing Agency (REPA), which was obliged to enter into a power purchase agreement (PPA) with renewable energy generators and to buy renewable energy generated ‘subject to the fulfilment of all necessary licence conditions’.[35] Eskom was appointed as the REPA. Prospective renewable energy generators were required to apply to the NERSA in order to qualify as such[36] and also for a generation licence.[37] The NERSA considered that a purchase obligation was required in South Africa due to the lack of ‘a fully fledged market … for the buying and selling of renewable energy’.[38]

The REFIT Regulatory Guidelines took account of the possibility of the generation of RES-E being very high and stated that

> ‘[s]hould take up of the REFIT be exceptionally high, either overall or in a particular technology, the Regulator will be permitted to set a capacity limit on each technology to prevent over subscription and therefore avoiding excessive consumer price increases’.[39]

The costs of connecting to the grid were to be paid by the renewable energy generator.[40]

7.3.6 Tariffs

In 2009 tariffs were approved for wind, small hydro, landfill gas and concentrated solar power (CSP),[41] as reflected in Table 7.1. Thereafter further tariffs were approved for CSP trough without storage, large-scale grid connected photovoltaic

[34] Ibid, 17.
[35] Ibid, 15 and 18.
[36] Ibid, 16.
[37] Ibid, 15.
[38] Ibid, 32.
[39] Ibid, 38-39 and 18.
[40] Ibid, 17-18.
[41] Ibid, 38.

(PV) systems, biomass solid, biogas and CSP tower with six hours of storage per day.[42] These tariffs are also set out in Table 7.1.

Table 7.1 REFIT Tariffs – Phases I and II[43]

Technology	REFIT (/kWh)
Wind	R1.25
Small hydro	R0.94
Landfill gas	R0.90
CSP trough plant (with six hours storage)	R2.10
CSP trough without storage	R3.14
Large-scale grid connected PV systems	R3.94
Biomass solid	R1.18
Biogas	R0.96
CSP tower (with six hours storage)	R2.31

Tariffs were payable for a period of twenty years[44] in respect of RES-E generators connected to the grid. Thus, off-grid power was excluded.[45]

The REFIT did not make any provision for degression. However, it provided for the annual review of tariffs for the first five years of implementation and thereafter every three years.[46] The resulting tariffs would only apply to new projects and not to existing projects, which would be guaranteed the specified tariffs for 20 years.

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[42] National Energy Regulator of South Africa (2 November 2009) *Media Statement: NERSA Decision on Renewable Energy Feed-In Tariffs (REFITs) Phase II* available at http://www.nersa.org.za/UploadedFiles/News/Media%20statement%20NERSA%20Decision%20on%20REFIT%20Phase%202%20-021109.pdf [accessed 28 December 2009].

[43] Data obtained from REFIT Regulatory Guidelines (n20) 38 and NERSA *REFIT Phase II* (n42).

[44] REFIT Regulatory Guidelines (n20) 22. and NERSA 'Review of Renewable Energy Feed-In Tariffs' *NERSA Consultation Paper* (March 2011) available at http://www.nersa.org.za/Admin/Document/Editor/file/Electricity/Consultation/Documents/Review%20of%20Renewable%20Energy%20Feed%20-%20in%20Tariff%20Consultation%20Paper%20%28Please%20note%20that%20table%20no5%20on%20page%2025%20has%20been%20updated%29.pdf [accessed 24 March 2011] 15.

[45] REFIT Regulatory Guidelines (n20) 16.

[46] Ibid, 17.

7.3.7 Direct selling

RES-E generators were permitted to sell electricity directly to consumers ‘wishing to purchase renewable energy outside of the REFIT mechanism, subject to fulfilment of necessary licence conditions’.[47]

7.3.8 Equalisation scheme

The REPA was obliged to record the total cost of renewable energy purchased under the REFIT each year and to calculate the difference between this and the Avoided Cost,[48] ‘and to pass on this cost to consumers using existing “pass through” arrangements’.[49]

7.3.9 Monitoring, reporting and review

The NERSA was made responsible for the ‘overall monitoring and review’ of the REFIT programme.[50] It was also required to publish an annual report regarding *inter alia* progress on the 10 000 GWh renewable energy target as well as future targets for renewable energy,[51] ‘the market introduction of the qualifying technologies’[52] and the ‘[f]inancial impacts of the REFIT including the additional overall cost to electricity consumers and average percentage increase on electricity prices’.[53]

Renewable energy generators were required to submit annual reports regarding *inter alia* the renewable energy supplied.[54]

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[47] Ibid, 15.
[48] ‘Avoided cost’ is defined as ‘the marginal cost for the same amount of energy acquired through another means such as the construction, finance and operation of new efficient generation facility [sic] or purchase from an alternate supplier’. Ibid, 5.
[49] Ibid, 19. As noted above, ‘existing pass through arrangements’ appear to refer to the arrangements that are currently in place to distribute the costs of electricity generation to all consumers.
[50] Ibid, 19.
[51] Ibid, 19.
[52] Ibid.
[53] Ibid.
[54] Ibid, 20.

The REPA (Eskom) was required to monitor and report on electricity generation by RES-E generators,[55] and to report to the NERSA regarding the total cost of RES-E purchased under the REFIT.[56]

7.3.10 A move away from the REFIT

In 2011, before any PPAs had been entered into, the NERSA proposed reductions of between 10 and 42 per cent to the above-mentioned REFIT rates in its Consultation Paper entitled 'Review of Renewable Energy Feed-In Tariffs'.[57] These reductions were heavily contested by prospective independent power producers and created uncertainty.[58] This became irrelevant when a few months later the Department of Energy announced that the fixed price system of the REFIT did not comply with legislation regarding procurement processes, namely the Preferential Procurement Policy Framework Act[59] (the PPPF Act), and that independent power producers (IPPs) would now have to participate in a competitive bidding process[60] (discussed further below). This decision was also contested by prospective IPPs including because they had invested significant time and money on the basis of guaranteed tariffs.[61]

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[55] Ibid.
[56] Ibid.
[57] The Consultation Paper was issued in terms of section 35 of the Electricity Regulation Act 4 of 2006. NERSA 'Review of REFITs' (n44) Table 5, 25. See also T Creamer 'Nersa moves to cut Refit tariffs just as SA promises to boost renewables' (22 March 2011) *Engineering News* available at http://www.engineeringnews.co.za/print-version/nersa-moves-to-cut-refit-tariffs-just-as-sa-promises-to-boost-renewables-2011-03-22 [accessed 22 March 2011].
[58] See for example I Salgado 'Nersa cuts proposed renewable energy tariff' (29 March 2011) *Business Report*, C van der Merwe 'Renewable energy developers say new tariffs could halt investments' *Engineering News* (5 May 2011) available at http://www.engineeringnews.co.za/article/renewable-energy-developers-say-revised-tariffs-could-halt-investments-2011-05-05 [accessed 6 May 2011] and S Njobeni 'Energy firms reject tariff reduction' (6 May 2011) *Business Day* available at http://www.businessday.co.za/articles/content.aspx?id=141900 [accessed 6 May 2011].
[59] Preferential Procurement Policy Framework Act 5 of 2000. This was discussed in 6.6.1.1.
[60] M Gosling 'Government's U-turn on wind energy rates' (20 June 2011) *Cape Times*. It was initially reported that competitive bidding would only apply in respect of the first 1000 megawatts of renewable energy procured and that the REFIT rates will 'act as a "ceiling" beyond which bids would not be considered'. See I Salgado 'Bidding on cards for green energy' (15 June 2011) *IOL* available at http://www.iol.co.za/business/business-news/bidding-on-cards-for-green-energy-1.1084140 [accessed 21 June 2011].
[61] See for example T Creamer 'Govt confirms inclusion of price competition in first renewables round' (4 July 2011) *Engineering News Online* available at http://www.engineeringnews.co.za/article/govt-confirms-inclusion-of-price-competition-in-first-renewables-round-2011-07-04 [accessed 4 July 2011].

As noted in Chapter 6, the PPPF Act provides that a 'preference point system' must be followed[62] and that the highest points must be awarded to the lowest 'acceptable tender'.[63] It was also seen that price is the most important criterion under this system.

In the view of government (the Department of Energy) 'the only possible procurement process option … [was] a competitive bidding process'.[64] However, Wim Trengove SC was reported as stating that the REFIT was not in breach of the PPPF Act and that

> '[t]here does not seem to be any principled distinction between a conventional procurement process which determines the product and invites bidders to compete on price, on the one hand, and the Refit scheme, which determines the price and invites bidders to compete on product, on the other'.[65]

It was also reported that government did in fact acknowledge the possibility of amending the legislation to allow for a fixed tariff.[66]

Furthermore, the PPPF Act empowers the Minister of Finance to exempt organs of state, on request, from the provisions of the PPPF Act in certain circumstances including if 'the likely tenderers are international suppliers'[67] and if 'it is in the public interest'.[68] It is arguable that at least the first ground is applicable in respect of a renewable energy procurement programme. Therefore, there is scope for the Minister of Finance to exempt the Department of Energy from applying this price-based system.

Furthermore, as noted above, the PPPF Act provides for the cost component in tenders to score either 80 or 90 per cent in regard to the total scoring. However, under the REIPPPP price scores only 70 per cent, which represents a departure from the PPPFA. Thus, 'special dispensation [is required] to depart from

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[62] PPPF Act (n59) section 2(1)(a).
[63] Ibid, section 2(1)(b). An 'acceptable tender' is defined as 'any tender which, in all respects, complies with the specifications and conditions of tender as set out in the tender document'. See section 1.
[64] Gosling 'Government's U-turn on wind energy rates' (n60).
[65] D Pressly 'Legal advice puts Refit in doubt' (27 June 2011) *Business Report*.
[66] Gosling 'Government's U-turn on wind energy rates' (n60).
[67] PPPF Act (n59) section 3(b).
[68] Ibid, section 3(c).

government's preferential procurement rules'.[69] It is not clear (from the information available) whether this departure has specifically been authorised.

In its REFIT Regulatory Guidelines the NERSA specifically rejected a competitive bidding or tendering system, stating that tendering systems

> 'tend to favour established businesses and can allow existing companies to keep potential competitors out of the market by bidding low on projects, regardless of whether or not the company has any intention or ability to actually build the renewable energy project'.[70]

In light of this clear rejection of the tendering system by the NERSA, it is unclear why a tendering programme was chosen as the next best option. It is also surprising that the alleged non-compliance of the REFIT with South Africa's procurement laws was only realised a few years after the introduction of the REFIT. Comprehensive reasons have not been made publicly available, nor have guidelines akin to the REFIT Regulatory Guidelines (which were published in the Government Gazette) been published. The approach taken in respect of the REIPPPP has thus not been very transparent.[71] Indeed, access to official documentation can only be obtained following the payment of a non-refundable amount of R15 000.

One possible explanation for the change of direction is that

> 'the policy may have been threatened by its own success. On a technical level, a large number of wind power plants with fluctuating energy production could have posed challenges to grid stability. On an administrative level, the flood of applications may have overwhelmed the understaffed authorities and could have led to even longer delays than currently experienced under the bidding process.

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[69] T Creamer 'SA finally sets renewables bidding process in motion' (31 July 2011) *Engineering News* available at http://www.engineeringnews.co.za/article/sa-finally-sets-renewables-bidding-process-in-motion-2011-07-31 [accessed 4 August 2011].
[70] REFIT Regulatory Guidelines (n20) 27.
[71] Indeed, the process has been described as 'opaque'. See A Pegels 'Pitfalls of Policy Implementation: The case of the South African feed-in tariff' 2011 available at http://die-gdi.academia.edu/AnnaPegels [accessed 24 April 2013] at 5. See also J Nganga, M Wohlert, M Woods, C Becker-Birck, S Jackson and W Rickerson (study for the Heinrich Böll Stiftung and the World Future Council) *Powering Africa through Feed-in Tariffs: Advancing Renewable Energy to Meet the Continent's Electricity Needs* 2013 available at http://www.worldfuturecouncil.org/fileadmin/user_upload/PDF/Feed_in_Tariff/Powering_Africa_through_Feed-in_Tariffs.pdf [accessed 26 March 2013] at 56, who state that the 'REIPPPP process lacks transparency for all but those project developers who are directly involved'.

On a political level, while NERSA may have favoured the REFiT there was less support from Eskom and the Department of Energy. Finally, the REFiT's guarantee to buy all electricity – combined with falling prices for solar PV – seems to have raised fears in the treasury about an unchecked growth of expenses and poor value for money'.[72]

However, it has been argued that a FIT policy can 'function well in both developed and developing countries, provided that proper care is taken in the policy design and accompanying policies'.[73] Specifically, it has been argued that 'feed-in laws have produced the quickest, lowest-cost deployment of renewable energy technologies in countries that have implemented them well'.[74]

After considering other support options for renewable energy the NERSA considered the feed-in tariff to be the best option to increase renewable energy in South Africa, specifically stating that

'[i]n the South African context, with a lack of competitive markets or established renewable industry, the feed-in tariff system is preferred as the most effective means for creating sustainable market conditions for the growth of a renewable energy industry'.[75]

The sudden about-turn of the Department of Energy and the NERSA is therefore questionable, especially in light of the lack of clear and compelling reasons given for the decision. It has also been noted that the 'conflicting positions' of the NERSA, the Department of Energy and 'most notably, the National Treasury … clearly indicate a lack of coordination among the departments and government entities involved'.[76]

Against this background, the instruments that are currently in effect in South Africa will be considered.

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[72] Nganga et al *Powering Africa through Feed-in Tariffs* (n71) 55-56. It has also been noted that the REFIT may only have been feasible with regard to small amounts of renewable energy. See A Pegels 'Renewable Energy in South Africa: Potentials, barriers and options for support' 2010 (38) *Energy Policy* 4945-4954, at 4953.
[73] Nganga et al *Powering Africa through Feed-in Tariffs* (n71) 10. See also TD Couture, K Cory, C Kreycik and E Williams *A Policymaker's Guide to Feed-in Tariff Policy Design* (for the national Renewable Energy Laboratory, US Department of Energy) 2010 available at http://www.nrel.gov/docs/fy10osti/44849.pdf [accessed 24 April 2012] x.
[74] M Mendonça *Feed-In Tariffs: Accelerating the Deployment of Renewable Energy* 2009, 8.
[75] REFIT Regulatory Guidelines (n20) 27.
[76] Pegels 'Pitfalls of Policy Implementation' (n71) 7.

7.4 Instruments that have been implemented in South Africa

7.4.1 Primary instruments

7.4.1.1 Renewable Energy Independent Power Producer Procurement Programme

The decision of the Department of Energy to implement the REIPPP Programme required the concurrence of the NERSA, which was provided in August 2011.[77]

It was initially reported that the REIPPPP would only apply in respect of the first 1000 MW of renewable energy procured.[78] However, the Department of Energy subsequently decided that the REIPPPP would apply in respect of the first 3725 MW of renewable energy procured, which is 'broadly in accordance with the capacity allocated to Renewable Energy generation in IRP 2010-2030'.[79] The generation capacity for each RET has been allocated as indicated in Table 7.2.

Table 7.2 Allocation of generation capacity amongst renewable energy technologies[80]

Technology	Capacity (MW)
Onshore wind	1850
Concentrated solar thermal	200
Solar photovoltaic	1450
Biomass	12.5
Biogas	12.5

[77] L Prinsloo 'Nersa concurs with renewable bidding process' (10 August 2011) *Engineering News* available at http://www.engineeringnews.co.za/article/nersa-concurs-with-renewables-bidding-process-2011-08-10 [accessed 12 August 2011].
[78] Njobeni 'Energy firms reject tariff reduction' (n58).
[79] See Prinsloo 'Nersa concurs with renewable bidding process' (n77), T Creamer 'Glitches and pleasant surprises as renewables tender gets under way' *Engineering News Online* (3 August 2011) available at http://www.engineeringnews.co.za/article/glitches-and-pleasant-surprises-as-renewables-tender-gets-under-way-2011-08-03 [accessed 4 August 2011] and http://www.ipp-renewables.co.za/ [last accessed 2 February 2012].
[80] Data obtained from http://www.ipp-renewables.co.za/ (n79).

Landfill gas	25
Small hydro	75
Small projects	100
Total	**3725**

The tendering process is relatively onerous and involves two stages.

In the first stage, bidders are required to meet 'minimum threshold requirements in six areas', namely environment, land, commercial and legal, economic development, financial and technical.[81] With regard to 'economic development' alone bidders for wind projects are required to meet minimum thresholds with regard to 17 different criteria, including that at least 12 per cent of South Africa-based employees must be citizens from local communities, and that at least 12 per cent of the shares in the project company must be held by black people.[82] It is also required that project developers contribute at least one per cent of project revenue to communities.[83] Bidders must show that they 'have a track-record in raising funds, or sufficient financial means at their own disposal to conduct the proposed project'.[84] Furthermore, the technology that prospective IPPs intend using should have been used at least twice commercially.[85] Bidders are only considered in the second stage if these requirements have been met.

In the second stage, bidders are evaluated on their bid prices and economic development objectives, which include factors such as job creation potential, local content and socioeconomic development.[86] The bid prices and economic

[81] A Eberhard 'Feed-In Tariffs or Auctions?' 2013 *ViewPoint* (Note number 338) available at http://www.worldbank.org/fpd/publicpolicyjournal [accessed 20 August 2013] 2.
[82] Ibid, 2-3. See also L Tait, HL Wlokas and B Garside *Making Communities Count: Maximising local benefit potential in South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP)* (International Institute for Environment and Development) 2013 available at pubs.iied.org/pdfs/16043IIED.pdf [accessed 7 August 2013] Table 1 at 11.
[83] Tait et al *Making Communities Count: Maximising local benefit potential in South Africa's REIPPPP* (n82) 12.
[84] B Becker and D Fischer 'Promoting Renewable Electricity Generation in Emerging Economies' 2013 (56) *Energy Policy* 446-455, 452.
[85] Ibid.
[86] T Creamer 'Renewables project developers pore over tender documents' (4 August 2011) *Engineering News* available at http://www.engineeringnews.co.za/article/renewables-project-developers-pore-over-tender-documents-2011-08-04 [accessed 5 August 2011]. See also Department of Energy *Renewable Energy IPP Procurement Programme: Window two Preferred Bidders' announcement* (21 May 2012) available at www.energy.gov.za [accessed 20 May 2013].

development objectives are weighted 70 per cent and 30 per cent respectively.[87] Government has indicated that the bid price will only be considered if a bidder demonstrates that economic development objectives will be met.[88]

As noted above, bidders are required to pay a non-refundable amount of R15 000 simply to have access to the request for proposal (RFP) documents. Thereafter, bidders must provide a 'bid guarantee' of R100 000 in respect of each megawatt of (proposed) installed capacity.[89]

The bid prices for the first round of bidding were capped.[90] The capped prices were 'not dissimilar to NERSA's 2009 REFITs'.[91]

Five bidding windows were established at the outset: November 2011, March 2012, August 2012, March 2013 and August 2013.[92] However, there have been delays in the procurement programme and all the bidding windows have been pushed back. Thus, the deadline for the third round of bidding occurred in August 2013 instead of in August 2012.

In addition to entering into a PPA with Eskom and an implementation agreement with the Department of Energy, bidders are also required to apply to Eskom to be connected to the grid.[93] Furthermore, a 'government framework support agreement' must be entered into between Eskom and the government.[94]

Capacity has been allocated separately to small projects, as seen in Tables 7.2 and 6.3 above, and a less complex process has been introduced in respect of

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[87] L Steyn 'A renewed focus on green energy' (12 August 2011) *Mail & Guardian Online* available at http://mg.co.za/article/2011-08-12-a-renewed-focus-on-green-energy/ [accessed 16 August 2011]. As noted above, under the PPPF Act, price is weighted at 80 or 90 per cent. See section 2(1)).
[88] T Creamer 'Renewables bidders conference reflects high levels of interest in SA roll-out' (14 September 2011) *Engineering News* available at http://www.engineeringnews.co.za/article/renewables-bidders-conference-reflects-high-levels-of-interest-in-sa-roll-out-2011-09-14 [accessed 21 September 2011].
[89] Creamer 'Renewables project developers pore over tender documents' (n86).
[90] The prices were capped at at R1150/MWh for wind, R2850/MWh for solar PV, R2850/MWh for CSP, R1070/MWh for biomass, R800/MWh for biogas, R600/MWh for landfill gas, and R1030/MWh for small hydro.
[91] Eberhard 'Feed-In Tariffs or Auctions? (n81) 2.
[92] Steyn 'A renewed focus on green energy' (n87).
[93] Creamer 'Renewables bidders conference reflects high levels of interest in SA roll-out' (n88).
[94] Department of Energy *REIPPPP: Window two Preferred Bidders' announcement* (n86).

projects that are less than 5 megawatts.[95] The REIPPPP for small projects is running separately and has commenced recently.[96]

Three rounds of bidding have taken place and capacity has been allocated to preferred bidders in respect of wind energy, small hydro, solar PV, CSP, landfill gas, and biomass projects.[97] The approved projects represent 3916 MW of renewable energy capacity.[98] The REIPPPP has also resulted in price reductions which are reflected in Table 7.3.

Table 7.3 Average bidding prices under Windows 1, 2 and 3 of the REIPPPP[99]

Technology	Price (/kWh)		
	Bidding window 1	**Bidding window 2**	**Bidding window 3**
Solar PV	R2.758	R1.645	R0.881
Wind	R1.143	R0.897	R0.656
Small hydro	n/a	R1.030	n/a
CSP	R2.686	R2.512	R1.460[100]
Landfill gas	n/a	n/a	R0.84
Biomass	n/a	n/a	R1.246

Table 7.3 shows that bidding prices have decreased significantly in respect of solar energy and wind energy.

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[95] See Creamer 'Renewables bidders conference reflects high levels of interest in SA roll-out' (n88) and T Creamer 'SA unveils the names of the first 28 preferred renewables bidders' (7 December 2011) *Engineering News* available at http://www.engineeringnews.co.za/article/sa-unveils-the-names-of-first-28-preferred-renewables-bidders-2011-12-07 [accessed 9 January 2012].

[96] See Department of Energy *Small Projects Renewable Energy Independent Power Producer Procurement Programme* available at http://www.ipp-smallprojects.co.za/ [accessed 11 November 2013].

[97] See Department of Energy (Renewable Energy IPP Procurement Programme) *Bid Window 3: Preferred Bidders' Announcement* 2013 available at http://www.energy.gov.za/IPP/List-of-IPP-Preferred-Bidders-Window-three-04Nov2013.pdf [accessed 5 November 2013].

[98] Ibid.

[99] Data obtained from Department of Energy *REIPPPP: Window two Preferred Bidders' announcement* (n86) and Department of Energy *REIPPPP: Window 3 Preferred Bidders' Announcement* (n97).

[100] It is noted that '[t]his pricing basis is not comparable with Bid Windows 1 and 2'. Department of Energy *REIPPPP: Window 3 Preferred Bidders' Announcement* (n97).

As noted in Chapter 6, in 2012 the Minister of Energy has determined that an additional 3200 MW of renewable energy should be procured,[101] which will also be procured through the REIPPP Programme.[102]

a) Progress made in implementing the REIPPPP thus far

It remains to be seen how successful the REIPPPP will be. Aside from one solar PV project which was very recently connected to the grid,[103] most of the first renewable energy projects under the programme are only due to come into operation during 2014. However, some (tentative) lessons have emerged.

On the one hand, the programme has stimulated significant interest. For instance, bids to the value of 3233 MW were submitted for 1044 MW of renewable energy capacity procured in the second round.[104] It has thus been argued that the REIPPPP 'can be considered a success',[105] which can be attributed to several reasons including that the programme was well designed,[106] high standards were established,[107] thresholds and targets for local content objectives have been strengthened in subsequent bidding rounds, there has been a positive response from the local capital market, and '[p]roject bidders are required to incorporate a tax of 1 percent of project revenues that will go into a government renewable energy fund to support subsequent procurement programmes'.[108] Furthermore, REIPPPP investors

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[101] In order to 'contribute towards energy security and to facilitate [the] achievement of the renewable energy targets of the Republic of South Africa'. See Department of Energy *IPP Procurement Programme 2012: Determination under section 34(1) of the Electricity Regulation Act 4 of 2006* GN 1074 in *Government Gazette* No. 36005 dated 19 December 2012, Part A, Regulation 1.

[102] Ibid, Part A, Regulation 1 and Regulation 3.

[103] The capacity of this project is 75 MW. N Odendaal 'REIPPPP first-window project connected to the grid' *Engineering News Online* (16 September 2013) available at http://www.engineeringnews.co.za/article/reipppp-first-window-ipp-connects-solar-power-to-grid-2013-09-16 [accessed 25 September 2013].

[104] See Department of Energy *Preferred Bidders – Window 2* available at http://www.ipprenewables.co.za/#page/1209 [last accessed 26 March 2013].

[105] Eberhard 'Feed-In Tariffs or Auctions? (n81) 4.

[106] Ibid, 5. See also A Waissbein, Y Glemarec, H Bayraktar and TS Schmidt (for the United Nations Development Programme) *Derisking Renewable Energy Investment: A Framework to Support Policymakers in Selecting Public Instruments to Promote Renewable Energy Investment in Developing Countries* 2013 available at http://www.undp.org/content/dam/undp/library/Environment%20and%20Energy/Climate%20Strategies/UNDP%20Derisking%20Renewable%20Energy%20Investment%20-%20Full%20Report%20%28April%202013%29.pdf [accessed 23 April 2013] Table 6 at 91.

[107] Eberhard 'Feed-In Tariffs or Auctions? (n81).

[108] Ibid, 5-6.

who were interviewed viewed the 'stringent requirements on financing to ensure projects are commissioned' positively.[109]

While transaction costs were initially high, they have decreased in the second round and were expected to decrease even more in further rounds.[110] Furthermore, as noted above, the bidding prices have decreased significantly in a short space of time.

The local content requirements are viewed positively,[111] and the percentage of local content has increased significantly from the first to the third rounds of bidding.[112] It has also been reported that there has been 'progress in the establishment of local manufacturing nodes that produce some of the components for solar and wind farms' in South Africa.[113]

On the other hand, it has been noted that

> 'cumbersome programme administration has led to serious delays exceeding the timelines initially set, forcing investors to extend financial guarantees for the project at additional cost, and thus undermining the economic forecasts on which the bid succeeded'.[114]

It has also been reported that the 'size and complexity of the REIPPP program stretched available legal and financial advisory services to the limit'.[115] Transaction costs under the REIPPPP have been high for government and for bidders.[116] Indeed, prospective IPPs under the REIPPPP are required to put up a significant amount of money before a tender is even awarded.

It has been argued that the onerous requirements of the REIPPPP would tend to favour larger IPPs, which are able to cover the extra costs, rather than smaller, community-run projects.[117] Since most projects are likely to have international

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[109] Waissbein et al *Derisking Renewable Energy Investment* (n106) Table 6 at 91.
[110] Eberhard 'Feed-In Tariffs or Auctions? (n81) 4.
[111] Nganga et al *Powering Africa through Feed-in Tariffs* (n71) 57.
[112] Department of Energy *REIPPPP: Window 3 Preferred Bidders' Announcement* (n97).
[113] D Peters *op cit*. M Gosling 'Go-ahead for 19 new energy projects' (13 May 2013) *Cape Times*.
[114] Nganga et al *Powering Africa through Feed-in Tariffs* (n71) 57.
[115] Eberhard 'Feed-In Tariffs or Auctions? (n81) 6.
[116] Ibid.
[117] Nganga et al *Powering Africa through Feed-in Tariffs* (n71) 57.

support, it has been reported that ‘the “added value” (high-tech materials and skilled labour) is taking place outside of South Africa through international firms’.[118]

REIPPPP investors who were interviewed noted that ‘tender processes can result in aggressive bidding and question[ed] whether current bids are sustainable’.[119] Indeed, even though the object of the REIPPP Programme is to reduce prices, ‘projects must still be bankable’.[120]

With regard to the local content requirements, the definition of a community as being within a 50 kilometer radius has been considered problematic, *inter alia* because beneficiary areas may overlap, leading to benefits being concentrated in small areas, rather than being distributed across the country or where they are most required.[121] It has also been argued that ‘[s]pecifications on what constitutes local content could be improved’.[122] Nevertheless, some REIPPPP investors expected the local content requirements to become restrictive in the future.[123]

With regard to black economic empowerment requirements it has been reported that, due to the lack of qualified firms, ‘some specialised renewable energy BBBEE [broad-based black economic empowerment] companies are being set up by elite South Africans to take advantage of the thresholds and therefore benefit from involvement in a number of projects’.[124]

It has also been argued that, while prices have decreased under the REIPPPP, they are still high compared to in other countries, which could perhaps be due to the local content and economic development thresholds.[125] In this regard it has been argued that a balance should ‘be struck between the promotion of economic development and prices’.[126] Solar energy manufacturers have reportedly called for

[118] Ibid, 58.
[119] Waissbein et al *Derisking Renewable Energy Investment* (n106) Table 6 at 91.
[120] Eberhard ‘Feed-In Tariffs or Auctions? (n81) 6.
[121] Tait et al *Making Communities Count: Maximising local benefit potential in South Africa’s REIPPPP* (n82) 14 and 20.
[122] Eberhard ‘Feed-In Tariffs or Auctions? (n81) 6.
[123] Waissbein et al *Derisking Renewable Energy Investment* (n106) Table 6 at 91.
[124] Nganga et al *Powering Africa through Feed-in Tariffs* (n71) 58.
[125] Eberhard ‘Feed-In Tariffs or Auctions? (n81) 4.
[126] Ibid, 4.

financial incentives including 'tax breaks or subsidies, to offset the cost of local-content requirements'.[127]

Other problems have emerged. There has been insufficient transmission grid capacity in some areas and there have reportedly been complaints regarding the unresponsiveness of Eskom's transmission planners.[128] Lack of transparency remains a concern and it has been argued that the REIPPP Programme 'lacks transparency for all but those project developers who are directly involved'.[129]

b) General comments

While it appears that the South African government was concerned about the potential costs of a FIT programme, which led to the move to the REIPPP Programme, it was seen in Chapter 4 that the FIT has emerged internationally as the instrument that has led to the greatest uptake of renewable energy and at the lowest cost.

While the bidding prices for some of the RETs under the REIPPPP have decreased quite significantly, it was pointed out above that this has raised concerns regarding the sustainability of bids. It was also seen in the international context (discussed in Chapter 4) that under tendering programmes, bidders often bid too low on projects in order to win bids, which has resulted in unviable projects. This was also the experience in China (discussed in Chapter 5). Since it is still relatively early in the REIPPP Programme, it remains to be seen whether all of the selected projects will be commissioned. The only project that has been commissioned thus far is a project that was selected in the first round of the REIPPPP, in which the bid prices were on par with the REFIT rates.

While costs are an important consideration, a key object identified in the Renewable Energy White Paper was the establishment of a sustainable renewable

[127] K Cloete 'Solar Industry Calls for Incentives to Offset Local-Content Costs' *Engineering News Online* (4 September 2013) available at http://www.engineeringnews.co.za/article/solar-industry-calls-for-incentives-to-offset-local-content-costs-2013-09-04/rep_id:3182 [accessed 18 September 2013].
[128] Ibid.
[129] Nganga et al *Powering Africa through Feed-in Tariffs* (n71) 56.

energy industry in South Africa.[130] As discussed in Chapter 4, sustainable markets for renewable energy are essential to reduce the costs of renewable energy.[131]

On the other hand, the REIPPP Programme has only been implemented in respect of a set amount of capacity, i.e. 3725 MW, and thereafter an additional 3200 MW. This does not indicate a long-term commitment. It only provides an incentive to bid to supply RES-E capacity in respect of these relatively minor amounts, and only during the established bidding periods (windows). There is no obligation on the grid operator (Eskom) to purchase RES-E outside of this. Once the required capacity has been taken up, there would be no incentive for RES-E generators to generate more RES-E in the absence of preferential tariffs. It is thus arguable that the REIPPPP is not supportive of a sustainable renewable energy industry in South Africa.

Secondary instruments to promote renewable energy are now considered.

7.4.2 Secondary instruments

7.4.2.1 Rebates for the installation of solar water heaters

The Eskom Solar Water Heating Programme was launched in 2008 and was intended to contribute to achieving government's renewable energy target of 10 000 GWh by 2013.[132] The Department of Energy launched a mass roll-out of this programme in 2010, *inter alia* to contribute to achieving its target of installing at least one million solar water heaters (SWHs) by 2014.[133]

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[130] Department of Minerals and Energy *White Paper on the Renewable Energy Policy of the Republic of South Africa* GN 513 in *Government Gazette* No. 26169 dated 14 May 2004, 20.
[131] JL Sawin *National Policy Instruments: Policy Lessons for the Advancement & Diffusion of Renewable Energy Technologies Around the World* (Thematic Background Paper) 2004 available at http://siteresources.worldbank.org/EXTRENENERGYTK/Resources/5138246-1237906527727/59507051239290499336/National0Polic1ies0around0the0World.pdf [accessed 26 April 2013] 9.
[132] Eskom *Integrated Demand Management: Solar water heating* available at http://www.eskomidm.co.za/residential/residential-technologies/solar-water-heating-supplier-list [accessed 6 October 2011].
[133] Department of Energy *Media Statement: Department of Energy offers 200 000 subsidies for Solar Water Heating Programme* (29 July 2010) available at http://www.energy.gov.za/files/media/pr/20100729Media_Statement_DoE_Standard_Offer.pdf [accessed 12 October 2010].

Under this programme, consumers may claim a rebate for the installation of a SWH provided that the SWH system and the installer are registered with Eskom.[134] This instrument is aimed at consumers who can afford the cost of installing a SWH and is distinct from the programme for the installation of SWHs in low-cost housing under the Reconstruction and Development Programme, in terms of which SWHs are generally installed free of charge.[135]

From April 2010 until the end of December 2010, 26 768 SWHs were installed as part of the rebate programme.[136] It is not clear how many SWHs have been installed as part of the rebate programme to date. However, over 350 000 SWHs had been installed under the overarching Solar Water Heating Programme by the first half of 2013.[137]

The National Building Regulations and Building Standards Act[138] has also been amended and provides that

> '[a]t least 50% (volume fraction) of the annual average hot water heating requirement [of certain buildings] shall be provided by means other than electrical resistance heating including but not limited to solar heating, heat pumps, heat recovery from other systems or processes and renewable combustible fuel'.[139]

7.4.2.2 Subsidies for renewable energy

The Renewable Energy Finance and Subsidy Office (REFSO), located within the Department of Energy, was established in 2005 to manage renewable energy subsidies and to advise 'developers and other stakeholders on renewable energy

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[134] Eskom *Integrated Demand Management* (n132).
[135] HL Wlokas and C Ellis 'Local Employment through the Low-Pressure Solar Water Heater Roll-Out in South Africa' (2013) (Energy Research Centre, University of Cape Town: Research Report Series) available at http://www.erc.uct.ac.za/Research/publications/13-Wlokas-Ellis_Employment_through_SWH_rollout.pdf [accessed 29 November 2013] 2.
[136] Department of Energy *Solar Water Heating* available at http://www.energy.gov.za/files/swh_frame.html [accessed 1 September 2011]
[137] D Peters (Minister of Energy) *Budget Vote Speech* 2013 available at www.pmg.org.za [accessed 14 May 2013].
[138] Act 103 of 1977.
[139] Regulation XA2 in GNR 711 in *Government Gazette* 34586 dated 9 September 2011.

finance and subsidies'.[140] The subsidies may not exceed 20 per cent of the capital cost of the relevant project[141] and subsidies are only provided for projects that cost less than R100 million.[142]

Six projects with a total capacity of 23.9 MW have been implemented since this office was established. These projects relate to small-scale hydro, biogas to electricity, wind energy and landfill gas to electricity.[143] Considering that South Africa currently has about 40 gigawatts (GW) of installed capacity, the contribution of 23.9 MW under the renewable energy subsidy is arguably not very significant. Indeed, one of the reasons that it was considered desirable to implement the REFIT was because it was questionable 'whether the current mechanisms [including the renewable energy subsidy] are sufficient to achieve the national renewable energy target'.[144]

Spending on this scheme decreased by half from 2008/2009 to 2009/2010. No renewable energy projects were subsidised from April to September 2011, despite a target of subsidising three projects for 2011/2012.[145] According to the National Treasury, the REFSO subsidies and the (former) REFIT could not 'operate concurrently because project developers can be over incentivised, leading to excessive profits at the expense of consumers and taxpayers'.[146] It is assumed that this argument applies equally in respect of the REIPPP Programme. Treasury has therefore proposed that the subsidy scheme be changed so that it no longer provides 'capital subsidies for the construction of renewable energy generation plants'.[147]

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[140] Department of Energy *Renewable Energy Finance and Subsidy Office* available at http://www.energy.gov.za/files/esources/renewables/r_refso.html [accessed 13 March 2013].
[141] H Winkler *Cleaner Energy Cooler Climate: Developing Sustainable Energy Solutions for South Africa* 2009 HSRC Press, 134.
[142] REFIT Regulatory Guidelines (n20) 25-26.
[143] Department of Energy *REFSO* (n140).
[144] REFIT Regulatory Guidelines (n20) 28.
[145] National Treasury 'Vote 29 - Energy' *Medium Term Budget Policy Statements* available at http://www.treasury.gov.za/documents/mtbps/2011/ [accessed 24 January 2012] 255-256.
[146] Ibid, 256.
[147] Ibid.

7.4.2.3 Tax treatment of certified emission reductions

As discussed in Chapter 2, under the Kyoto Protocol to the United Nations Framework Convention on Climate Change, developed country parties may implement project activities in developing country parties, which result in greenhouse gas (GHG) emission reductions, and earn (tradable) certified emission reductions (CERs).

In South Africa, the income generated from the sale of CERs earned from clean development mechanism (CDM) projects is exempt from normal tax.[148] There has been a very low uptake of the CDM in South Africa for a number of reasons.[149] Although there is a lot of potential for the CDM, it has been argued that in light of all of the barriers facing the CDM, 'tax exemption is unlikely to be the solution'.[150]

7.4.2.4 Levy on electricity generated from non-renewable sources

A levy of 2 cents per kilowatt hour was imposed on electricity generated from non-renewable sources in July 2009 in light of the electricity shortages that were being experienced at the time and in recognition of the contribution of coal-generated electricity to climate change.[151] It was anticipated that this levy would raise R4 billion in revenue per year.[152]

This levy was increased to 2.5 cents per kilowatt hour with effect from April 2011[153] and was subsequently increased to 3.5c/kWh with effect from 1 July 2012. It is intended that the levy will replace the current mechanism for funding energy efficiency projects such as the solar water heater programme.[154]

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[148] Income Tax Act (n17) section 12K(2). It should be noted that the CDM project must have been registered before the end of December, 2012. See the definition of 'qualifying CDM project' in section 12K(1).
[149] The CDM was outlined in 2.2.3.2. For more information on the barriers to CDM implementation see the sources cited in n79 in Chapter 2.
[150] Pegels 'Renewable Energy in South Africa' (n72) 4951.
[151] SARS *Budget Tax Proposals 2008/2009* (n18) 10.
[152] Ibid.
[153] Gordhan *Budget Speech 2011* (n18) 32.
[154] P Gordhan *2012 Budget Speech* (22 February 2012) available at http://www.gov.za/speeches/view.php?sid=25270 [accessed 24 February 2012].

While this could be considered a carbon tax of sorts, it is not a real carbon tax as the amount of the levy bears no relation to the carbon emitted.[155] Indeed, it applies to all electricity equally, whether generated from coal, nuclear or gas.

7.5 Instruments that have been proposed for implementation in South Africa

7.5.1 Carbon tax

In 2007 the Scenario Building Team, established by Cabinet, proposed that a carbon tax be implemented in South Africa as one measure to reduce South Africa's GHG emissions. In 2010 National Treasury published the Carbon Tax Discussion Paper, which thoroughly considers the implementation of a carbon tax in South Africa.[156] Further details on the proposed carbon tax were provided in the Budget Tax Proposals of 2012. The process culminated in the publication of the Carbon Tax Policy Paper in May 2013, in terms of which a carbon tax will be implemented in 2015. These policy documents are discussed briefly in 7.5.1.1 to 7.5.1.5 below in order to illustrate the development of government policy on carbon taxation.

No developing country has broad-based carbon pricing in place yet and thus there is no (developing country) model to 'inform the design of a South African carbon pricing regime'.[157]

[155] See for example M Jefferson 'Energy Policies for Sustainable Development' in United Nations Development Programme, United Nations Department of Economic and Social Affairs and World Energy Council *World Energy Assessment: Energy and the Challenge of Sustainability* 2000, Box 12.3 at 424.
[156] It should be noted that a carbon tax already applies in respect of motor vehicles. A tax of R75 per gram per kilometre ('g/km') of carbon dioxide applies to new passenger cars for each g/km exceeding 120 g/km, with effect from 1 September 2010. See GN R770 in *Government Gazette* No. 33514 dated 31 August 2010. However, since the concern here is with electricity, this carbon tax is not considered further.
[157] See B Cloete and E Tyler *Carbon Tax Design Options – A Discussion Document* 2012 (WWF South Africa) available at http://awsassets.wwf.org.za/downloads/carbon_tax_design_options_a_discussion_document_final_launch_product_1.pdf [accessed 2 April 2012] 7.

7.5.1.1 Long Term Mitigation Scenarios: Strategic Options for South Africa

As noted in Chapter 6, the Long Term Mitigation Scenarios: Strategic Options for South Africa (LTMS)[158] recommended that a carbon tax be implemented[159] and that it increase from about R100/tCO_2e in 2008 to about R750/tCO_2e between 2040 and 2050.[160] The LTMS also noted that '[t]axes generate revenues … [which] can be used to provide incentives';[161] and recommended that in addition to an escalating carbon tax, incentives be provided for renewable energy, biofuels and SWHs. The importance of revenue recycling (discussed in Chapter 4) was also noted.[162]

7.5.1.2 Reducing Greenhouse Gas Emissions: The Carbon Tax Option

The implementation of a carbon tax was seriously considered by National Treasury in its discussion paper entitled 'Reducing Greenhouse Gas Emissions: The Carbon Tax Option'[163] (the Carbon Tax Discussion Paper), which was intended to develop the work contained in the MBI policy paper.[164]

The Carbon Tax Discussion Paper, having identified carbon taxation and carbon trading as two of the main policy instruments for carbon pricing, considers a carbon tax to be preferable to emissions trading for various reasons, including the lower costs and administration involved in a carbon tax system.[165] Determining an appropriate price for carbon (the tax level), however, is not a simple matter and carbon price estimates in different studies vary substantially.[166]

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[158] Scenario Building Team *Long Term Mitigation Scenarios: Strategic Options for South Africa* (Technical Summary, Department of Environmental Affairs and Tourism) 2007.
[159] Ibid, 18.
[160] Ibid.
[161] Ibid.
[162] Ibid.
[163] National Treasury 'Reducing Greenhouse Gas Emissions: The Carbon Tax Option' *Discussion Paper for Public Comment* (December 2010) available at http://www.treasury.gov.za/public%20comments/Discussion%20Paper%20Carbon%20Taxes%2081210.pdf [accessed 15 December 2010].
[164] Ibid, 4.
[165] Ibid, 6 and 28-29.
[166] See Carbon Tax Discussion Paper (n163) Table 4, 23.

The Carbon Tax Discussion Paper states that (in South Africa) the object is partial rather than full internalisation of externalities.[167] It also notes that

> 'a carbon tax set at an appropriate level and phased in over time would provide a strong price signal and certainty to both producers and consumers, acting as an incentive for more environmentally friendly behaviour over the long term'.[168]

There are further issues that must be considered in designing a carbon tax (particularly in South Africa), including the tax base and administration,[169] the distributional effects (impacts on society),[170] impacts on competitiveness[171] and how the tax revenue will be used.[172] The Carbon Tax Discussion Paper discusses these elements in detail and addresses concerns such as how to reduce the impacts of a carbon tax on poor households and on carbon-intensive industries. These are taken up further in the Carbon Tax Policy Paper, which represents government's current position on a carbon tax and is discussed in 7.5.1.5 below.

7.5.1.3 National Climate Change Response White Paper 2011

The National Climate Change Response White Paper[173] reiterates the call for the implementation of a carbon tax. It deals briefly with the rationale for introducing carbon taxes and sets out a number of considerations that must be addressed in designing a carbon tax, including the tax rate, technical and administrative feasibility, distributional impacts, competitiveness and relief measures.[174] As this White Paper has been overtaken by more recent developments (discussed immediately below), it is not considered further.

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[167] Ibid, 59.
[168] Ibid, 9.
[169] Ibid, 30.
[170] Ibid, 37-39.
[171] Ibid, 39-40.
[172] Ibid, 50-51.
[173] Department of Environmental Affairs *National Climate Change Response White Paper* GN 757 in *Government Gazette* No. 34695 dated 19 October 2011.
[174] Ibid, 40.

7.5.1.4 Budget Tax Proposals 2012

In his 2012 Budget Speech, Finance Minister Gordhan announced that a revised policy paper on a carbon tax would be published for further public comment and consultation.[175] The Budget Tax Proposals for 2012 stated that '[f]ollowing public consultation, government has revised its concept design for a carbon tax'.[176] The proposals included percentage-based thresholds for all sectors, below which the carbon tax would not be applicable. The carbon tax would only apply above the thresholds at a rate of R120/tCO_2e from 2013/2014. The Budget Tax Proposals provided for additional allowances in respect of trade-exposed sectors.[177] These elements were considered further in the Carbon Tax Policy Paper (discussed below).

7.5.1.5 Carbon Tax Policy Paper: Reducing greenhouse gas emissions and facilitating the transition to a green economy

The 'Carbon Tax Policy Paper: Reducing greenhouse gas emissions and facilitating the transition to a green economy'[178] (the Carbon Tax Policy Paper) was published in 2013. It sets out various background issues, including the policy steps prior to the preparation of the present document,[179] the economics of and rationale for carbon pricing,[180] carbon taxation versus carbon trading,[181] international experiences with regard to carbon pricing,[182] as well as the economic impacts of a carbon tax.[183] In contrast to previous policy documents, the Carbon Tax Policy Paper provides more specificity regarding the design elements of the proposed carbon tax, which are discussed below.

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[175] Gordhan *2012 Budget Speech* (n154) 16.
[176] South African Revenue Service *Tax Proposals Budget* 2012 available at http://www.treasury.gov.za/documents/national%20budget/2012/sars/SARS%20Tax%20Proposals%20at%20a%20glance.pdf [accessed 27 February 2012] 8.
[177] Ibid, 8-9.
[178] National Treasury *Carbon Tax Policy Paper: Reducing greenhouse gas emissions and facilitating the transition to a green economy* 2013 available at http://www.info.gov.za/view/DownloadFileAction?id=189311 [accessed 2 May 2013].
[179] Ibid, 21-27.
[180] Ibid, 28-29.
[181] Ibid, 34.
[182] Ibid, 36-39.
[183] Ibid, 40-45.

a) Tax base

The carbon tax will apply to Scope 1 emissions, which are emissions that 'result directly from fuel combustion and gasification, as well as from non-energy industrial processes',[184] including processes such as electricity generation, coal and gas to liquid, crude oil refining, mining, cement, transport and waste.[185] The carbon tax will apply to carbon dioxide, methane, nitrous oxide, perfluorocarbons, hydrofluorocarbons and sulphur hexafluoride.[186]

While it is preferable to impose the tax on the actual emissions, this can be 'administratively complex',[187] and the tax will therefore be imposed indirectly on the fuel input, namely the coal, crude oil or natural gas. The taxes for the relevant fuel inputs will be determined through the use of 'emissions factors', which will be prescribed or approved by the Department of Environmental Affairs.[188] The Carbon Tax Policy Paper notes that 'emission factors and/or procedures are available to quantify CO_2-eq emissions with a relatively high level of accuracy for different processes and sectors'.[189]

b) Tax level

In principle the carbon tax should be 'applied at a rate equivalent to the marginal social damage costs'.[190] However, due to the fact that there is no international agreement on global pricing of carbon emissions, and in order to reduce negative impacts on the competitiveness of local firms and on households, the tax will be introduced at a modest rate of R120/tCO_2e from 1 January 2015 and will increase by 10 per cent each year until 2019 'in order to provide a clear long-term price signal'.[191]

Tax-free thresholds will also be established, below which the tax will not apply during the first phase, i.e. from 2015-2019. These tax-free thresholds are reflected in Table 7.4.

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[184] Ibid, 47.
[185] Ibid, Table 6 at 48-49.
[186] Ibid, 47.
[187] Ibid, 12.
[188] Ibid, 47.
[189] Ibid, 12.
[190] Ibid, 15.
[191] Ibid, 15 and 58.

Table 7.4 Tax-free emission thresholds by sector[192]

Sector	Basic tax-free threshold*	Maximum additional allowance for trade exposure	Additional allowance for process emissions	Total	Maximum offset
Electricity	60	–	–	60	10
Petroleum (coal/gas to liquid)	60	10	–	70	10
Petroleum – oil refinery	60	10	–	70	10
Iron and steel	60	10	10	80	5
Cement	60	10	10	80	5
Glass and ceramics	60	10	10	80	5
Chemicals	60	10	10	80	5
Pulp and paper	60	10	–	70	10
Sugar	60	10	–	70	10
Agriculture, forestry, land use	60	–	40	100	0
Waste	60	–	40	100	0
Fugitive emissions – coal mining	60	10	10	80	5
Other	60	10	–	70	10

It can be seen that all sectors enjoy a basic tax-free threshold of 60 per cent during the first phase. Therefore, 60 per cent of the emissions of all firms in the listed sectors will be entirely exempt from the carbon tax. Furthermore, sectors that are vulnerable to trade exposure, enjoy a further 10 per cent allowance. A further 10 per cent allowance is provided for sectors that have limited potential to reduce emissions, including iron and steel, glass and ceramics and cement. In addition, all sectors are provided with an additional allowance of either 5 or 10 per cent, in the form of the use of offsets, i.e. carbon credits.

Thus, the 60 per cent tax-free threshold may be extended up to 90 per cent during the first phase and the effective tax level will range from only R12 to R48/tCO_2e between 2015 and 2019. The waste and forestry, agriculture and land use sectors will be exempt from paying the carbon tax at all during the first phase, primarily due to difficulties with measuring emissions in these sectors.[193]

[192] Table 7.4 obtained from Carbon Tax Policy Paper (n178) Table 8 at 53.
[193] Ibid.

After the first phase, the tax-free thresholds may either be reduced or replaced by absolute emissions thresholds.[194] The tax-free thresholds should be aligned with the carbon budgets that were mooted in the Climate Change Response White Paper.[195] In addition, there will be an incentive to reduce the carbon intensity of products and the basic tax-free threshold may be adjusted with reference to a firm's carbon intensity in comparison to a benchmark.[196] The basic tax-free threshold may be adjusted up or down by 5 per cent. Firms that are above the benchmark will be penalised while those that fall below the benchmark will be rewarded.[197]

It is acknowledged that the introduction of a carbon tax even at these modest levels would most likely have impacts on households that 'filter through to higher energy prices and electricity, fuel and transport costs'.[198]

c) Who is subject to the tax

In principle, 'an environmentally effective and efficient carbon tax should aim for broad coverage' with as few exemptions and exclusions as possible.[199] As noted above, the tax will apply to a number of sectors including electricity, coal and gas to liquid, iron and steel, cement, chemicals and paper and pulp.[200] However, they will enjoy a reduced tax rate in the first phase, and the waste and forestry, agriculture and land use sectors will be entirely exempt in the first phase.

d) Use of the revenue

To reduce the negative impacts of a carbon tax it is possible to introduce revenue recycling (which was discussed in detail in Chapter 4). The Carbon Tax Policy Paper

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[194] Ibid, 14.
[195] Ibid, 54. Discussed in 6.5.5 above.
[196] Ibid, 14.
[197] Ibid. The calculation of the adjustment is explained in Box 2 at 54-55.
[198] Ibid, 15.
[199] Ibid.
[200] Ibid, 48-49.

notes that shifting taxes from ‘goods’, such as income, to ‘bads’, such as pollution and GHG emissions, could result in environmental and employment benefits.[201]

Specific options mooted are tax shifting and rebates for carbon capture and storage (CCS). It also appears that it is intended to provide support to various flagship programmes that were identified in the Climate Change Response White Paper, including the Climate Change Response Public Works Flagship Programme, the Renewable Energy Flagship Programme and the Energy Efficiency and Energy Demand Management Flagship Programme.[202] Other support measures include the strengthening of the free basic electricity policy, an energy efficiency savings tax incentive, and support for the REIPPP Programme primarily in the form of concessional loans for small-scale renewable energy projects (of 1-5 MW installed capacity). Such measures should be temporary.[203]

It has been reported that government expects to raise carbon tax revenue of about R15 billion per year.[204]

e) Other considerations

The impacts of the carbon tax on local firms could lead to carbon leakage, which occurs when firms move their businesses to countries that do not have carbon pricing in place, in order to reduce their costs.[205] This could be addressed through the imposition of border tax adjustments (BTAs), which are taxes that are imposed by a country that has carbon pricing in place (country A) on carbon-intensive goods imported into that country from another country (country B) that does not have carbon pricing in place.[206] This would serve to prevent the ‘leakage’ of carbon emissions to country B. It would also serve to protect the competitiveness of local firms (in country A) as they would not have to compete against products that are not subject to carbon taxation.

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[201] Ibid, 10.
[202] Ibid, 65-66. Discussed in 6.5.5 above.
[203] Ibid, 46.
[204] Bloomberg ‘Treasury mulls lower electricity levies to counter carbon tax’ *Business Report* (3 May 2013).
[205] Carbon Tax Policy Paper (n178) 16.
[206] Ibid.

However, there are 'significant practical and administrative challenges with this approach'.[207] In any event, BTAs will not be imposed at the outset but a 10 per cent tax-free threshold (as noted in Table 7.4) will be provided to energy- and trade-intensive sectors.[208] The National Treasury considers that these thresholds will assist in addressing concerns regarding competitiveness and carbon leakage.[209]

The Carbon Tax Policy Paper also discusses the possibility of gradually phasing out the levy imposed on electricity generated from non-renewable sources as the carbon tax is increased over time in order to avoid the possibility of double taxation.[210] However, '[s]uch restructuring should ensure that all large energy intensive users improve their energy efficiency and reduce their emissions, and do not escape the impact and intent of an energy and carbon tax through long-term pricing agreements'.[211]

A carbon tax, if implemented, should comply with the principles of taxation, in particular, neutrality, equity and certainty, simplicity and minimising costs.[212] Furthermore, various criteria, such as environmental effectiveness, tax revenue, support for the tax, legislative aspects, technical and administrative viability, competitiveness effects, distributional impacts and adjoining policy areas,[213] must be taken into account when considering an environmentally-related tax. While these have not been specifically discussed, some of these principles and criteria have been touched on in 4.5.1.2 above including neutrality, certainty, simplicity and distributional impacts.

7.5.1.6 Viability of a carbon tax in South Africa

A number of studies have considered the impacts of a carbon tax in South Africa as well as the design of the various elements.[214] While a carbon tax in the South African

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[207] Ibid, 59.
[208] Ibid, 60.
[209] Ibid, 58.
[210] Ibid, 18 and 70.
[211] Ibid, 70.
[212] MBI Policy Paper (n1) 56-57.
[213] Ibid, 59-64.
[214] See S Devarajan, DS Go, S Robinson and K Thierfelder 'Tax Policy to Reduce Carbon Emissions in a Distorted Economy: Illustrations from a South African CGE model' 2011 (11) *The Berkeley Electronic Journal of Economic Analysis & Policy* (article 13); H Winkler and A Marquard 'Analysis of

context raises a number of issues, various studies consider that it would be possible to address these concerns; and it has been argued that '[w]ith appropriate design, a carbon tax can be a powerful instrument of mitigation in South Africa, and at the same time contribute to socio-economic objectives'.[215] Importantly, a carbon tax is only one option to reduce emissions and it 'should be considered as part of a broader suite of options including regulatory and economic instruments'.[216] Significantly, as noted in Chapter 4, one study found that when various environmental taxes – including a direct tax on carbon emissions – were applied in conjunction with reduced food prices (a form of revenue recycling), a 'triple dividend' was yielded.[217]

7.5.2 Renewable energy certificate trading

A voluntary tradable renewable energy certificate (TREC) market has been introduced in South Africa and the Tradable Renewable Energy Certificate South Africa body (TRECSA) was established in 2005.[218] As noted in 4.4.1.2, in Europe and the USA renewable energy certificate trading is often combined with the renewable obligation. Even though the TREC system is technically a current instrument, it has not been very successful and government has been considering how a more effective system should be developed. It is for this reason included here under 'proposed instruments'.

In 2007 the (former) Department of Minerals and Energy published the Tradable Renewable Energy Certificate report (the TREC report), which considered the

the Economic Implications of a Carbon Tax' 2011 (22) *Journal of Energy in Southern Africa* 55-68; J van Heerden, R Gerlagh, J Blignaut, M Horridge, S Hess, R Mabugu and M Mabugu 'Searching for Triple Dividends in South Africa: Fighting CO_2 pollution and poverty while promoting growth' 2006 (27) *The Energy Journal* 113-141; and Cloete and Tyler *Carbon Tax Design Options* (n157).

[215] Winkler and Marquard 'Analysis of the Economic Implications of a Carbon Tax' (n214) 66.

[216] Ibid, 65.

[217] As discussed in 4.5.1.2, a 'triple dividend' – reduced GHG emissions, increased gross domestic product and reduced poverty – was yielded if various environmental taxes were 'recycled' by being combined with reduced food prices. See Van Heerden et al 'Searching for Triple Dividends in South Africa' (n214).

[218] Department of Minerals and Energy 'Tradable Renewable Energy Certificates: System Feasibility Study' *New and Renewable Energy* (Final Report) May 2007 (Report number: DME/CE/001/260307) available at http://www.nano.co.za/TRECSystemFeasibilityFinalReport7May07.pdf [accessed 9 July 2011] 30.

establishment of a voluntary TREC system in South Africa. Only the most pertinent aspects are highlighted here.

The TREC report refers to TRECs as 'electronic records that verify the origin of energy from registered renewable energy facilities'.[219] Under the TREC system there are three different income streams: selling the (renewable) electricity to the grid at current electricity prices in terms of a power purchase agreement, generating certified emission reductions (CERs) under the Kyoto Protocol and issuing TRECs.[220]

The TREC report recommends that the European Renewable Energy Certification System (RECS) be implemented in South Africa and considers that the TREC system should be voluntary.[221] It goes on to consider more technical aspects of the system, including the adoption of the principles and rules of operation, the establishment of the Issuing Body (to issue TRECs) and the issue, transfer and redemption of the actual RECS certificates.[222]

Since the publication of the TREC report, the (former) Department of Minerals and Energy has established the 'South African National Tradable Renewable Energy Certificate Team' (SANTREC), which has been charged with coordinating the TREC system.[223] The TRECSA industry participant body has been established as the interim Issuing Body (IB),[224] charged with the issuing of TRECs. The TREC system is administered by zaRECS.[225]

By 2010, 121 445 MWh (representing the same number of renewable energy certificates) had been issued and 42 349 MWh had been redeemed.[226] In the first half of 2011/12 no new renewable energy certificates were issued because it was decided 'to put the programme of formalising trading of green certificates on hold'

[219] Ibid, 8.
[220] Ibid,11.
[221] Ibid, 81.
[222] See for example Appendix C: TREC system requirements, motivation and recommendation including legal and regulatory requirements in DME 'Tradable Renewable Energy Certificates System Feasibility Study' (n218) 68-91.
[223] South African Wind Energy Programme *Domain Protocol for the South African Voluntary Tradable Renewable Energy Certificates Market (final report)* (Report No. 2/2010) 2010 available at www.energy.gov.za/files/SAWEP/DomainProtocol/FInalReport.pdf [accessed 24 January 2012] 6.
[224] Ibid, 3.
[225] See *zaRECs* available at http://www.zarecs.co.za/ [last accessed 30 November 2013].
[226] Ibid.

due to the low levels of renewable energy in South Africa at the time. However, this decision was to be reviewed when renewable energy levels had increased.[227]

The TREC system has not been very successful. It has been argued that due to a lack of government involvement the TREC system is unsustainable,[228] and that 'further regulatory certainty and the establishment of a suitable TREC system' are required.[229] It has also been argued that as voluntary TREC markets do not create sufficient demand, mandatory TREC markets are required to promote renewable energy.[230]

At a local level the City of Cape Town has started to buy 'green electricity' from the Darling Wind Farm, which it thereafter sells to willing purchasers (mainly companies) in the form of 'green electricity certificates' (GECs). The 'green electricity' is not separate from regular coal-generated electricity as it is simply fed into the grid. Thus, customers would pay their normal electricity bills and then pay an additional amount for the green electricity (beforehand), which in 2012/2013, was priced at 25c/kWh (excluding VAT).[231]

7.5.3 Carbon trading

As noted above, the South African government considers carbon taxation to be preferable to carbon trading and identifies a number of advantages of a carbon tax over an emissions trading scheme, including that a carbon tax is easier to administer, it could 'piggyback' on the current tax administrative system and it provides greater price certainty.[232]

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[227] National Treasury 'Vote 29 - Energy' (n145) 255-256. See also L Steyn 'Department misses green targets' (28 October 2011) *Mail & Guardian Online* available at http://mg.co.za/article/2011-10-28-department-misses-green-targets [accessed 28 October 2011].
[228] DME 'Tradable Renewable Energy Certificates: System Feasibility Study' (n218) 13.
[229] Ibid, 10.
[230] S Fakir and D Nicol *Investigation: Obstacles and Barriers to Renewable Energy in South Africa* 2008 (a study prepared for the National Environmental Advisory Forum, Department of Environmental Affairs and Tourism) available at http://www.environment.gov.za/Branches/COO/neaf_2005/Documents/Obstacles%20&%20barriers%20to%20renewable%20energy%20in%20SA.pdf [accessed 12 May 2011] 27.
[231] See City of Cape Town *Electricity: How to buy Green Electricity Certificates (GECs)* available at http://www.capetown.gov.za/en/electricity/GreenElectricity/Pages/Howtopurchasegreenelectricitycertificates.aspx [last accessed 20 November 2012].
[232] Carbon Tax Discussion Paper (n163) 28.

Nevertheless, government is considering the implementation of a carbon trading system in South Africa (in addition to the carbon tax) and has briefly considered the necessary features of a tradable permit system, including open trade, permits that are well defined and that are capable of being banked, and a penalty for violations that is far greater than the price of a permit (or certificate).[233] However, government notes that ensuring open trade

> 'will be difficult in South Africa because many industries are still largely oligopolistic and dominated by a small number of large firms … which is likely to limit the level of trading, which, in turn will undermine the effectiveness of these kind of systems'.[234]

On the other hand, the National Climate Change Response White Paper identifies a possible role for emission trading schemes in respect of sectors or companies that are subject to a carbon budget in terms of the White Paper[235] (as discussed in Chapter 6). The Carbon Tax Policy Paper states that government will investigate the feasibility of introducing an emissions trading scheme to complement the carbon tax from around 2025.[236]

7.6 Concluding remarks

This chapter has highlighted the increased role that is being played by market-based instruments in South Africa and described the MBIs that are currently in place to promote renewable energy, including the REIPPP Programme, subsidies for solar water heaters and the levy on electricity generated from non-renewable sources. Although the REFIT has been replaced by the REIPPPP, due to the advantages of the feed-in tariff and its clear success internationally, the REFIT that was introduced in 2009 was also outlined. It was noted that the REIPPPP is in place only in respect of specific amounts of capacity and, therefore, it is not sufficient to create a sustainable renewable energy industry. This also means that the REIPPPP is not in place indefinitely and that the REIPPP programme is thus not 'the last word'.

[233] MBI Policy Paper (n1) 51.
[234] Ibid, 51-52.
[235] National Climate Change Response White Paper (n173) 28.
[236] Carbon Tax Policy Paper (n178) 34.

This chapter has also briefly discussed the MBIs that have been considered for implementation in South Africa, namely the carbon tax, carbon trading and renewable energy certificate trading.

Renewable energy cannot be promoted in a vacuum, with no attempt to transform the carbon-intensive nature of the energy sector. Introducing a carbon tax would serve to ‘put a price on carbon’, thereby internalising external environmental and social costs, and would arguably discourage the continued reliance on carbon-intensive energy sources, thus making renewable energy sources more viable. Furthermore, a carbon tax would provide a source of revenue that could be used at least in part to fund the costs of a feed-in tariff programme.

Chapter 8 will now consider the implementation of a feed-in tariff framework in South Africa.

Chapter 8

Implementing a feed-in tariff in South Africa

8.1 Introduction

In promoting renewable energy, the aim should not be

> 'simply to install capacity, but to provide the conditions for [the] creation of a sustained and profitable industry, which, in turn, will result in increased renewable energy capacity and generation, and will drive down costs. To achieve this end, a viable, clear and long-term government commitment is critical. Also essential are policies that create markets, and ensure a fair rate of return for investors'.[1]

It has emerged from international experience and from the literature that a crucial aspect in promoting renewable energy is to create security for prospective renewable energy investors, central to which is a stable policy environment. Indeed, it has been noted that

> '[c]onsistency is critical for ensuring continuous growth and stability in the [renewable energy] market, enabling the development of a domestic manufacturing industry, reducing the risk of investing in a technology, and making it easier to obtain financing. It is also cheaper… With stop-and-go policies, each time around the funds must be appropriated, a new program must be administered, information must be distributed to stakeholders, and so on. As

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[1] JL Sawin *National Policy Instruments: Policy Lessons for the Advancement & Diffusion of Renewable Energy Technologies Around the World* (Thematic Background Paper) 2004 available at http://siteresources.worldbank.org/EXTRENENERGYTK/Resources/5138246-1237906527727/59507051239290499336/National0Polic1ies0around0the0World.pdf [accessed 26 April 2013] (executive summary).

a result, costs of administering the program could approach those of the incentives themselves'.[2]

In this research the feed-in tariff (FIT) has emerged as an instrument that has achieved wide success in promoting electricity generated from renewable energy sources (RES-E), *inter alia* due to the 'overall **stability and continuity**' provided by this policy framework.[3] By early 2013 some form of FIT policy had been implemented in 71 countries, including several developing countries such as China, India and Kenya.[4] However, FIT policies have been implemented in developing countries more recently than in developed countries, and it is thus not yet possible to fully gauge their success in these developing countries.

This chapter considers the elements and potential design of a FIT policy in South Africa with reference to the principles and country examples that were discussed in Chapters 4 and 5 respectively.

8.2 Feed-in tariff

8.2.1 Overview

As developed countries generally provide 'best practice' examples, account must be taken of South Africa's developing country status in considering the appropriate design of a FIT policy here. Even so, it has been argued that although

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[2] Ibid, 26-27. See also M Ragwitz, A Held, G Resch, T Faber, R Haas, C Huber, PE Morthorst, SG Jensen, R Coenraads, M Voogt, G Reece, I Konstantinaviciute and B Heyder *OPTRES: Assessment and Optimisation of Renewable Energy Support Schemes in the European Electricity Market* (Final Report) 2007 available at http://www.optres.fhg.de/OPTRES_FINAL_REPORT.pdf [accessed 11 July 2011] 18.

[3] TD Couture, K Cory, C Kreycik and E Williams *A Policymaker's Guide to Feed-in Tariff Policy Design* (for the national Renewable Energy Laboratory, US Department of Energy) 2010 available at http://www.nrel.gov/docs/fy10osti/44849.pdf [accessed 24 April 2012] 11. See also J Nganga, M Wohlert, M Woods, C Becker-Birck, S Jackson and W Rickerson (study for the Heinrich Böll Stiftung and the World Future Council) *Powering Africa through Feed-in Tariffs: Advancing Renewable Energy to Meet the Continent's Electricity Needs* 2013 available at http://www.worldfuturecouncil.org/fileadmin/user_upload/PDF/Feed_in_Tariff/Powering_Africa_through_Feed-in_Tariffs.pdf [accessed 26 March 2013] 10.

[4] See Renewable Energy Policy Network for the 21st Century (REN21) *Renewables 2013: Global Status Report* available at http://www.ren21.net/Portals/0/documents/Resources/GSR/2013/GSR2013_lowres.pdf [accessed 14 June 2013] 72.

> 'Africa faces other social, political and economic challenges than Europe … many of the REFiT design principles … remain the same and can be adjusted to take account of specific country needs'.[5]

Careful consideration of the policy design can help to ensure that RES-E develops at the desired scale while avoiding 'unintended consequences such as runaway program cost'.[6] It would be particularly important in South Africa that government balances the need for low energy prices against the need to offer tariff rates that are sufficiently high to attract private investment.[7]

In this chapter, relevant institutions are first outlined (in 8.2.2). The specific elements of a FIT policy are then considered (in 8.2.3), with a view to considering the appropriate design of these elements in the South African context. The design elements discussed below are not absolutely clear-cut and may overlap to some extent.

8.2.2 Institutions

The National Energy Regulator of South Africa (the NERSA) undertook responsibility for the implementation of the REFIT, while responsibility for the Renewable Energy Independent Power Producer Procurement Programme (the REIPPPP) is undertaken by the Department of Energy. As the FIT would be a large-scale programme (unless limits were placed on its growth), it is submitted that it would be appropriate for the Department of Energy to be responsible for its introduction and administration.

However, it would still be necessary for RES-E generators to obtain licences from the NERSA, and the NERSA would remain responsible for the regulation of tariffs (as discussed in Chapter 6). In addition, it would be appropriate (at least for the present) for RES-E generators to enter into power purchase agreements (PPAs) with Eskom. While concerns might be raised regarding bias on the part of Eskom, it is submitted that such concerns should be allayed if an obligation were placed on

[5] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 2.
[6] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) x.
[7] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 2.

Eskom to connect RES-E generators to the grid and to purchase their electricity as a priority (as discussed in 8.2.3.5 and 8.2.3.6 below). Once the Independent System and Market Operator (the ISMO, which was discussed in 6.2) is established, it would be more appropriate for RES-E generators to enter into PPAs with the ISMO.

In addition, the Department of Environmental Affairs would necessarily be involved with regard to the consideration of applications for environmental authorisations.

8.2.3 Necessary elements of a feed-in tariff policy in South Africa

8.2.3.1 Overview

As seen in Chapter 5, the implementation of FIT policies can differ from country to country.[8] This is due to the varying policy objectives of different governments,[9] which will impact on the design of the various elements such as eligibility criteria and whether tariffs are differentiated in respect of different renewable energy technologies (RETs).[10]

The elements that should be included in a FIT policy, which emerged in Chapters 4 and 5 above, include a binding renewable energy target, obligations relating to connecting to and upgrading of the grid, an obligation relating to the purchase of electricity generated from renewable energy sources (RES-E), appropriate tariffs, as well as provision for transparency and access to information.[11]

At the outset, it is emphasised that, when the feed-in tariff was initially introduced in Germany, the relevant legislation was fairly basic. As the feed-in tariff developed,

[8] See for example P del Río 'The Dynamic Efficiency of Feed-in Tariffs: The impact of different design elements' 2012 (41) *Energy Policy* 139-151, Table 2, who sets out the differences in the design elements of the FIT policies of EU and non-EU countries.
[9] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) x.
[10] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 3 and 14. See further Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 2-4.
[11] It should be noted that the design elements discussed here are in line with those considered to be the most important in Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 14; as well as with the policy design elements considered in Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 2-4.

the legislation became more nuanced. It has been recommended that '[i]n countries with a relatively short history of renewable energy development and those establishing a REFiT scheme for the very first time … the support mechanism [should be kept] simple at the start'.[12] Accordingly, an initial recommendation is that any FIT policy in South Africa be relatively simple at the outset and that it be developed over time to ensure the continued effectiveness of the policy.

It is especially important that the FIT policy is designed so as to create long-term stability. In particular, '[r]apid or unexpected changes in payment levels or policy structure can damage investor confidence and significantly impede the pace of renewable energy growth'.[13]

8.2.3.2 A binding renewable energy target

Targets are important *inter alia* because they signal 'long-term commitment to investors … [and] indicate that support mechanisms will be in place for a certain period of time and they increase the likelihood of tariffs being sufficiently high'.[14] It is submitted that renewable energy targets should be informed to a large extent by a country's renewable energy potential. For instance, the establishment of ambitious RES-E targets in a country that lacks significant renewable energy resources would make achieving the target challenging as well as costly. However, South Africa has significant renewable energy resources, which means that it would actually be cheaper to promote renewable energy in South Africa than in a country like Germany.[15]

As noted in Chapter 6, the White Paper on the Renewable Energy Policy of the Republic of South Africa (the REWP) established a target of 10 000 gigawatt hours (GWh) of renewable energy generation by 2013. The Integrated Resource Plan 2010-2030 (IRP 2010-2030) effectively serves to bolster this target and envisages

[12] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 14.
[13] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 99. See also Ragwitz et al *OPTRES Report* (n2) 21-22.
[14] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 24. See also Ragwitz et al *OPTRES Report* (n2) 23.
[15] This was discussed in the presentation of M Fischedick at 'Strategic Energy Policy Developments in Germany and South Africa' *German South African Lecture Series: 'Energy Sciences'* (12 March 2013) (STIAS, Mostertsdrift, Stellenbosch).

that renewable energy capacity will amount to 21 per cent of total electricity capacity (18.8 GW excluding hydro) by 2030, or 9 per cent (approximately 41 tera watt hours) of total electricity supply, by 2030. However, there is no incentive to go beyond 9 per cent of RES-E supply by 2030. It is also unlikely that any consequences would attach to non-compliance with this 'target'.

It was seen in Chapter 3 that targets considered viable (in South Africa) in the literature range from 13 per cent of RES-E by 2020,[16] to at least 27 per cent RES-E by 2030.[17] This is significantly more than the target provided for in the IRP 2010-2030. In light of all of this, an argument could be made for establishing a more ambitious target for RES-E. It is arguable that the German approach of using the words 'at least' to precede the RES-E targets, ensures that the target does not act as a cap on the uptake of renewable energy but rather serves as a lower level of ambition, which could allow for the uptake of more RES-E.

Although a binding RES-E target does not necessarily need to be included in the feed-in tariff policy, it is important that the FIT policy is linked to existing targets,[18] which can increase investor confidence.[19] While it has been argued that linking the FIT to renewable energy targets can create more administrative complexity as progress in meeting the target has to be monitored,[20] it is submitted that this is not a disadvantage, especially in light of the poor performance with regard to achieving the (unambitious) 2013 renewable energy target.

In Germany, targets were established for renewable energy and RES-E under the Renewable Energy Sources Act (the EEG). The overall renewable energy target reflects Germany's target under the European Union Directive regarding the use of

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[16] D Banks and J Schäffler *The Potential Contribution of Renewable Energy in South Africa* 2006 (draft update report) (prepared for Sustainable Energy & Climate Change Project and Earthlife Africa) available at http://www.nano.co.za/PotentialContributionOfRenewableEnergyInSAFeb06.pdf [accessed 18 January 2012] 53.

[17] M Edkins, A Marquard and H Winkler 'South Africa's Renewable Energy Policy Roadmaps' 2010 (Final Report for the United Nations Environment Programme Research Programme: *Enhancing information for renewable energy technology deployment in Brazil, China and South Africa*) available at http://www.erc.uct.ac.za/Research/publications/10Edkinesetal-Renewables_roadmaps.pdf [accessed 27 March 2011].

[18] W Rickerson, C Laurent, D Jacobs, C Dietrich and C Hanley *Feed-in Tariffs as a Policy Instrument for Promoting Renewable Energies and Green Economies in Developing Countries* 2012 (United Nations Environment Programme) available at www.unep.org/pdf/UNEP_FIT_Report_2012F.pdf [accessed 28 March 2013] 22.

[19] Ibid, 23-24.

[20] Ibid, 24.

energy from renewable sources.[21] Spain's FIT policy did not incorporate targets but was intended to contribute to achieving Spain's renewable energy and RES-E targets. In both India and China targets for renewable energy are in place, but the FIT policies in these countries do not appear to be linked to these targets. South Africa's Renewable Energy Feed-in Tariff (REFIT) was specifically intended to support the 10 000 GWh renewable energy target (which is now outdated).

Thus, if the RES-E target is not specifically included in the FIT policy, the FIT policy should at least be linked to the RES-E target; i.e., it should be stated that the FIT is intended to contribute to achieving the RES-E target. The target could also be established in terms of the National Energy Act,[22] which empowers the Minister of Energy to make regulations regarding *inter alia* 'minimum contributions to national energy supply from renewable energy sources'.[23]

It has also been recommended that short-, medium- and long-term targets be established in order to establish 'a pathway of how renewables can increasingly substitute fossil and nuclear power generation sources'.[24] In Germany, the EEG establishes RES-E targets for 2020, 2030, 2040 and 2050.

8.2.3.3 Definitions

Renewable energy has been defined in various South African policy documents including the REWP and the National Energy Act (discussed in Chapter 3 above). The latter defines renewable energy as 'energy generated from natural non-depleting resources including solar energy, wind energy, biomass energy, biological waste energy, hydro energy, geothermal energy and ocean and tidal energy'.[25] This definition is appropriate and if not incorporated directly into the FIT policy, it could be stated in the FIT policy that renewable energy has the meaning assigned to it in the National Energy Act. RES-E could be defined simply as 'electricity generated from renewable energy sources'.

[21] In terms of European Union 'Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC'.
[22] Act 34 of 2008.
[23] National Energy Act 34 of 2008, section 19(1)(d).
[24] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 24.
[25] National Energy Act (n23) section 1.

With regard to the purchasing entity, Eskom currently owns most of the distribution and transmission infrastructure in South Africa and it would thus be practical to specify that Eskom be the purchaser of RES-E. This was indeed the case under the REFIT of 2009. However, an independent body – the Independent System and Market Operator (ISMO) – will soon be established in terms of the imminent Independent System and Market Operator Act to be the buyer and seller of electricity in the future.[26] Once the ISMO has been established, it would be practical to specify the ISMO as the purchasing entity.

Further technical terms should be defined, including ‘generator’, ‘transmitter’, ‘distributor’ and ‘customer’. It could be specified that these have the meaning assigned to them in the Electricity Regulation Act.[27]

8.2.3.4 Eligibility criteria

a) Eligible technologies

It is important that the FIT policy should support a number of RETs for various reasons. Including a range of RETs ensures that less mature RETs can be promoted, thereby assisting them to become more mature. While including less mature technologies could result in higher electricity costs for consumers in the short term, it can assist in lowering costs in the long term,[28] and in achieving the ambitious deployment of RES-E.[29]

Selecting a range RETs also ensures that intermittent and non-intermittent RETs will be included, which is important.[30] For example, there would be extremely negative consequences if government were to rely only on wind energy, which is an intermittent energy source. If wind energy capacity were developed on a large-scale and replaced (baseload) coal energy, this could lead to an unstable electricity supply

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[26] Department of Energy *Independent System and Market Operator Establishment Bill* in GN 290 in *Government Gazette* No. 34289 dated 13 May 2011.
[27] Act 4 of 2006.
[28] Couture et al *A Policymaker’s Guide to Feed-in Tariff Policy Design* (n3) 69, Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 15 and Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 26-27.
[29] Ragwitz et al *OPTRES Report* (n2) 52.
[30] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 15.

during times of peak electricity demand.[31] On the other hand, it has been noted that 'a diverse portfolio of renewable energy generators can allow different technologies to balance one another',[32] thus leading to a more resilient electricity supply.[33] Therefore, wind energy and solar photovoltaic (PV) (without storage), which are intermittent sources, should be balanced with more stable sources such as biomass, concentrated solar power (CSP) (with storage) and hydropower[34] that can provide power on demand. This could assist in 'lay[ing] the foundation for a 100% renewables-based electricity system at an early stage'.[35]

The decision regarding eligible technologies would necessarily be informed by the availability of the various renewable energy resources, and could be established *inter alia* with reference to tools like wind and solar maps.[36] For instance, CSP is not included under Germany's FIT due to the fact that there is not much potential for CSP in Germany.[37] As seen in Chapter 5, a relatively wide range of RETs is included in the FIT policies of Germany and Spain. The RETs that are eligible for tariffs in India and China are more limited.

In South Africa the potential capacity of various RETs has been considered in various studies and by government. Furthermore, suitable RETs were identified in the REFIT that was introduced in 2009, namely onshore wind energy, solar PV, CSP (with and without storage), solid biomass, biogas, landfill gas and small hydro. These have remained the same under the REIPPPP, except that there is no differentiation between the different types of CSP (i.e. with and without storage). It is submitted that a distinction between CSP with and without storage is important, especially in light of the fact that a commonly-cited disadvantage of renewable energy is that it is an intermittent source. Encouraging CSP with storage would be advantageous as this would overcome the problem of intermittency.

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[31] See for example Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 55-56, who argue that this was one of the concerns of the South African government with regard to the REFIT.
[32] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 8.
[33] Ibid.
[34] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 15. See also Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 68.
[35] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 15.
[36] Ibid, 14.
[37] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 67-68.

There is no reason to diverge from the REFIT in this regard. It is thus submitted that the following should be defined as eligible technologies: onshore wind energy, solar PV,[38] CSP (with and without storage), solid biomass,[39] biogas, landfill gas and small hydro. With regard to biomass and biogas, it is submitted that the FIT policy should specify that these must be produced sustainably, i.e. that the biomass product from which energy is generated must be re-grown.

b) Project age

Beyond defining the RETs that are eligible, it is also possible to specify the age of renewable energy installations that will be included under the FIT.[40] The practice is for only new plants (and not existing plants) or plants that have been upgraded to be eligible. The REFIT also provided that only new investments qualified for tariffs. The rationale is that the development of new renewable energy capacity could be impeded if existing (RES-E) generators were able to qualify 'without requiring them to repower or modernize'.[41] This means that only the latest (and most efficient) technologies would qualify. This is unlikely to be problematic in South Africa since there are very few RES-E plants currently. However, a project such as the Darling Wind Farm would not be eligible, unless the FIT policy provided for upgraded RES-E plants to also qualify for tariffs.

c) Project size

It should also be decided whether the projects that are eligible to participate in the FIT should be restricted on the basis of size.[42] In this regard, it is cheaper to produce RES-E from larger installations. For instance, large-scale hydro is 'already slightly

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[38] In some advanced FIT systems, a distinction is made between ground-mounted and building-integrated solar PV. See Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 15. This is indeed the approach under Germany's EEG.
[39] It is important that biomass is precisely defined. For example, it has been noted that biomass potentially incorporates a significant range of resources including forestry products, energy crops and municipal waste. Usually, with regard to waste, the part that is non-biodegradable would not be eligible under the FIT. See Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 15.
[40] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 27.
[41] Ibid, 28.
[42] Ibid, 30.

more competitive with conventional energy sources even without any financial support in areas with large resources'.[43] The FIT policy may therefore limit the size of projects that are eligible to participate as it is more likely that larger installations would not need the financial assistance.

A disadvantage of restricting the eligibility of RETs by excluding larger installations is that this could hamper progress in deploying significant amounts of renewable energy. In addition, independent power producers (IPPs) may opt to break a larger installation into several smaller installations in order to comply with the capacity limit, which would lead to decreasing the 'cost efficiency' that is harnessed in the case of larger projects.[44] Since smaller installations are generally more expensive than larger installations, the inclusion of smaller installations would increase the costs of the FIT programme. It has been suggested that policymakers do not include capacity limits for any RETs except for large-scale hydro.[45] It was seen with regard to Germany and Spain that project size was limited in respect of only a few RETs.[46] Under the REFIT, limits were only placed on small hydro power plants and large-scale solar PV.

This decision will depend greatly on the relevant government's policy goals.[47] While larger projects are more likely to be cost-effective (i.e. a lower cost per kilowatt hour (kWh)) they 'are less likely to be domestically owned and financed'.[48] On the other hand, while 'smaller projects tend to be more expensive … [they] are more likely to be domestically owned and financed'.[49] Encouraging the latter could be important in promoting the participation of communities and could contribute to the achievement of socio-economic goals. Experience in some developing countries has also shown that

> 'some grids cannot support large amounts of renewable energy development either because of their size or their relative instability. By restricting project sizes,

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[43] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 15.
[44] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 69.
[45] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 16. However, there is limited potential for large-scale hydro in South Africa, so such an exclusion would not be necessary.
[46] This can be seen in Tables 5.2 and 5.4 in Chapter 5.
[47] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 70.
[48] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 32.
[49] Ibid.

policy makers can encourage more "manageable" development – particularly when program caps that reflect grid limitations are also introduced'.[50]

It would be important to establish the amount of RES-E that the South African grid could support, and it is relevant that the grid is already in the process of being expanded from the 2010 capacity level of approximately 44.5 GW to approximately 89.5 GW in 2030 (in terms of the IRP 2010-2030). As noted above, it would be possible to combine different types of RETs so that some stable RETs operate alongside intermittent RETs and contribute to grid stability.

In light of the disadvantages of placing capacity limits on eligible technologies, it is submitted that policymakers should be hesitant to do so, at least at the outset of the FIT programme. However, it would be possible to differentiate tariffs according to the size of the installation (discussed further in 8.2.3.7), which would involve decreasing tariffs within a technology band as the size of an installation increases, which is the approach followed in Germany and Spain. This would arguably go some way towards ameliorating concerns regarding the costs of the programme.

d) Ownership

It should also be determined who is eligible to develop RES-E installations and qualify for tariffs under the FIT programme.[51] It has been argued that no plants should be excluded based on their ownership,[52] as having fewer limitations on participation can lead to greater penetration of renewable energy as well as broader support.[53] Furthermore, including utilities could 'reduce institutional opposition and help jurisdictions capture a greater share of domestically available RE potential'.[54] On the other hand, it has been suggested that allowing utilities to participate could serve to 'extend their monopoly status.'[55] Another possible drawback is that they may be able to limit the access of other players.[56]

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[50] Ibid, 31.
[51] Ibid, 29.
[52] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 16.
[53] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 68.
[54] Ibid.
[55] Ibid, 69.
[56] Ibid.

In Germany it was previously the position that state-owned installations could not participate in the FIT.[57] However, this exclusion is not present in the current version of the EEG.

In the South African context, the point of departure is that non-state actors should not be prevented in any way from participating in a FIT programme. However, the inclusion of state-owned entities such as Eskom, would need to be carefully considered. As noted in Chapter 3, Eskom holds a monopoly with regard to electricity generation, transmission and distribution, and it is arguable that it would be preferable to exclude Eskom in order to allow IPPs to enter the market. On the other hand, it would arguably be beneficial if there was an incentive for Eskom to invest in renewable energy rather than being excluded from the FIT programme and continuing its investment in coal-generated electricity.

On balance it is submitted that, at least at the outset, the priority should be to increase the number of IPPs. Although the benefits of allowing utilities to participate should not be ignored, it would be preferable to reassess the inclusion of state-owned entities at a later stage.[58]

8.2.3.5 Obligations relating to connecting to, and upgrading of, the grid

a) Overview

It has been noted that '[u]nfair grid access rules are often a barrier in power markets where the grid operator itself is engaged in power production'.[59] An obligation to connect IPPs to the grid is thus important in South Africa in light of Eskom's

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[57] See for example Gesetz fur den Vorrang Erneuerbarer Energien (Erneuerbare-Energien-Gesetz, BGBI. I S. 2074) (Renewable Energy Sources Act) (EEG of 2009) Section 66(3).

[58] It should be noted that the FIT would be a public-private partnership. See C Benjamin 'Mzansi turns over a renewable leaf' *Mail & Guardian Online* (25 October 2013) available at http://mg.co.za/article/2013-10-25-00-mzansi-turns-over-a-renewable-leaf [accessed 31 October 2013], who notes that the current REIPPP Programme is a public-private partnership in terms of which 'government agrees to buy the power and the private sector carries the risk should the project not come in on time'.

[59] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 21. See also Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 52.

monopoly.[60] While the REFIT guaranteed renewable energy generators access to the grid, an obligation connection was not explicitly included. Thus, including a provision in the FIT policy stating that 'eligible plants must be connected to the grid'[61] would be preferable.

It has been recommended that, as in Germany, it be specified that RES-E plants must be 'immediately' connected to the grid in order to prevent delay on the part of the grid operator (i.e. Eskom), and that a priority connection must also be specified to ensure that RES-E plants are connected to the grid ahead of conventional power plants.[62]

The relevant FIT policy must also deal with the situation where the grid needs to be upgraded in order to be able to take up the additional capacity.[63] In Germany and China grid operators are required to connect renewable energy generators to the grid and to upgrade the grid if required.[64] No such obligation was included under the REFIT. It is submitted that a FIT policy in South Africa should include an obligation (on the grid operator, Eskom) to upgrade the grid.

While concerns could be raised regarding the 'the ability of the grid to absorb new generation and/or the technical feasibility (or necessity) of extending the grid to accommodate all available renewable resource',[65] it has been noted that government plans to double South Africa's electricity capacity by 2030. Thus, upgrading of the grid is in any event required and the implementation of the FIT would complement the current (urgent) need for additional electricity capacity.

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[60] See for example H Winkler 'Renewable Energy Policy in South Africa: Policy options for renewable electricity' 2005 (33) *Energy Policy* 27-38, 35.
[61] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 21.
[62] Ibid.
[63] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 52-53.
[64] However, it was noted in Chapter 5 that in the Chinese context, despite this obligation to upgrade, there have been problems with regard to congestion and grid integration, which have led to consequent efficiency losses. See Y Song and N Berrah *China: East or West Wind: Getting the Incentives Right* (Policy Research Working paper 6486) (The World Bank) available at http://elibrary.worldbank.org/doi/pdf/10.1596/1813-9450-6486 [accessed 19 September 2013] 7.
[65] Ibid, 55.

b) Costs of connecting to, and upgrading of, the grid

It is important to determine who will bear the costs of connecting to and upgrading the grid.[66] There are three primary options. Firstly, the IPP may be held responsible for the costs of connecting the installation to the closest grid connection point, while the grid operator is held responsible for any costs incurred in upgrading the grid (shallow connection charging). Secondly, the IPP may be held responsible for all of these costs (deep connection charging). Thirdly, a mixed approach could be adopted in terms of which the IPP is responsible for the costs of connection while the IPP and grid operator share the costs of upgrading the grid.[67]

Each approach has its relative advantages and disadvantages. For instance, an advantage of the shallow approach is that it provides for greater transparency regarding the relevant costs, which reduces risk. On the other hand, if IPPs are not responsible for the costs of upgrading, they would not 'necessarily consider how to site projects in a way that would optimize the use of the existing grid'.[68] With regard to the deep approach, while renewable energy generators would not have to pay use charges (to the grid operator), they are likely to incur much higher costs than under the shallow approach.[69]

In Germany the costs of connecting to and upgrading the grid are borne by the grid operator and independent power producers respectively (the shallow approach). In China the Renewable Energy Law specifies that expenses incurred in connecting to the grid and 'other reasonable expenses' be paid for by grid operators, but 'retrieved from the selling price'.[70] It is not clear if 'other reasonable expenses' would include the costs of upgrading the grid.

In the African context, it has been recommended that either the shallow connection charging approach be adopted or that all of these costs are borne by the grid operator.[71] It is submitted that, as in Germany, the shallow connection charging

[66] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 22.
[67] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 87.
[68] Ibid.
[69] Ibid, 87-88.
[70] Renewable Energy Law of the People's Republic of China, Article 21.
[71] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 23. See also A Klein, E Merkel, B Pfluger, A Held, M Ragwitz, G Resch and S Busch (Fraunhofer ISI and Energy Economics Group) *Evaluation of Different Feed-in Tariff Design Options – Best practice paper for the International Feed-*

approach is preferable and that the costs of connection and upgrading should be shared by grid operators and RES-E generators. It is most likely however, that the additional costs of grid connection and upgrading would form ‘part of the tariff calculation methodology’.[72] This provides more security to prospective RES-E generators,[73] as it ensures that their costs will be covered.

8.2.3.6 Obligation relating to the purchase of RES-E

a) Overview

In addition to the obligation placed on the grid operator (Eskom) to connect IPPs to the grid, it is crucial that the grid operator is also obliged to purchase electricity from RES-E generators and to distribute it. This would ensure that security is provided to RES-E developers that their electricity will be bought.[74] Indeed, it has been observed that

> ‘[t]he purchase obligation protects renewable electricity producers in monopolistic or oligopolistic markets where the grid operator might also dispatch power generation capacity. When decisions are made about which power generation sources to use to meet electricity demand, such grid operators might be biased and dispatch power from power plants such as their own plants first’.[75]

The purchase obligation is also important with regard to intermittent RETs ‘such as wind and solar PV, as the producer cannot control when the electricity will be generated’.[76] As noted in Chapter 7, a purchase obligation was included under the REFIT.

Obliging the grid operator to purchase and dispatch RES-E as a priority, and ahead of conventional (coal-generated) electricity, would result in the displacement

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In Cooperation 2010 available at http://www.feed-in-cooperation.org/wDefault_7/content/research/index.php [accessed 5 September 2011] 72.

[72] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 23.

[73] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 57.

[74] See Klein et al *Evaluation of Different Feed-in Tariff Design Options* 24. See also Couture et al *A Policymaker’s Guide to Feed-in Tariff Policy Design* (n3) 71 and 101.

[75] M Mendonça, D Jacobs and B Sovacool *Powering the Green Economy: The feed-in tariff handbook* 2010, 30.

[76] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 21.

of some conventional electricity generated by Eskom. This could have an impact on electricity prices,[77] as RES-E is (at this stage) generally more expensive than conventional electricity. While current electricity prices do not include all the external environmental and social costs (discussed in Chapter 3), the increase in electricity prices that may result due to the uptake of a significant amount of RES-E cannot be ignored.[78]

In Germany and Spain there was previously no limit on the uptake of RES-E. It has been argued that Germany's experience 'has shown that a "cap-less" policy environment can create positive results for job creation, manufacturing, export market growth, and avoided environmental costs'.[79] Furthermore, the cap-less policy appears to have resulted in lower prices of RES-E in Germany.[80]

However, allowing for limitless RES-E growth would arguably increase the costs of the entire programme. In Germany, due to higher than anticipated interest in solar PV, capacity limits were introduced (as discussed in Chapter 5). Capacity caps were also introduced in Spain in respect of wind and CSP plants and the FIT programme was subsequently terminated.[81]

Furthermore, the excess generation of RES-E from an intermittent RET, such as wind energy, could result in instability in the grid (as discussed in 8.2.3.4 above).[82] It has also been argued that the purchase obligation would require the grid operator to

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[77] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 58.
[78] Indeed, it has been noted that '[u]ltimately, there is an inherent tension between introducing free and open access to renewable energy FITs and limiting ratepayer costs'. C Kreycik, TD Couture and KS Cory *Innovative Feed-In Tariff Designs that Limit Policy Costs* (National Renewable Energy Laboratory: Technical Report NREL/TP-6A20-50225) 2011 available at http://www.nrel.gov/docs/fy11osti/50225.pdf [accessed 8 April 2013] iv.
[79] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 84. See the discussion in 5.2.5.
[80] Indeed, in Germany the cost in 2008 for solar PV was US$6.10 (for a 2008 market size of 5300 MW) compared to US$7.90 in the United States (for a 2008 market size of 800 MW). Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n78) 10-11. Furthermore, while some policymakers may fear the rapid expansion of RES-E because it will increase electricity prices, this may not necessarily be the case and there is 'strong evidence to suggest that increased supplies of (renewable) electricity will depress the wholesale electricity price'. See J Prest 'The Future of Feed-in Tariffs: Capacity caps, scheme closures and looming grid parity' 2012 (1) *Renewable Energy Law and Policy Review* 25-41, 39.
[81] It has been noted that in Spain '[g]enerous tariffs, combined with a high-quality solar resource and insufficient oversight, led to a rush of development that overwhelmed regulators and prompted a drastic policy change'. Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) x. See also Del Río 'The Dynamic Efficiency of Feed-in Tariffs' (n8) 149-150.
[82] This is because baseload power (coal-generated electricity) would be displaced and could take a while to restart if shut down so that RES-E could be taken up and distributed. Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 58.

purchase electricity regardless of demand, which could be considered to be 'inconsistent with competitive electricity market structures'.[83]

b) Cost containment

Against the background sketched above it is necessary to look more closely at various mechanisms that could be implemented by policymakers to limit the costs of a FIT programme.[84] While this would introduce some complexity, it has been argued that

> '[i]mplementing cost controls from the outset can avert the need for drastic policy corrections and can therefore help projects secure financing and provide greater certainty to investors and manufacturers while still enabling RE targets to be met on time'.[85]

However, revisions to the FIT policy should be implemented in a gradual and predictable manner rather than arbitrarily and unpredictably, in order to avoid uncertainty.[86] The central issue is thus for decision-makers to ensure that investment security for prospective RES-E generators is balanced with cost containment and grid stability.

(i) *Caps*

Some countries have set caps to contain the costs of a FIT programme. There are various types of caps, including caps on: total programme size (i.e. total capacity); the size of individual projects; the total policy costs; or caps with regard to specific technologies (i.e. the more expensive RETs).

[83] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 71. See also M Mendonça *Feed-In Tariffs: Accelerating the Deployment of Renewable Energy* 2007, 93.
[84] See Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 65-69, who discusses the various ways in which different triggers and adjustments can be combined.
[85] Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n78) 34. See also Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) x, who note that '[e]xperience suggests that it is advisable to design policies with an eye to cost containment'.
[86] Del Río 'The Dynamic Efficiency of Feed-in Tariffs' (n8) 149.

Imposing a cap on the programme size or total capacity can be done on a short-term basis – for example, by specifying the total amount of RES-E that may be taken up per year – or on a longer-term basis, for example, by imposing an overall programme cap that would be fulfilled over a number of years.[87]

Imposing a cap on the total amount of RES-E that may be taken up would provide signals to investors and manufacturers regarding future market growth of the different RETs and would 'also help policymakers control overall policy costs by providing firm limits on the amount of renewable energy development'.[88] However, imposing a cap would limit the amount of RES-E development that can take place and may reduce investment stability by creating a stop-and-go investment cycle.[89] Investment stability would be reduced because investors would be 'unlikely to know how quickly the caps will be reached and whether their particular project will make the cut before the cap is subscribed'.[90]

This can lead to a further, related problem, namely that if investors have to 'queue' their projects, they may enter 'speculative bids' for unviable projects simply to secure a position in the queue[91] and thus take the place of more viable projects.[92] Policymakers have introduced procedures to deal with this, such as requiring the payment of application fees or a security deposit linked to development milestones.[93]

It has been argued that hard or total capacity caps 'are a blunt instrument for constraining the impact of any FIT law'.[94] However, even introducing periodic caps could lead to a stop-and-go investment cycle as investors rush to complete projects before the deadline, followed by a lull as they wait for the next bidding window. This would evidently not promote a sustainable renewable energy industry.[95]

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[87] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 32.
[88] Ibid, 81.
[89] M Ragwitz, J Winkler, C Klessmann, M Gephart and G Resch (Fraunhofer ISI, Ecofys and Energy Economics Group) *Recent Developments of Feed-in Systems in the EU – A research paper for the International Feed-In Cooperation* 2012 available at http://www.feed-in-cooperation.org/wDefault_7/content/research/index.php [accessed 28 March 2013] 10.
[90] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 81.
[91] Ibid.
[92] Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n78) 10.
[93] Ibid. Queuing is dealt with further at 8.2.3.10 below.
[94] Prest 'The Future of Feed-in Tariffs' (n80) 34.
[95] Ibid, 34. See also Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n78) 9.

It is notable that South Africa's REIPPPP is based on the announcement of once-off bidding windows, which encourages investment in RES-E only for as much RES-E capacity is available in a specific bidding window.

It is also possible to impose a cap on the size of projects, for example, limiting all individual projects to 5 megawatts (MW). It is also possible to set different limits in respect of different RETs.[96] Thus, Ontario has set a limit of 10MW in respect of solar PV projects.[97] While this can assist in controlling overall policy costs, it can also limit renewable energy development and increase the costs of renewable energy as smaller projects will not 'harness economies of scale'.[98] This can also lead to large projects being divided into smaller projects, which could significantly increase the costs of the programme.[99] Caps on project size are less effective in limiting costs than caps on total programme size.[100]

Finally, governments may limit the total amount of money that they wish to spend on a programme and thereby impose an 'upper limit on the total ratepayer impact'.[101] This can be done by awarding a specific amount of money to different RETs based on the desired amount of installed capacity.[102] While giving policymakers more control over the costs of the FIT policy and doing so in a transparent way, this approach can lead to limited renewable energy development, queuing challenges, a disproportionate focus on costs at the expense of benefits such as job creation and reduced emissions, and 'stop-and-go development, which makes it difficult to develop a sustainable domestic renewable industry'.[103]

[96] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 82.
[97] Ibid, 84.
[98] Ibid, 82.
[99] Ibid.
[100] Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n78) 8.
[101] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 83.
[102] Ibid.
[103] Ibid.

(ii) *Growth corridors*

It is also possible to control costs by setting 'growth corridors with continuous automatic adjustment of tariffs'.[104] A growth corridor has been described as

> 'the amount of renewable capacity a country would like to see installed in a given year (e.g. 800-1200 MW, or 1000 MW) or part of a year (e.g. 200-300 MW per three month[s]). In case growth is in line with that growth corridor the normal tariff degression would apply (e.g. minus 10% per year). In case growth is stronger than envisaged, the tariff degression is increased (e.g. minus 1% per 10% overshoot). In case of less growth than envisaged, tariff degression is decreased. The higher the frequency of adjustments (e.g. once in three month[s] instead of once a year) and the higher the increase of tariff degression in case of overshoot, the higher the control on support cost but the lower the investment stability. Germany currently uses this system in the case of photovoltaics, whereas Spain applies a fixed cap for the annual installed capacity'.[105]

The setting of growth corridors (also referred to as responsive degression) is linked to the adjustment of tariff levels, which is discussed further in 8.2.3.7 below. The setting of growth corridors with the continuous adjustment of tariffs 'preserves investment stability to a higher degree'[106] (than caps). It also ensures that governments can adjust the FIT to maintain a predefined level of growth.[107] It has also been argued that the more 'a cap resembles the tariff degression approach … the more likely it is to represent a reasonable compromise between competing policy objectives'.[108] On the other hand, the setting of growth corridors may not be as effective in containing the costs of the programme.[109]

It is debatable which approach would be most suitable to contain costs and preserve grid stability in South Africa, and it is arguable that at the outset it may not

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[104] Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 80. See also Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n78) iv.
[105] Ragwitz et al *Recent Developments of Feed-in Systems in the EU* (n89) 10.
[106] Ibid.
[107] Prest 'The Future of Feed-in Tariffs' (n80) 36.
[108] Ibid, 33.
[109] Ragwitz et al *Recent Developments of Feed-in Systems in the EU* (n89) 10. See also Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 80 and Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n78) 17.

be necessary to introduce capacity caps.[110] Indeed, this would require the least administration and regulation.[111] On the other hand, an 'uncapped and unadjusted FIT … cannot be controlled'.[112] It would thus be advisable to plan for the possibility of exceptional growth in RES-E but without introducing hard capacity caps.

It should be noted that in general the escalating costs of FIT policies have mainly been 'due to the uptake of solar technologies'.[113] Indeed, in Germany, a total capacity cap has only been introduced in respect of solar PV and certain jurisdictions, such as Ontario, have placed a capacity limit on individual solar PV projects.[114] Therefore, one possibility would be to only introduce an overall capacity cap or establish a growth corridor in respect of solar technologies.

On the other hand, it has been noted that

> 'at least in Australia, the knowledgeable observer can detect a discernable [sic] fear on the part of some governments that "too much" PV will be installed… This is coupled with an obsession with devising ways of putting the solar genie back into the bottle, to exercise "cost containment"'.[115]

Whichever policy choices are made, a project registry should be established and made publicly available.[116] This would enable anyone interested in establishing a RES-E plant to easily determine the overall status of RES-E plants in South Africa and the status of applications. Due to the lead time of RES-E plants (of about one to two years) it would be possible to tell well in advance whether or when any capacity caps or growth corridors (if established) will be reached.

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[110] For example, it was argued with regard to the 2009 REFIT, that the capacity 'cap on South Africa's REFIT should be removed to allow for large-scale deployment'. See M Edkins, A Marquard and H Winkler 'Assessing the Effectiveness of National Solar and Wind Energy Policies in South Africa' 2010 (Final Report for the United Nations Environment Programme Research Programme: *Enhancing information for renewable energy technology deployment in Brazil, China and South Africa*) available at http://www.erc.uct.ac.za/Research/publications/10Edkinesetal-Solar_and_wind_policies.pdf [accessed 27 March 2011] vi and 20. However, this report was written in the context of the IRP 1 and before the publication of the IRP 2010-2030.

[111] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 69.

[112] Ibid.

[113] Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n78) 1.

[114] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 84.

[115] Prest 'The Future of Feed-in Tariffs' (n80) 39.

[116] See for example Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 68.

It is clear from the preceding discussion that the issue of cost containment is a complex one.[117] It is arguable that it is preferable to avoid capacity caps generally. However, a capacity cap, or preferably a growth corridor, could be established in respect of solar technologies. This would need to be included or communicated at the outset of the programme to avoid such measures being introduced suddenly or unpredictably, which as noted above, can threaten investment security. However, this is highlighted as an issue for further investigation.

8.2.3.7 Tariffs

Various decisions must be made with regard to the tariffs that would be paid to RES-E generators by the grid operator (which are distinct from the electricity prices paid by final consumers) including determining the tariff level, the duration of the tariffs, whether tariffs should be differentiated and whether tariffs should be adjusted.

a) Tariff level

It is important that policymakers 'get the tariff level right'.[118] If tariffs are too low, prospective investors would not make much profit and thus would not be incentivised to invest in renewable energy; and if tariffs are too high it would result in increased electricity prices, which could have severe consequences for low-income households and access to energy generally.[119] It has been argued that determining the appropriate level is one of the main challenges of a successful FIT programme.[120]

There are different methods to determine tariff levels, including basing the tariffs on avoided costs (i.e. the costs that are avoided by the grid operator by the provision of RES-E as opposed to having to build a new power plant to supply the electricity)

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[117] See also Prest 'The Future of Feed-in Tariffs' (n80) 37-41.
[118] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 17.
[119] Ibid. See also Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 19. See also Mendonça *Feed-In Tariffs* (n83) 103; JA Lesser and X Su 'Design of an Economically Efficient Feed-In Tariff Structure for Renewable Energy Development' 2008 (36) *Energy Policy* 981-990, 982 and Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n78) 1.
[120] T Couture and Y Gagnon 'An Analysis of Feed-in Tariff Remuneration Models: Implications for renewable energy investment' 2010 (38) *Energy Policy* 955-965, 955-956.

or on the actual cost of renewable energy generation[121] to which a small premium of about 5 to 10 per cent of 'return on investment per year' is added.[122] The latter approach has been widely used in the European Union (EU) and has been the most effective in promoting renewable energy worldwide.[123] In certain jurisdictions this has been cheaper than basing tariffs on avoided costs.[124]

Determining the actual costs of generation is usually determined through market research and analysis of the current costs of renewable energy.[125] Various factors must be considered, including the investment costs of plants, grid-related and administrative costs, operation and maintenance costs, fuel costs, inflation,[126] interest rates and decommissioning costs.[127] Once this is all taken into account, a tariff level can be set, also having regard to how much electricity is expected to be generated and the projected 'lifetime' of the installation.[128] This is a complex (and non-legal) exercise and will not be considered further here. It may be noted, however, that such details 'are typically not incorporated into legislative or regulatory language'.[129]

As the generation costs of different RETs differ, basing the tariffs on the actual cost of generation would necessarily result in tariffs that are differentiated according to technology.[130] This would not be the case if the tariffs were based on avoided costs, which would yield a standard tariff that would apply to all RETs (irrespective of their differing costs). Rates based on actual generation can thus be more effective at 'achieving portfolio diversity' than rates based on avoided costs.[131]

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[121] Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 11. See also Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 38-39.
[122] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 17. See also Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 12. For further methods of determining tariffs see further Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 7.
[123] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 7. See also Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 17.
[124] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 130.
[125] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 8.
[126] See Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 47-50.
[127] See Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 17-18 and Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 11.
[128] Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 11.
[129] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 76.
[130] Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 12.
[131] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 41.

Determining tariffs based on the actual costs of generation would be consistent with South Africa's legislation. For example, section 15 of the Electricity Regulation Act[132] provides that

> '[a] licence condition determined under section 14 relating to the setting or approval of prices, charges and tariffs and the regulation of revenues … must enable an efficient licensee to recover the full cost of its licensed activities, including a reasonable margin or return'.

Arguably, this implies that tariffs will be based on the actual cost of generation plus a small profit. Similarly, the 'basic economic principle underpinning the [2009 REFIT] … [was] the establishment of a tariff (price) that cover[ed]… the cost of generation plus a "reasonable profit" to induce developers to invest'.[133] It is considered that the REFIT was appropriate in this regard.

Tariffs had already been determined under the REFIT of 2009 and tariffs have also been established under the first three bidding windows of the REIPPP Programme (discussed in Chapter 7). This would arguably provide some guidance to decision-makers regarding the determination of appropriate tariffs.

b) Duration of tariffs

It must also be determined how long tariffs will be paid in respect of particular projects. The concern has generally been to ensure that tariffs are paid for the economic lifetime of the relevant project. Tariffs that are paid over a shorter period of time will result in lower policy costs.[134] However, a shorter contract time may 'remove the incentive for projects to continue operating over their entire lifetimes'.[135] On the other hand, tariff payment periods that are too long could hamper technological

[132] Act 4 of 2006.
[133] National Energy Regulator of South Africa (NERSA) *South Africa Renewable Energy Feed-in Tariff (REFIT): Regulatory Guidelines* in GN 382 of 2009 in *Government Gazette* 32122 dated 17 April 2009, 11.
[134] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 43.
[135] Ibid.

innovation,[136] and contracts that are 25 years or longer may give rise to the possibility of overcompensation.[137]

FIT contracts usually range between 15 and 25 years.[138] In European countries that have implemented FIT policies, tariffs are usually paid for between six years and 20 years.[139] In Germany tariffs are generally paid for about 20 years, which is the 'average lifetime of many renewable energy plants'.[140] This provides security to investors as it ensures that they would be able to recover their costs and may also translate into greater price stability for customers.[141] Under the REFIT it was also provided that tariffs would be guaranteed for 20 years.

There is no reason to diverge from international practice or the REFIT in this regard. It is thus recommended that in South Africa tariffs should be guaranteed for approximately 20 years, as it is ideal for the guaranteed tariff to cover the average economic life of installations.[142]

Another consideration, which is more relevant with regard to a longer tariff payment period, relates to whether tariffs should be adjusted for inflation.[143] It is possible to adjust all or part of tariffs for inflation, or simply to include inflation in the initial calculation of FIT tariffs, so that there is no explicit adjustment. The latter approach is followed in Germany.[144] The 2009 REFIT provided that tariffs would be adjusted anually on the basis of the consumer price index or another appropriate

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136 Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 20.
137 Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 73.
138 Ibid, 72. See also Mendonça *Feed-In Tariffs* (n83) Table 9.2, 91.
139 Mendonça *Feed-In Tariffs* (n83) 90-91.
140 Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 20.
141 Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 73. See also R Wiser and S Pickle *Financing Investments in Renewable Energy: The Role of Policy Design and Restructuring* (Ernest Orlando Lawrence Berkeley National Laboratory, University of California) 1997 available at eetd.lbl.gov/ea/emp/reports/39826.pdf [accessed 3 July 2012] 43-44.
142 Indeed, it was accepted under the 2009 REFIT that the economic life of installations is 20 years. REFIT Regulatory Guidelines (n133) Table A1.1, at 22.
143 Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 42. See also Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 20.
144 Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 42. Another option is 'front-end loading', which means that higher tariffs are awarded in the first years of life of an installation, for example, in the first ten years, following which, tariffs are decreased. An advantage of this approach is that it can enable investors to pay off loans more quickly, by earning higher tariffs 'in the early years when they are needed most'; and can also reduce the amount of interest payable by investors. However, an important disadvantage (especially in the South African context) is that this would increase the costs of the policy, and thus, electricity costs in the early years, rather than the tariff costs being distributed over the entire period, which would mean that the costs for consumers would be more even (and would not spike in the early years of a project).

inflation index.[145] It is submitted that such adjustments should be included in the initial calculations.

c) Differentiated (stepped) tariffs

It is possible to differentiate tariffs according to a number of different factors, including the type of technology or fuel used, the size of the installation, and the resource quality at the relevant site or location.[146] Differentiating tariffs on these grounds can assist in limiting the costs of the FIT programme.[147] Doing so presupposes that tariffs are based on the actual costs of generation.

(i) *Type of renewable energy technology or fuel*

Differentiating tariffs according to the type of renewable energy technology or fuel takes into account that different RETs are at different stages of maturity or development and therefore have differing costs[148] (as discussed in Chapter 3). Thus, tariffs for wind energy would be lower than tariffs for solar power. Differentiating tariffs on this basis thus encourages the development of a wide range of technologies, rather than just the most mature and cheapest technologies (if only a single tariff level was offered). This 'ensures that jobs, manufacturing opportunities, and associated economic activities are created in several renewable energy technology sectors'.[149]

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[145] REFIT Regulatory Guidelines (n133) 17.
[146] See Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 23; Mendonça *Feed-In Tariffs* (n83) 93; and Ragwitz et al *OPTRES Report* (n2) 100.
[147] M Ragwitz, A Held, E Stricker, A Krechting, G Resch and C Panzer *Recent Experiences with Feed-In Tariff Systems in the EU – A research paper for the International Feed-In Cooperation* 2010 (commissioned by the Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)) available at http://www.feed-in-cooperation.org/wDefault_7/content/research/index.php [accessed 5 September 2011] 9-10.
[148] See for example Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 19.
[149] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 99.

It is also possible to differentiate tariffs for biomass with regard to the type of fuel used. For example, fuel produced from fuel crops costs more than fuel produced from waste biomass.[150] This practice is followed in Germany and in Spain.

There is no question that tariffs should be differentiated on the basis of RET in South Africa. This approach was already followed under the 2009 REFIT as well as under the REIPPPP currently. The tariffs for the different RETs were considered in Chapter 7.

(ii) *Project size*

Differentiating tariffs on the basis of project size takes into account the fact that large plants tend to be less expensive[151] since economies of scale have been achieved, making it cheaper to generate electricity. Differentiating tariffs on this basis also reinforces the decision to offer FIT tariffs that are based on the actual costs of generation.[152] This approach also ensures that developers of different-sized installations would achieve a similar profit, despite the different costs associated with constructing different renewable energy installations.[153] This encourages the participation of different sizes of RES-E generators and ensures that it is not only profitable to participate on the basis of large installations. Thus, IPPs could range from 'the homeowner seeking to install a PV system on their rooftop, to the institutional investor seeking to invest in large, commercial or utility-scale projects'.[154]

On the other hand, failure to differentiate tariffs according to project size 'could lead to windfall profits for large projects', while making it unprofitable to participate with smaller projects.[155]

Almost all EU countries that have a FIT policy in place differentiate their tariffs based on installation size.[156] It was seen in the case of the FIT policies in Germany and Spain that as the capacity of a plant increases, so the tariff decreases. This

[150] See Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 18 and 35. See also Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 24.
[151] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 16.
[152] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 25.
[153] Ibid.
[154] Ibid, 28.
[155] Ibid.
[156] See Ragwitz et al *OPTRES Report* (n2) 107.

does not appear to be the case in India and China. The REFIT also did not provide for differentiated tariffs for different project sizes.

It is submitted that it would be preferable to differentiate tariffs on the basis of plant size in a South African FIT policy. However, it would need to be considered whether this should be introduced at the outset or whether it would be desirable to introduce this at a later stage as the FIT becomes more mature. While this differentiation introduces more complexity, not doing so would result in spending money unnecessarily on financing larger installations, which can generate RES-E at a lower cost than smaller plants. It is thus submitted that a very basic system of differentiation based on project size (installed capacity) could be introduced at the outset, similar to the approach taken in Germany under the original EEG (as seen in Chapter 5 (in Table 5.1)).

(iii) *Resource quality or availability*

It is also possible to differentiate tariffs within the same technology band or category according to the availability of the resource. As seen in Chapter 5, this practice is followed in Germany. With regard to wind energy, for example, a lower tariff can be offered in areas where it is very windy where there will be a higher yield of electricity and it will therefore cost less to generate;[157] and a higher tariff can be paid in respect of areas where there is a lower availability of wind energy. On the other hand, providing the same standard tariff where energy costs less to produce would result in excess profits to RES-E generators to the detriment of consumers, who would bear the additional costs unnecessarily.[158] Offering a standard tariff could also lead to RES-E developers flocking to windy areas, which could give rise to public opposition.

Providing higher tariffs in less windy areas would thus encourage the development of RES-E plants being dispersed, and ensure that the development of wind energy would not be restricted to areas with high yields of wind and could also be developed at sites with lower yields.[159] This could also assist in reducing

[157] See Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 25.
[158] Ibid, 26. See also Mendonça *Feed-In Tariffs* (n83) 93-94.
[159] Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 33. See also Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 29.

bottlenecks that could otherwise develop in windier areas[160] and reduce windfall profits to RES-E generators in those areas.[161] However, it would still be important that the 'sites with the most favourable conditions' are exploited first,[162] as this is more cost efficient.[163]

There are different ways in which to differentiate tariffs according to resource quality. As seen in Chapter 5, Germany makes use of the 'reference turbine' with regard to wind energy. If the output of a particular installation falls below 150 per cent of the output of the hypothetical reference turbine after five years, then the initial (higher) tariff is extended, whereas, if an installation produces more than 150 per cent of the output of the reference turbine after five years, the tariffs are reduced. A different approach is followed in France, where reference is made to the 'actual wind resource performance data' for a particular installation over a ten-year period and the tariff level is retained or decreased based on this actual performance.[164] As noted in Chapter 5, China has been divided into four regions and fixed tariffs for wind energy have been set for each region.

In France tariffs are also differentiated for solar PV in different regions of the country.[165] It is suggested that this approach 'could be particularly valuable for large countries with a significant disparity in local resource potential'.[166] This is especially relevant to South Africa where the Northern Cape, for example, has far more solar potential than other regions. Under the REFIT no differentiation was made in respect of resource quality or availability.

While this approach would necessarily introduce more complexity, it is submitted that this would not be too onerous, especially considering that wind and solar maps have been developed for South Africa; and it would arguably not be too complicated to develop differentiated tariffs for different areas with reference to the resource availability in those areas. Indeed, this would be less complex than the approach

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[160] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 32.
[161] Ibid.
[162] Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 38. See also Ragwitz et al *OPTRES Report* (n2) 112.
[163] See Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 80 and Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 33.
[164] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 30.
[165] Ibid, 32.
[166] Ibid.

followed in Germany and in France where the output of the relevant installations must be monitored.

(iv) *Location*

It is also possible to differentiate tariffs according to the location of the installation without reference to resource availability. Thus, in Germany different tariffs are offered for solar energy depending on whether installations are free-standing or whether they are attached to, or on top of buildings. This reflects the fact that it is more expensive to build solar installations on existing structures. It is also desirable to build installations on or attached to existing structures rather than requiring new space.[167]

Germany also differentiates tariffs for wind installations depending on whether they are onshore or offshore.[168] This reflects the fact that it is more expensive to develop wind installations offshore.

It is not clear that this level of differentiation is necessary in South Africa yet. For example, no offshore wind turbines are in the process of being constructed as yet. However, the construction of solar plants on existing structures should perhaps be encouraged. It would then need to be decided whether this differentiation should be introduced at the outset or at a later stage.

(v) *Demand orientation*

Electricity demand differs depending on the time of day and the season. Thus, in Spain tariffs are differentiated according to the season (winter or summer) as well as the time of day (peak or off-peak). Higher tariffs are paid during peak times during the day.[169] However, such differentiation could only be applied to RETs 'that can

[167]See for example Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 35. See also Table 5.3 in Chapter 5 above.
[168] See Table 5.2 in Chapter 5 above.
[169] Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 61.

adjust their time of generation' including biomass, CSP with storage and hydropower.[170]

This approach increases the market orientation of the FIT programme, and ensures that supply is more closely related to demand. This increases the value of the RES-E generated,[171] which would be more valuable during peak times (when there is more demand) than during off-peak times. However, such tariff differentiation would increase administrative complexity[172] and it is not recommended that a FIT policy in South Africa introduce this level of differentiation (at least at the outset).

vi) *Discussion*

Differentiating tariffs on all of the grounds discussed above would introduce more complexity to the design of the FIT, which would most likely involve more administration and higher costs.[173] However, if the policy is well-structured these differentiations could increase the cost efficiency of the programme.[174] Therefore, while it would be desirable to introduce some level of tariff differentiation to achieve certain objectives, such as the penetration of a range of RETs, it is submitted that there should not be excessive tariff differentiation. It is submitted, for example, that the Spanish approach of differentiating tariffs according to demand orientation may be too complex in South Africa at the present stage.

It is notable that the 2009 REFIT Regulatory Guidelines considered the differentiation of tariffs and stated that differentiating tariffs *inter alia* with regard to installation size, geographical value and local generation are appropriate in more developed energy markets, and recommended that 'once the first phase of the REFIT is up and running, the second phase can begin to address some of these issues, building on the lessons learned from the first phase'.[175]

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170 Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 44.
171 Ibid, 45. See also Ragwitz et al *OPTRES Report* (n2) Table 20, 125.
172 See Ragwitz et al *OPTRES Report* (n2) Table 20, 125.
173 See for example Ragwitz et al *OPTRES Report* (n2) Table 15, 112 and Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 38.
174 Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 35.
175 REFIT Regulatory Guidelines (n133) 36.

While maintaining simplicity is arguably an important objective, this should be within reason and should not lead to RES-E generators earning windfall profits. It is thus submitted that the ideal option would be for tariffs to be differentiated (or stepped) to some extent. At the very least tariffs should be differentiated on the basis of technology, which was already the approach taken under the 2009 REFIT and under its successor. Furthermore, it is unlikely that it would be too administratively complex or expensive to differentiate tariffs according to the resource availability in different regions, with reference to the wind and solar maps for South Africa that have already been developed. It may also be possible to include a very basic level of differentiation with regard to installation size. Further tariff differentiations could be introduced in time and with appropriate notice.

d) Fixed tariff or premium tariff

There is a further option to offer a fixed tariff, which is independent of the market price,[176] or a premium tariff that is added to the market price of electricity.[177] As seen in Chapter 5, fixed tariffs are offered in Germany, India and China. Indeed, most countries with FITs in place offer fixed tariffs.[178] The REFIT also provided for fixed tariffs. On the other hand, Spain offers the option of premium tariffs in addition to fixed tariffs. Under this approach, the RES-E generated is usually traded on the spot market.[179]

It has been argued that the premium system is a better option as it is reasonable to pay higher tariffs when electricity demand is higher and electricity is thus more expensive, and to pay lower tariffs when electricity demand is lower and electricity is

[176] Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 43.

[177] It is also possible to set tariffs as a percentage of prevailing electricity prices. This was the approach taken in Germany in terms of the StrEG Act that was passed in 1990 and that was subsequently replaced by the EEG in 2000. Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 19-20. See further Couture and Gagnon 'An Analysis of Feed-in Tariff Remuneration Models' (n120) 960-961.

[178] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 21.

[179] Ibid, 50. See also Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 80.

less expensive.[180] The premium system can thus encourage RES-E generators to adapt their generation to demand.[181]

On the other hand, premium tariffs are more risky as RES-E investors do not know future tariff levels in advance[182] and there is no purchase guarantee.[183] Premium tariffs can also give rise to a 'considerable risk of overcompensation',[184] which translates into higher costs per kWh of electricity generated.[185] As seen in Chapter 5, the premium tariff in Spain led to RES-E developers earning windfall profits (which led to the introduction of cap and floor prices).

As fixed tariffs are independent of the market price for electricity, it has been argued that they 'distort competitive electricity prices'[186] and do not take account of electricity demand.[187]

On the other hand, as fixed tariffs provide more certainty, RES-E generators can be sure of exactly how much money they will receive for electricity generated. This increased security (and consequently lower risk) should lead to more renewable energy development'.[188] The reduced risk may also translate into lower capital costs, thereby reducing the the costs of developing renewable energy.[189] It has been argued that fixed tariffs have generally 'demonstrated a higher level of cost efficiency compared to premium-price FIT payments … and have created … more transparent market conditions for RE development'.[190] Indeed, a study analysing premium and fixed tariffs in the EU found that profits earned under the premium option were about €0.01/kWh to €0.03/kWh higher than under the fixed tariff option.[191]

[180] J Schallenberg-Rodriguez and R Haas 'Fixed Feed-In Tariff Versus Premium: A review of the current Spanish system' 2012 (16) *Renewable and Sustainable Energy Reviews* 293-305, 303. See also Couture and Gagnon 'An Analysis of Feed-in Tariff Remuneration Models' (n120) 962.
[181] Ibid.
[182] Couture and Gagnon 'An Analysis of Feed-in Tariff Remuneration Models' (n120) 962.
[183] Ragwitz et al *OPTRES Report* (n2) 118.
[184] Schallenberg-Rodriguez and Haas 'Fixed Feed-In Tariff Versus Premium' (n180) 294. See also See Ragwitz et al *OPTRES Report* (n2) 117.
[185] Couture and Gagnon 'An Analysis of Feed-in Tariff Remuneration Models' (n120) 962.
[186] Ibid, 961.
[187] Ibid, 962.
[188] Ibid.
[189] Ibid.
[190] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 23. See also Couture and Gagnon 'An Analysis of Feed-in Tariff Remuneration Models' (n120) 964.
[191] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 62.

The increased security offered by fixed tariffs may also 'attract a greater *diversity* of investors… [which] is reflected perhaps most clearly in the high levels of local ownership found in countries like Germany'.[192] Fixed tariffs can also guard against unpredictable fossil fuel prices in contrast to premium tariffs, which would lead to increased electricity prices if conventional (fossil fuel-generated) electricity prices were to increase.[193] Fixed tariffs are also less administratively complex as they require less regulatory oversight and involvement.[194]

In light of all these factors, it is submitted that it would preferable for tariffs in South Africa to be fixed.

e) Adjustment of tariff levels

As renewable energy technologies become more mature, so their costs decrease (as discussed in Chapter 3). It is thus important to include a mechanism to ensure that tariffs are decreased as the costs of generation decrease. Decreasing tariffs 'as experience is gained' would help to ensure that the FIT programme will be economically efficient.[195] However, maintaining tariffs at appropriate levels is challenging *inter alia* due to 'rapidly changing markets'.[196]

There are several options for adjusting tariffs to ensure that the tariff levels for new installations reflect the decreasing costs of RES-E. In the first place it is possible to apply degression, which

> 'is applied because the total costs of a technology … tend to decrease in a relatively predictable way. This is based on the observation that for every doubling in output in a given industry, there tends to be a proportional decrease in the unit cost over time'.[197]

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[192] Couture and Gagnon 'An Analysis of Feed-in Tariff Remuneration Models' (n120) 962.
[193] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 45.
[194] Ibid, 46.
[195] Ragwitz et al *OPTRES Report* (n2) 49. See also Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n78) 34 and Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 79.
[196] Prest 'The Future of Feed-in Tariffs' (n80) 28. See also Ragwitz et al *OPTRES Report* (n2) 121.
[197] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 36-37 and Mendonça *Feed-In Tariffs* (n83) 95. It has further been noted that the degression rate should ideally correspond

As discussed in Chapter 5, automatic degression is applied in Germany whereby tariffs for new installations are reduced by a set percentage each year. Thus, the tariff for a particular installation would be lower if it were to begin operation in five years' time compared to in one year's time. Degression rates are higher for RETs that are less mature and are evolving rapidly, such as solar PV, as opposed to more mature RETs such as wind and hydro power.[198]

It is also possible to apply 'flexible' or responsive' degression (or growth corridors), in terms of which the adjustment of tariffs is linked to the attainment of a specific level of capacity (as discussed in 8.2.3.6 above). As seen in Chapter 5, Germany applies responsive degression in respect of solar PV, with the basic degression rate of 1 per cent per month being adjustable either up or down depending on the amount of capacity installed in a specific period. No provision is made for degression in Spain, except in respect of solar PV, and tariffs may be revised annually. No provision is made for tariff degression in either India or China.

Automatic adjustments are arguably 'the most transparent option, especially if the adjustment schedule is known and published in advance'.[199] They also provide more certainty to prospective IPPs than periodic tariff revisions.[200] However, automatic degression does not take account of factors such as the increasing costs of labour or of the materials required to develop RETs, which could hamper the development of renewable energy,[201] or that rapid deployment could decrease prices more quickly than anticipated.[202]

An advantage of responsive degression in this regard is that it introduces 'a self-adjusting element in the policy design'[203] and allows the rate of degression to be determined by the market and not vice versa.[204] It has also been argued that

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'to the cost reduction due to technological learning'. See Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 80.

[198] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 37.

[199] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 68.

[200] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 39. See also Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n78) 34.

[201] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 40.

[202] Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n78) 13.

[203] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 41.

[204] Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n78) 13.

responsive degression may be more appropriate with regard to RETs like solar PV that have 'more dynamic cost trends'.[205]

On the other hand, difficulties with the responsive degression approach include the fact that it may create uncertainty as to when a certain capacity level will be reached. It has also been found that 'adjustments strictly assessed on quantity of capacity installed may fail to coincide with actual price trends'.[206] As responsive degression introduces more complexity, it may be better suited to large renewable energy markets.[207]

It was seen in Chapter 7 that the REFIT did not make any provision for degression. In light of the above, it is recommended that in South Africa there be automatic or fixed degression. However, as noted above, an argument could be made for applying responsive degression in respect of solar energy.

There should also be scope to revise tariffs to take account of situations where the degression rate is not reflecting actual market developments and changes related to costs, and it has been noted that there is a challenge in achieving a balance between flexibility to respond to sudden changes in price and providing security to investors.[208] In this regard it is possible to provide that tariffs may be revised either after certain time periods or with the attainment of a certain amount of capacity.[209]

It has been argued that while time-based triggers are more transparent '[c]apacity-based triggers can also be transparent if progress towards the triggers is actively monitored (e.g. using a project registry) and publicly available for developers to see'.[210]

In most countries, tariffs are revised periodically. It is accordingly submitted that tariffs should be reviewed after certain time periods, for example, every three years.

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[205] Ibid, 34.
[206] Ibid.
[207] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 41.
[208] Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 23. See also Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 76.
[209] Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 21 and Mendonça *Feed-In Tariffs* (n83) 92.
[210] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 68.

This is arguably administratively simpler than using capacity-based triggers, and more transparent.

8.2.3.8 Transparency and provision of information

In Germany it has been seen that requirements regarding the provision of information are imposed on the various roleplayers, including the installation operators, grid system operators and transmission system operators (discussed in Chapter 5 above).

Transparency and access to information are no less important in South Africa, especially in light of the 'secretive and unresponsive culture in public and private bodies [prior to 1994] which often led to an abuse of power'.[211] The Constitution of the Republic of South Africa thus includes a right of access to information[212] and the Promotion of Access to Information Act[213] (PAIA) has been enacted to give effect to this right. PAIA includes amongst its objects 'generally, to promote transparency, accountability and effective governance of all public and private bodies'.[214]

It is submitted that in South Africa information should be provided by the relevant entity[215] regarding the amount of RES-E that it buys from RES-E generators and sells to its customers. It should also be required that the responsible authority (the Department of Energy) provide progress reports to ensure that decision-makers reflect on the effectiveness of the law and consider how it might be improved.

Such reports usually deal with the growth of RETs, any increased costs for consumers as well as the ecological impacts of renewable energy plants, and could also deal with the impact of the FIT policy on greenhouse gas emissions, job creation and manufacturing.[216] It is submitted that progress reports should also

[211] Promotion of Access to Information Act 2 of 2000, Preamble.
[212] See Section 32 of the Constitution of the Republic of South Africa, 1996, which provides that 'Everyone has access to – (a) any information held by the state; and (b) any information that is held by another person that is required for the exercise or protection of any rights.'
[213] PAIA (n211).
[214] Ibid, section 9(e).
[215] This would be Eskom at present, but would most likely be the ISMO once it is established.
[216] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 24. See also Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 103.

indicate how much of the increase in electricity tariffs is due to the consumption of RES-E.

As noted in 8.2.3.6 it is also suggested that a project registry should be established by the Department of Energy, which should be made publicly accessible. It could also be required, as in Austria, that electricity bills show the electricity mix being provided.[217]

8.2.3.9 Other elements

a) Additional payments

It is also possible to consider the payment of bonus amounts *inter alia* for very efficient technologies, the use of specific fuels, the upgrading (or repowering) of older wind and hydro facilities so that they become larger and more efficient,[218] local- or community-ownership and the use of innovative technologies.[219] While such bonus payments could encourage various social, environmental, and economic benefits,[220] their inclusion should be carefully considered as they can increase the administrative complexity and costs of the FIT programme,[221] and it has been argued that bonus payments should only be included if this does not affect the transparency of the programme and if their benefits outweigh the higher administrative costs.[222] For instance, the additional costs could be outweighed by benefits such as promoting local content or local ownership. This is considered further below.

[217] D Reiche and M Bechberger 'Policy Differences in the Promotion of Renewable Energies in the EU Member States' 2004 (32) *Energy Policy* 843-849, 846.
[218] This is unlikely to be too relevant in South Africa, in which there is not a mature renewable energy market.
[219] See Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 47-49.
[220] For example, repowering can achieve a 'higher electricity yield' 'with the same amount of wind turbines'. Mendonça *Feed-In Tariffs* (n83) 99.
[221] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 49.
[222] Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 81.

b) Promoting localisation

Promoting local content can assist in avoiding expensive imports[223] and contribute to economic growth and the creation of jobs.[224] In this regard it has been argued that

> 'the policy framework created by FIT policies has enabled certain countries such as Germany and Denmark to become incubators of RE technology and innovation, and create export opportunities in RE markets around the world. Combined with a long-term commitment to a renewable energy future, these countries have begun to lock in their strategic position in the energy economy of the 21st century'.[225]

Similarly, promoting localisation could provide an opportunity for South Africa to become a leader in Africa in regard to the manufacture of RET infrastructure.[226] This can be done in a number of ways, *inter alia* through local content requirements, local ownership laws, mandating international developers to transfer skills and technical capacity where foreign expertise are required,[227] and offering additional payments (discussed above) for a higher percentage of local content.[228] In certain countries RES-E generators are also required to pay a percentage of the revenue to the municipality in which the RES-E project is located.[229] Including such requirements would most likely increase the administrative complexity and the costs of the programme.[230] Requiring projects to have a certain percentage of local content may also create delays.[231]

The current REIPPP Programme, however, includes local content requirements. It has been reported that, in the second round of bidding, local content of at least 25 per cent of the total costs of projects was required for all RETs except solar PV and CSP without storage, for which 35 per cent was required. This was increased to 40 per cent and 45 per cent in the third round of bidding.[232] Furthermore, project

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223 Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 3.
224 Ibid, 133.
225 Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 104.
226 It has been noted that '[t]he greatest local benefit comes from a high degree of local ownership'. Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 133-134.
227 Ibid, 133.
228 Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 34.
229 Ragwitz et al *OPTRES Report* (n2) 125.
230 See for example Ragwitz et al *OPTRES Report* (n2) 126.
231 Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 34.
232 Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 57.

developers are required to pay between 1 and 1.5 per cent of project revenue to communities within a 50 kilometer radius to support socio-economic development.[233]

Against this background, it has been concluded that

'[l]ocal content strategies will likely continue to be a topic of intense discussion internationally. Countries will need to identify appropriate strategies for balancing their national economic development objectives with the cost and complexity of local content policies and with international trade regimes'.[234]

This is therefore also highlighted as an area for further consideration.

c) Environmental authorisation

As noted in Chapter 6, the regulations under the National Environmental Management Act[235] (the NEMA) only require environmental authorisations in respect of the construction of power plants which are more than 10 MW. However, under the REIPPPP it is required that all prospective projects obtain an environmental authorisation. It is proposed that under a FIT policy all projects should also be required to obtain an environmental authorisation, which would require project developers to comply with the environmental assessment process provided for in the NEMA and its regulations.[236] It would also be possible to include the construction of such projects as listed activities in regulations under the NEMA, for which an environmental assessment must be carried out.[237]

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[233] See L Tait, HL Wlokas and B Garside *Making Communities Count: Maximising local benefit potential in South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP)* (International Institute for Environment and Development) 2013 available at pubs.iied.org/pdfs/16043IIED.pdf [accessed 7 August 2013] 12 and M Gosling 'Go-ahead for 19 new energy projects' (13 May 2013) *Cape Times*.

[234] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 34.

[235] Act 107 of 1998.

[236] Department of Environmental Affairs *National Environmental Management Act (107/1998): Environmental Impact Assessment Regulations, 2010* GN 543 in *Government Gazette* No. 33306 dated 18 June 2010.

[237] Department of Environmental Affairs *National Environmental Management Act (107/1998): Listing Notice 1: List of Activities and Competent Authorities identified in terms of Sections 24(2) and 24D* GN 544 in *Government Gazette* No. 33306 dated 18 June 2010; Department of Environmental Affairs *National Environmental Management Act (107/1998): Listing Notice 2: List of Activities and Competent Authorities identified in terms of Sections 24(2) and 24D* GN 545 in *Government Gazette* No. 33306 dated 18 June 2010; Department of Environmental Affairs *National Environmental*

d) Direct selling

A further question is whether renewable energy generators should be allowed to sell RES-E directly to consumers under the FIT policy. In Germany, for example, it is possible to sell electricity directly to consumers, in which case generators may not claim the fixed tariffs but are paid a market premium (discussed in Chapter 5). In South Africa, the 2009 REFIT guidelines made provision for the direct selling of RES-E to consumers; however, this would have been 'outside of the REFIT mechanisms'.[238]

It was suggested above that it would not be appropriate for premium tariffs to be a feature of a FIT policy in the South African context. However, it would be possible to introduce direct selling subject to the usual tariffs for electricity being applied. If this is considered too complex at the outset, it could be introduced at a later stage.[239]

e) Net metering

Net metering is distinct from, but can complement, a FIT programme[240] and it has been argued that '[n]et metering and differentiated tariffs should be key considerations for any REFiT policy as they allow smaller, local producers to be involved'.[241] The IRP 2010-2030 confirms that

> '[n]et metering, which allows for consumers to feed energy they produce into the grid and offset this energy against consumed energy, should be considered for all consumers (including residential and commercial consumers) in order to realise the benefits of distributed generation'.[242]

Management Act (107/1998): Listing Notice 3: List of Activities and Competent Authorities identified in terms of Sections 24(2) and 24D GN 546 in *Government Gazette* No. 33306 dated 18 June 2010.

238 REFIT Regulatory Guidelines (n133) 15.

239 Indeed, in Germany the option of direct selling was only introduced with the EEG amendment of 2009, i.e. nine years after the implementation of the original EEG. This was discussed in 5.2.4.9.

240 Mendonça et al *Powering the Green Economy* (n75) 164.

241 Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 130.

242 Department of Energy *Electricity Regulation Act No.4 of 2006: Electricity Regulations on the Integrated Resource Plan 2010-2030* GNR 400 in *Government Gazette* No. 34263 dated 6 May 2011, 24. See also Scenario Building Team *Long Term Mitigation Scenarios: Strategic Options for South Africa* (Technical Summary, Department of Environmental Affairs and Tourism) 2007, 21.

It is submitted that it would be advantageous to include net metering in a South African FIT policy. However, municipalities have opposed net metering since it would reduce an important source of their income.[243] This issue would therefore need to be resolved.

f) Cost sharing

As discussed in Chapter 5, Germany has a sophisticated system in place to ensure that the increased costs of electricity due to the uptake of RES-E are borne by system operators across the country equally, rather than only the system operators that have a lot of 'green' electricity in their grids.[244] Thus, grid system operators and transmission system operators are required to keep records of how much has been spent on tariffs for RES-E to ensure that tariff costs are equalised amongst different system operators.

The situation would arguably be much simpler in South Africa. Eskom owns all of the transmission infrastructure and half of the distribution infrastructure, with the other half being owned by municipalities.[245] Thus, the transmission and distribution infrastructure is essentially owned by government. Furthermore, all independent power producers sell their electricity to Eskom and municipalities purchase their electricity from Eskom.

Once the ISMO is established[246] it will be charged with various responsibilities (discussed in Chapter 6) including the buying and selling of electricity. In future it would therefore be the ISMO that would practically be able to monitor the amount of RES-E fed into the grid and distributed to customers. However, the government will be the only member of the ISMO.[247] In either event there would thus be only one entity that is responsible for the purchase and sale of all electricity, whether it be Eskom or the ISMO. Furthermore, 'pass through arrangements' for independent power producers are already in place to ensure that the costs of electricity

[243] M Gosling 'Solar energy consumers gridlocked' *Cape Times* (13 February 2013).
[244] M Ringel 'Fostering the Use of Renewable Energies in the European Union: The race between feed-in tariffs and green certificates' 2006 (31) *Renewable Energy* 1-17, 16.
[245] J Krupa and S Burch 'A New Energy Future for South Africa: The political ecology of South African renewable energy' 2011 (39) *Energy Policy* 6254-6261, 6256.
[246] In terms of the imminent Independent System and Market Operator Act (n26).
[247] Ibid, section 3(b).

generation are distributed to all consumers (as noted in the discussion of the REFIT in Chapter 7). It is therefore submitted that few problems would arise with regard to the distribution of costs amongst different system operators, and that there would be no need for the establishment of a specific scheme for the sharing of costs to the extent required in Germany.

g) Forecast obligation

In some countries renewable energy generators are required to forecast ahead of time how much RES-E they plan to feed into the grid. In Spain, for example (as discussed in Chapter 5), RES-E generators are required to forecast the expected supply 30 hours beforehand.

A forecast obligation may be seen as an example of best practice as it can assist with integrating renewable energy into the grid, promote better grid management and also contribute to achieving ambitious renewable energy targets.[248] However, forecast obligations are usually imposed on larger, more intermittent resources, although they can be imposed on all generators above a certain size.[249] Indeed, a forecast obligation adds complexity to the system and may be costly for smaller IPPs.[250] It was also seen that in Spain (discussed in Chapter 5) the forecast obligation increased the costs of the programme.

In the draft (standard) power purchase agreement that was attached to the NERSA Consultation Paper for Phase 2 of the 2009 REFIT, provision was made for renewable energy sellers to provide monthly and weekly generation forecasts. However, it does not appear that any consequences were attached to the provision of inaccurate information.[251]

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[248] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 102. See also Ragwitz et al *OPTRES Report* (n2) 121 and Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 74.

[249] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 102.

[250] Imposing a penalty for deviations can also 'discriminate against smaller project developers'. Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 85. See also Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 79.

[251] National Energy Regulator of South Africa *NERSA Consultation Paper: Renewable Energy Feed-In Tariff Phase 2* (July 2009) available at http://www.nersa.org.za/Admin/Document/Editor/file/Electricity/REFIT%20Phase%20II%20150709.pdf [accessed 10 May 2013] Appendix A, 7.

While it would be possible to introduce a forecast obligation, in light of the potential disadvantage to smaller IPPs (especially if a penalty is imposed for submitting inaccurate information) and the increased costs attached to a forecast obligation, it is submitted that it would not be ideal to introduce a forecast obligation in South Africa, at least at the outset.

h) Financing the feed-in tariffs

It has been argued that, while 'many studies focus on the level of the feed-in tariffs, the levels themselves are irrelevant if they cannot be paid'.[252] However, it has also been argued that it should not be assumed that FIT policies will be expensive. On the contrary, countries can design their FIT policies so as to 'reflect their different policy goals and national circumstances [and] FIT policies can be designed to limit ratepayer impact and do not necessarily need to be "expensive" from the point of view of ratepayers'.[253] It has also been noted that renewable energy may actually be the cheapest power option in many countries.[254] Thus, a FIT policy may not actually require additional funding.

To the extent that FIT policies do require additional funding, the two primary ways in which the cost of the tariffs can be recovered (or the costs of the FIT policy be financed) are from ratepayers, i.e. electricity consumers, or from the national budget, i.e. taxpayers.[255]

In most countries that have implemented the FIT, the increased costs are effectively shared among all electricity customers.[256] This option necessarily increases the price of electricity[257] and there may be opposition if electricity prices

[252] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 52.
[253] Ibid, 79.
[254] Ibid.
[255] Ibid, 50. See further Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 92-94, who discuss different options with regard to ratepayer funding. It has been noted that it is unlikely that international climate change funding (including the CDM) will deliver the funds required to finance a FIT policy. See for example Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 84-87.
[256] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 92. See also Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 63.
[257] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 50.

are increased significantly. It is, however, possible to include provisions that limit the impact for low-income households and energy-intensive industries.[258]

An advantage of passing the costs on to taxpayers is that electricity prices need not be increased,[259] as the costs of RES-E would be funded from the general fiscus. This approach also provides a transparent way to monitor costs. On the other hand, passing the costs on to taxpayers can be controversial and taxes are not likely to be popular.[260] It may also result in uncertainty with regard to the availability of funding and create risk for RES-E generators; for example, 'if renewable energy development begins to happen very quickly, the budget will be more quickly exhausted, dampening investment appetite as renewable energy development picks up'.[261]

In Germany, the increased costs of electricity are spread amongst all consumers. The impact of the FIT policy on electricity-intensive consumers is further limited by the special equalisation scheme (discussed in Chapter 5) and the cost reductions enjoyed by electricity-intensive consumers are transferred to other electricity consumers.[262] In China the additional costs of RES-E are also spread amongst consumers through the imposition of country-wide levy on the sale of electricity.[263]

South Africa's 2009 REFIT guidelines provided for the tariff costs to be recovered from electricity consumers.[264] It is submitted that in terms of a future FIT policy the tariffs should likewise be paid by electricity consumers.

According to some, passing on the costs of a FIT policy entirely to consumers in developing countries may lead to negative consequences, and undermine efforts to increase access to energy and alleviate poverty.[265] To avoid this, social transfer mechanisms should be implemented so that energy-intensive users and wealthy households cross-subsidise low-income households. One way of doing this would be

[258] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 102.
[259] Couture and Gagnon 'An Analysis of Feed-in Tariff Remuneration Models' (n120) 959.
[260] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 95.
[261] Ibid. See also Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 52.
[262] Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 67.
[263] Renewable Energy Law of the People's Republic of China (as amended), Article 20.
[264] Electricity consumers would pay the difference between 'the cost of energy purchased under REFIT and the Avoided Cost'. REFIT Regulatory Guidelines (n133) 15.
[265] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 16 and 3.

to exempt certain groups, such as low-income consumers, from paying the additional costs due to the FIT policy.[266] It would also be possible to introduce subsidies for low-income households.[267] Furthermore, South Africa's free basic electricity policy (discussed in Chapter 3) could possibly be strengthened.

However, it was seen in Chapter 3 that the price of conventional coal-generated electricity in South Africa has increased considerably, and average electricity prices have risen from 18c/kWh in 2007 to about 65c/kWh in 2013.[268] The increased costs are borne entirely by consumers. At the same time, the costs of renewable energy are continuously decreasing. This makes it likely that 'the "gap" between conventional and renewable energy sources will narrow and the amount of "above market" FIT payments will decrease'.[269]

At present, the average price of electricity in South Africa is about 65c/kWh, while the average cost of wind energy in the third round of bidding under the REIPPPP was approximately 66c/kWh.[270] As noted above, it has also been reported that electricity generated from the new coal power plants, Medupi and Kusile, will cost 97c/kWh.[271] It therefore appears that wind energy will cost less than new coal options.

If a carbon tax is introduced in South Africa, it would also be possible to use part of the revenue raised to finance the FIT, which would assist in offsetting some of the increased costs of electricity due to the uptake of RES-E (to the extent that these arise).[272] This means that consumers would still feel some impact of increased

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[266] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 81.
[267] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 2.
[268] Figures obtained from Eskom *Integrated Report 2011* available at http://financialresults.co.za/2011/eskom_ar2011/downloads/eskom-ar2011.pdf [accessed 15 January 2013] 15 and Eskom *Interim Integrated Report 2012* available at http://www.pads.eezeepage.co.za/i/94638/4 [accessed 16 January 2013] 13.
[269] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 81-82. See also Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 2.
[270] Department of Energy (Renewable Energy IPP Procurement Programme) *Bid Window 3: Preferred Bidders' Announcement* 2013 available at http://www.energy.gov.za/IPP/List-of-IPP-Preferred-Bidders-Window-three-04Nov2013.pdf [accessed 5 November 2013]. The average bid price for wind decreased from about 90c/kWh in the second round of bidding. See Department of Energy *Renewable Energy IPP Procurement Programme: Window two Preferred Bidders' announcement* (21 May 2012) available at www.energy.gov.za [accessed 20 May 2013]. As discussed in 7.4.1.1 above.
[271] Gosling 'Go-ahead for 19 new energy projects' (n233).
[272] The possibility of using revenue generated from a carbon tax to fund a RES-E programme has also been mooted in A Marquard, B Merven and E Tyler 'Costing a 2020 Target of 15% Renewable Electricity for South Africa' 2008 (Energy Research Centre, University of Cape Town) available at

electricity prices. However, this would result in the 'good', i.e. RES-E not being penalised and actually being subsidised, while the 'bad', i.e. electricity generated from coal would be penalised, which would sent the correct price signal to consumers. It would effectively amount to cross-subsidisation in line with the environmental fiscal reform approach that was discussed in Chapter 4.

In Mauritius, for example, a small-scale FIT programme is in place, which is financed by a fund – the Maurice Ile Durable Fund – which derives its revenue from a carbon tax on fossil fuels. It is described as being 'popular with citizens as it does not increase the financial burden on consumers, as is the case in many other countries'.[273]

As noted already, the South African government plans to implement a carbon tax in 2015. It has not yet indicated how the proposed carbon tax will interact with the REIPPPP and the IRP 2010-2030, which sees renewable energy capacity increasing by 17.8 GW by 2030.

8.2.3.10 Administrative aspects

a) Overview

The imposition of a feed-in tariff in itself may not be sufficient to ensure that renewable energy is taken up. The entire policy framework as well as other non-economic barriers must be considered, including grid-related and administrative barriers.[274] It has been noted that even a well-designed FIT policy may be ineffective

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http://www.erc.uct.ac.za/Research/publications/08-Marquardetal-costing_a_2020_target.pdf [accessed 26 May 2011] 37.

[273] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 45. However, this source of revenue would be threatened if the use of fossil fuels was to decrease. It is also argued that '[i]f the government is serious about meeting its target and sees the REFiT as part of the solution, it may need to explore financing options beyond the MIDF'. At 45-46.

[274] See for example United Nations Environment Programme (UNEP) Finance Initiative *Financing Renewable Energy in Developing Countries: Drivers and Barriers for Private Finance in Sub-Saharan Africa* (A study and survey by UNEP Finance Initiative on the views, experiences and policy needs of energy financiers) 2012 available at http://www.unepfi.org/fileadmin/documents/Financing_Renewable_Energy_in_subSaharan_Africa.pdf [accessed 18 January 2013] 48-50 and S Ölz (for the International Energy Agency and Organisation for Economic Co-operation and Development) *Deploying Renewables: Principles for Effective Policies*

in the face of *inter alia* administrative barriers such as long project approval times.[275] Furthermore, a FIT policy 'should not be seen as an isolated policy for the energy sector, but as an integral part of a country's overall development strategy'.[276] It should also 'be integrated with rural development and poverty eradication strategies'.[277] While it is not possible to resolve all of these complex issues in this thesis, they are briefly considered below.

b) Barriers

(i) *Administrative barriers*

It is widely accepted that administrative barriers can have 'a significant impact on the success of an instrument and hamper the effectiveness of technically very powerful policy schemes'.[278] Streamlining administrative processes and regulations can lower costs for investors, which would ultimately assist in reducing the generation costs and ultimate tariffs.[279]

Specific recommendations with regard to overcoming administrative barriers, include the setting of time limits for the approval process,[280] reducing the number of authorities involved and establishing a 'one-stop shop' to coordinate the entire process,[281] and spatial planning at the local level to 'anticipate future renewable energy projects by including them when drafting or revising regulations and standards'.[282] It is also important that the relevant policies are simple to implement and comply with, and any permission and administrative procedures should be clear

2008 available at http://www.iea.org/publications/freepublications/publication/name,15746,en.html [accessed 14 July 2011] 23. See also Ragwitz et al *OPTRES Report* (n2) 182-190, who set out a number of barriers (other than financial) that have been experienced in the European context.

[275] Mendonça et al *Powering the Green Economy* (n75) 34. See also Ölz *Deploying Renewables: Principles for Effective Policies* (n274) 23, who refers to the importance of removing non-economic barriers first.

[276] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 128.

[277] Ibid, 133.

[278] Ragwitz et al *OPTRES Report* (n2) 49.

[279] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 83-84.

[280] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 23.

[281] Ibid, 24.

[282] Ibid.

and straightforward.[283] It has also been suggested that simpler procedures be designed for smaller projects.[284]

It has been argued that governments and state-owned utilities can help to reduce the project development costs by providing the necessary information on the country's renewable energy potential.[285] For example, solar and wind maps have been established for South Africa, as seen in Chapter 3, which would assist prospective IPPs in deciding the most appropriate areas for the establishment of RES-E plants.[286] In Germany municipalities are required to indicate where it is viable to build plants in their spatial planning.[287] In Germany (and in Denmark) municipalities are also required to

> 'reserve specific areas for wind turbines and have set restrictions on proximity to buildings and lakes, among other things. These policies have been extremely successful, reducing uncertainty about if and where turbines can be sited and expediting the planning process'.[288]

It would certainly make it easier for prospective IPPs if it were known in advance where, in terms of planning laws, it is possible to establish different RES-E plants.

It must also be decided whether a power purchase agreement with the grid operator is required. If a power purchase agreement (PPA) is required it should be specified whether this contract is standard. A standardised PPA could include provisions regulating aspects such as project size, technology type, ownership structure and expected annual generation.[289] An advantage of such contracts is that they could 'streamline the project development process'.[290] This would also reduce

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[283] Mendonça *Feed-In Tariffs* (n83) 104.
[284] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 23.
[285] Ibid, 132.
[286] See also n268 in Chapter 3, which discusses the planned development of 'Renewable Energy Development Zones' by the government, which would 'allow for wind and solar PV energy projects … to be developed in these areas without requiring additional environmental authorisation'. This would also be relevant to the discussion of environmental authorisation in 8.2.3.9 above.
[287] Reiche and Bechberger 'Policy Differences in the Promotion of Renewable Energies' (n217) 845.
[288] Sawin *National Policy Instruments: Policy Lessons* (n1) 23.
[289] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 72.
[290] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 70. See also Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 3. It has been noted (in the African context) that '[t]he introduction of standardised feasibility templates and PPAs has successfully reduced red tape'. Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 132.

administrative costs, provide security and increase efficiency as well as transparency.[291]

(ii) *Social barriers*

Promoting public acceptance of renewable energy and a FIT policy is highly important.[292] In Portugal it is required that wind generators pay 2.5 per cent of the revenue received to the municipality in the location of the wind turbine.[293] While this may increase public acceptance as well as public welfare in the relevant location, it also increases administrative complexity and increases costs for RES-E generators.[294] However, as noted above, the REIPPPP similarly requires RES-E generators to pay between 1 and 1.5 per cent of project revenue to communities within a 50 kilometer radius to support socio-economic development.[295]

In Denmark and Germany local ownership of wind turbines has assisted in increasing the acceptance of wind energy.[296] Local content requirements, which are included under South Africa's REIPPP Programme, could have a similar effect.

In addition, it is submitted that the relevant government department, i.e. the Department of Energy, should be responsible for raising awareness regarding the benefits and importance of RES-E.

(iii) *Grid-related barriers*

While insufficient grid capacity could be a cause for concern,[297] it is submitted that this would not necessarily arise in the South African context.[298] As government plans

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[291] In Germany a written contract is not required as the purchase obligation does away with the need for a formal PPA. Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 72.
[292] Mendonça *Feed-In Tariffs* (n83) 104.
[293] Ragwitz et al *OPTRES Report* (n2) 125.
[294] Ibid, 126.
[295] See Tait et al *Making Communities Count: Maximising local benefit potential in South Africa's REIPPPP* (n233) 12 and Gosling 'Go-ahead for 19 new energy projects' (n233).
[296] Reiche and Bechberger 'Policy Differences in the Promotion of Renewable Energies' (n217) 846.
[297] See for example Ragwitz et al *OPTRES Report* (n2) 184.
[298] See Reiche and Bechberger 'Policy Differences in the Promotion of Renewable Energies' (n217) 846; Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 131-132; and Couture et al *A*

to double grid capacity by 2030 in any event, this would enable the additional RES-E to be absorbed.

Another important aspect, alluded to above, is the integration of RES-E into the grid in light of the intermittency of some RETs. This refers to 'balancing power', which can 'be interpreted as implying that conventional power capacity has to be available to compensate for any missing production from renewable plants'.[299] However, it would also be possible to 'balance' intermittent RETs with more stable RETs such as biomass and hydro. Furthermore,

> 'it should be stressed that there are other ways to balance RES-E production than the use of conventional power plants. Strong RES-E deployment could push the innovation in new storage facilities for handling the intermittency of RES-E power production'.[300]

However, integration of RES-E into the grid is a complex technical issue, which cannot be fully resolved here and is highlighted as another issue for further consideration.

c) Queuing

The need for queuing procedures can arise especially where the FIT policy imposes a cap, which makes it more likely that prospective IPPs would enter speculative bids in order to 'reserve' a place in the queue, in respect of a project that may or may not be developed.[301]

There are several ways to deal with this challenge. For example, a security deposit could be required, which would be repaid as specific milestones are achieved, or a financial commitment for the interconnection application could be introduced, or increased in respect of projects above a certain size.[302] This is likely to

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Policymaker's Guide to Feed-in Tariff Policy Design (n3) 86-87, who deal with the problem of limited grid capacity.

[299] Ragwitz et al *OPTRES Report* (n2) 150.

[300] Ibid, 151.

[301] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) 88.

[302] Ibid. It was noted above that under the REIPPPP, prospective RES-E generators are required to pay a deposit of R100 000 in respect of each megawatt of (proposed) installed capacity. T Creamer 'Renewables project developers pore over tender documents' (4 August 2011) *Engineering News*

reduce the risk of speculative queuing and increase the likelihood that prospective IPPs ‘will submit honest applications and that the proposed projects will be developed in a timely and efficient manner’.[303] However, it could also act as a barrier to small investors.

It may be noted that this challenge would not arise if there were no caps in place, as in Germany.[304]

d) Programme revisions

While the provision of certainty and security to investors is crucial, it is also important that the system be flexible and that governments are able to address any barriers as they emerge.[305] This can be done by allowing for programme revisions.

Programme revisions should be distinguished from tariff adjustments and tariff reviews, discussed above at 8.2.3.7. Programme revisions relate to far broader decisions, such as whether to impose a capacity cap or whether to impose restrictions with regard to eligible technologies. Programme revisions ‘typically involve a more detailed review of the policy’s success, while highlighting where changes need to be made based on both evolving policy goals and changing technology costs and market conditions’.[306] While the REFIT Regulatory Guidelines provided for the review of the programme, no provision was made for programme revisions.

Programme revisions may occur at predetermined dates (for example, every four years), or may be triggered by the attainment of specific capacity milestones.[307] Programme revisions triggered by predetermined dates can increase transparency, and also promote investor confidence through the provision of a stable timetable for

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available at http://www.engineeringnews.co.za/article/renewables-project-developers-pore-over-tender-documents-2011-08-04 [accessed 5 August 2011]. This could be viewed as a queueing procedure.

[303] Couture et al *A Policymaker’s Guide to Feed-in Tariff Policy Design* (n3) 89. See also Kreycik et al *Innovative Feed-In Tariff Designs that Limit Policy Costs* (n78) 17, who describe the queuing procedure implemented with regard to the California Solar Initiative Programme.

[304] Couture et al *A Policymaker’s Guide to Feed-in Tariff Policy Design* (n3) 89.

[305] Mendonça *Feed-In Tariffs* (n83) 103.

[306] Couture et al *A Policymaker’s Guide to Feed-in Tariff Policy Design* (n3) 77.

[307] Ibid, 78.

revisions, which can promote more renewable energy development.[308] On the other hand, policy revisions triggered by the attainment of capacity milestones will increase the flexibility of the programme and also provide a programme that is more responsive to cost factors.[309] However, the latter approach may create uncertainty for RES-E generators and investors regarding when milestones will be reached.[310]

In Germany, the EEG makes provision for the Federal Government to evaluate the Act and submit a progress report by 31 December 2014 – i.e. within three years of implementation – and every four years thereafter.[311] It is submitted that in South Africa, simplicity and transparency should be preferred and that policy revisions should similarly occur at predetermined dates.

e) Choice of legal instrument

Another question relates to whether the FIT should be implemented in terms of legislation or regulations. It has been argued that implementing a feed-in tariff via legislation provides the feed-in tariff with the force of law and could increase investor confidence.[312] On the other hand, implementing a feed-in tariff through regulations provides the opportunity for more participation by all stakeholders.[313]

In Germany, specific legislation was enacted to establish the feed-in tariff, and it is recommended that the same approach be followed in South Africa. Indeed, when the NERSA introduced the REFIT it stated that introducing a feed-in tariff through legislation 'would enable the process to be all encompassing'.[314] It is submitted that the Department of Energy should be responsible for introducing the relevant legislation.

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[308] Ibid, 77.
[309] Ibid, 78.
[310] Ibid, 79.
[311] Gesetz fur den Vorrang Erneuerbarer Energien (Erneuerbare-Energien-Gesetz, BGBI. I S. 1754) (Renewable Energy Sources Act) (EEG of 1 April 2012) available at http://www.erneuerbare-energien.de/fileadmin/Daten_EE/Dokumente__PDFs_/eeg_2013_bf.pdf section 65.
[312] Rickerson et al *Feed-in Tariffs in Developing Countries* (n18) 18-19.
[313] Ibid, 19.
[314] REFIT Regulatory Guidelines (n133) 29-30.

It was noted in Chapter 7 that the REFIT, in the view of government, did not comply with South Africa's preferential procurement rules,[315] but that according to Wim Trengove SC this was not necessarily the case. It was also reported that government did entertain the possibility of amending the legislation in order to allow for a fixed tariff.[316] It is thus submitted that, if a feed-in tariff is found to breach South Africa's procurement laws, amendment of the relevant legislation should be considered.[317]

Alternatively, the Minister of Finance would be able to exercise his discretion to exempt the relevant organs of state from the requirements of the PPPF Act that relate to price competition on the basis that 'the likely tenderers are international suppliers'[318] and that 'it is in the public interest' to do so.[319]

8.2.4 General comments

It has been argued that a FIT policy should be designed with the goal of providing security to prospective RES-E investors while at the same time (which is especially important in South Africa) ensuring that the policy is designed with a view to cost containment.[320]

To this end, maintaining simplicity at the outset is important. In relation to the REFIT it was argued that '[a] simple REFIT will be easy to implement quickly – the greater the complexity of the REFIT the more chance of delays or confusion in its implementation'.[321] It is submitted that this would apply equally to a future FIT policy, especially in a developing country like South Africa.

[315] Including the Preferential Procurement Policy Framework Act 5 of 2000. This was discussed in 7.3.10 above.
[316] M Gosling 'Government's U-turn on wind energy rates' (20 June 2011) *Cape Times*.
[317] For example, the Preferential Procurement Policy Framework Act could arguably be amended to provide for a fixed price, which was acknowledged by government as a possibility. See Gosling 'Government's U-turn on wind energy rates' (n316) .
[318] PPPF Act (n315) section 3(b).
[319] Ibid, section 3(c).
[320] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n3) x. See also Del Río 'The Dynamic Efficiency of Feed-in Tariffs' (n8) 149-150.
[321] REFIT Regulatory Guidelines (n133) 36. See also Klein et al *Evaluation of Different Feed-in Tariff Design Options* (n71) 79.

The elements that have been considered necessary for an effective FIT policy are:

- a binding target for RES-E;
- the inclusion of a range of renewable energy technologies;
- an obligation to connect RES-E generators to the grid and to purchase the RES-E generated as a priority;
- the establishment of appropriate (fixed) tariffs, which are guaranteed for a period of approximately 20 years;
- the differentiation of tariffs to some extent, for example, in respect of different RETs;
- providing for the adjustment of tariff levels through (basic) automatic degression;
- the consideration of measures to contain costs especially with regard to more expensive RETs such as solar energy – for example, through the use of caps or growth corridors;
- the potential inclusion of bonus payments, for example, for the promotion of local content; and
- providing for transparency and the provision of information.

Other elements that could potentially be included are direct selling and net metering. More technical aspects such as administrative and grid-related barriers must also be addressed. Furthermore, it would need to be determined how the FIT policy would be financed.

It is important that a FIT policy should not be implemented indefinitely since preferential tariffs will no longer be required once RES-E reaches grid parity (i.e. once RES-E costs the same as conventional electricity). In this regard, it has been noted that 'feed-in tariffs are better for the interim stage of market introduction',[322] and that when markets and RETs are more mature, instruments such as a renewable obligation with the option of trading, could be introduced. This could be accompanied by tender programmes in regard to large-scale projects, such as

[322] Ragwitz et al *OPTRES Report* (n2) 4-5.

offshore wind energy.[323] While the issue is not considered further here, it is something that should perhaps be considered at a later stage.

No less essential (as alluded to above) is political will. Indeed,

> '[p]olitical will and support at the highest level is very important to overcome internal barriers such as vested interests of the current power producers. In Ethiopia, the lack of enthusiasm has kept the policy under revision in draft format for four years, while in Egypt and South Africa the REFiT has been sidelined in favour of a bidding process'.[324]

In the context of wind energy specifically it has been noted that, while Germany has lower wind potential than a number of other European countries it has much more wind power due to the 'favourable political climate'.[325] In the South African context specifically it has been noted that

> '[u]nlike many other developing countries, South Africa does not suffer greatly from lack of technological capacity or inability to raise finance, as has been demonstrated by large-scale and innovative projects developed in the past in the energy sector (for instance, the development of a large-scale synfuels programme in the 1970s, or the electrification programme in the 1990s). However, not all projects are pursued with equal political will or find a conducive economic environment'.[326]

8.3 Concluding remarks

This chapter has examined the elements of a possible feed-in tariff framework in South Africa, with reference to recommendations in the literature as well as international experience. Some reference has also been made to the REFIT that was introduced (but not fully implemented) in South Africa in 2009. While developed

[323] Ibid. See also Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 130 and Sawin *National Policy Instruments: Policy Lessons* (n1) 27.
[324] Nganga et al *Powering Africa through Feed-in Tariffs* (n3) 129.
[325] Greenpeace and Global Wind Energy Council *Global Wind Energy Outlook* 2010 available at http://www.gwec.net/wp-content/uploads/2012/06/GWEO-2010-final.pdf [accessed 16 March 2011] 52.
[326] H Winkler and A Marquard 'Changing Development Paths: From an energy-intensive to low-carbon economy in South Africa' 2009 (1) *Climate and Development* 47-65, 59-60.

countries generally provide the best practice examples, this chapter has attempted to consider the appropriate design of the relevant elements in a specifically South African context.

Given the importance of the financial impact of a FIT policy, it has been noted that certain RETs may be reaching grid parity; for example, wind energy may cost less than new coal options in South Africa. Thus, it cannot be assumed that the development of all RETs will be too expensive in South Africa, and the focus should rather be on controlling the costs of more expensive RETs such as solar energy.

While recommendations have been made in this chapter, certain issues have been highlighted as areas for further consideration, including how best to contain the costs of the FIT programme in the face of excessive cost increases, and how to effectively promote localisation with regard to RES-E projects and integrate RES-E into the grid.

As noted above, a FIT programme in South Africa has not necessarily been ruled out, especially in light of the opacity and uncertainty surrounding the decision to replace the REFIT with the REIPPPP. Furthermore, the REIPPP Programme has only been implemented in respect of specific amounts of RES-E capacity. It is thus still (arguably entirely) competent for a FIT policy to be developed and implemented with regard to the uptake of RES-E in the future.

Chapter 9

Key recommendations and conclusions

9.1 Overview

The research underlying this thesis was undertaken during 2010 to 2013 – a period during which the legal and policy framework in South Africa for energy generally and renewable energy in particular was undergoing rapid and considerable transition.

The research was broadly concerned with (a) describing and discussing the primary market-based instruments that have been implemented internationally to promote renewable energy with a view to identifying which have been the most effective; and (b) in light of these findings, discussing the legislative and policy developments that would be necessary for the successful implementation of such instruments in South Africa.

These questions were approached by first considering the problem of climate change. It was seen that climate change has been fuelled by increased energy demand since the time of the Industrial Revolution. This demand has been met primarily by coal and has resulted in a significant increase in greenhouse gas emissions, primarily carbon dioxide, and a consequent rise in global temperatures.[1] In light of continuing economic growth, greenhouse gas emissions show no signs of abating and climate change has been described as 'the biggest challenge of our time'.[2]

Climate change poses considerable risks to South Africa due to its developing country status and its particular vulnerabilities. However, South Africa is also a

[1] See for example H Winkler (ed) *Energy Policies for Sustainable Development in South Africa: Options for the Future* 2006 (Energy Research Centre, University of Cape Town) 1-2.
[2] K Annan 'A united call for action on climate change' *The Washington Post* (23 January 2014) available at http://www.washingtonpost.com/opinions/kofi-annan-a-united-call-for-action-on-climate-change/2014/01/22/3694fa0c-82c1-11e3-9dd4-e7278db80d86_story.html?hpid=z3 [accessed 7 February 2014].

comparatively significant contributor to climate change due to its significant reliance on coal to generate energy.[3] Indeed, while developed countries are historically responsible for the majority of greenhouse gas emissions, as developing countries strive to attain higher levels of socio-economic development, their energy generation and consumption is increasing significantly. While it would not be fair to curtail the growth of developing countries, which has been recognised in the international climate change negotiations,[4] the continuous growth of greenhouse gas emissions is projected to have disastrous consequences on a global scale, as indicated in a number of studies.[5] In this regard, it has been argued that taking early action to respond to climate change should be considered an investment that could assist in avoiding more severe consequences and higher costs in the future.[6]

This thesis has emphasised the need to rely on other energy sources, including renewable energy (internationally and in South Africa). It has been recognised that renewable energy has the potential to be 'a major contributor in protecting our climate, nature, and the environment as well as providing a wide range of environmental, economic and social benefits that will contribute towards long term global sustainability'.[7]

However, it was seen that a significant barrier to renewable energy is that it generally has higher upfront costs than conventional fossil fuel-generated energy. While this does not take into account various factors, such as the provision of large subsidies to fossil fuel industries,[8] financial support for renewable energy is still required at least at the outset.[9]

The thesis discussed the move internationally towards market-based instruments, due to the recognition that they can be more effective than command-

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[3] Department of Environmental Affairs *National Climate Change Response White Paper* GN 757 in *Government Gazette* No.34695 dated 19 October 2011, 11. As discussed in 2.3 above.
[4] As discussed in 2.2.3 above.
[5] As discussed in Chapter 2.
[6] 'Executive Summary' *Stern Review: The Economics of Climate Change* 2006 available at http://news.bbc.co.uk/1/shared/bsp/hi/pdfs/30_10_06_exec_sum.pdf [last accessed 19 August 2012] i. As discussed in 2.2.2 above.
[7] National Energy Regulator of South Africa (NERSA) *South Africa Renewable Energy Feed-in Tariff (REFIT): Regulatory Guidelines* in GN 382 of 2009 in *Government Gazette* 32122 dated 17 April 2009, 11. Further benefits of renewable energy were discussed in 3.2.2.2.
[8] Such factors were outlined in 3.2.2.3.
[9] Department of Minerals and Energy *White Paper on the Renewable Energy Policy of the Republic of South Africa* GN 513 in *Government Gazette* No. 26169 dated 14 May 2004, 44.

and-control instruments in achieving environmental goals.[10] Several market-based instruments have been introduced internationally to promote electricity generated from renewable energy sources (RES-E), including the feed-in tariff (FIT), the renewable obligation and renewables tendering. These were discussed in detail in Chapter 4 and it was identified that the FIT has been the most effective in promoting RES-E *inter alia* due to the 'overall **stability and continuity**' provided by the policy framework,[11] which is necessary to encourage investment and growth in the renewable energy industry.[12] It was seen that South Africa has implemented a renewables tendering programme. However, it has been noted that there is no internationally acknowledged tendering success story and that renewables tendering programmes tend to create stop-and-go cycles, which is contrary to the objective of providing stability and continuity.[13]

In light of these findings, Chapter 5 considered the implementation of the FIT internationally, with the object of identifying the elements that should be present in a model feed-in tariff policy, which could be used to inform the design of a possible FIT policy in the South African context. The focus was on the German FIT, which is acknowledged to be a great success and was thus considered as an example of best practice. However, the FIT policies of other countries, namely Spain, India and China were also explored and discussed briefly, and some preliminary observations were made regarding the elements that should ideally be included in a future FIT policy in South Africa.

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[10] This move to market-based instruments and the rationale for their implementation were discussed in Chapter 4.

[11] TD Couture, K Cory, C Kreycik and E Williams *A Policymaker's Guide to Feed-in Tariff Policy Design* (for the national Renewable Energy Laboratory, US Department of Energy) 2010 available at http://www.nrel.gov/docs/fy10osti/44849.pdf [accessed 24 April 2012] 11. See also J Nganga, M Wohlert, M Woods, C Becker-Birck, S Jackson and W Rickerson (study for the Heinrich Böll Stiftung and the World Future Council) *Powering Africa through Feed-in Tariffs: Advancing Renewable Energy to Meet the Continent's Electricity Needs* 2013 available at http://www.worldfuturecouncil.org/fileadmin/user_upload/PDF/Feed_in_Tariff/Powering_Africa_through_Feed-in_Tariffs.pdf [accessed 26 March 2013] 10.

[12] J Lipp 'Lessons for Effective Renewable Electricity Policy from Denmark, Germany and the United Kingdom' 2007 (35) *Energy Policy* 5481-5495, 5483. See also REFIT Regulatory Guidelines (n7) 27.

[13] JL Sawin *National Policy Instruments: Policy Lessons for the Advancement & Diffusion of Renewable Energy Technologies Around the World* (Thematic Background Paper) 2004 available at http://siteresources.worldbank.org/EXTRENENERGYTK/Resources/5138246-1237906527727/5950705123929049336/National0Polic1ies0around0the0World.pdf [accessed 26 April 2013] 9. This was discussed in 4.4.1.3.

Chapter 6 outlined the legislation and policy documents that have been implemented in South Africa that are relevant to the promotion of renewable energy in order to trace the development of renewable energy policy. Even though South Africa has considerable renewable energy resources,[14] it was seen that the promotion of renewable energy did not receive high priority until the end of the last decade.[15] However, government has more recently envisaged a more important role for renewable energy in the future, which is evidenced by the inclusion of renewable energy in the Integrated Resource Plan 2010-2030[16] (IRP 2010-2030).

The increased importance attached to renewable energy by the South African government has also been evidenced by the introduction of market-based instruments to promote renewable energy, notably the Renewable Energy Feed-in Tariff (REFIT) and the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). These were both discussed in detail in Chapter 7 and the reasons for the replacement of the REFIT by the REIPPPP were critically considered.[17]

Aside from the debate regarding the legal basis of the REFIT, it appears that a major concern was the potential cost of the programme.[18] However, it has been argued that 'FIT policies can be designed to limit ratepayer impact and do not necessarily need to be "expensive" from the point of view of ratepayers'.[19] In light of the international effectiveness of the FIT and the view that FITs can be successful in developing countries if well-designed,[20] Chapter 8 considered the legislative and policy developments that would be necessary to implement a FIT policy in South

[14] This was discussed in 3.3.4.3.
[15] This was seen in the discussion contained at 6.4 above.
[16] Department of Energy *Electricity Regulation Act No. 4 of 2006: Electricity Regulations on the Integrated Resource Plan 2010-2030* GNR. 400 in *Government Gazette* No. 34263 dated 6 May 2011. This has been discussed in detail in 6.4.6. In addition, the role of renewable energy has increased from the IRP 1 (Department of Energy *Electricity Regulation Act, 2006: Determination regarding the Integrated Resource Plan and new generation capacity* GN 25 in *Government Gazette* No. 32898 dated 29 January 2010) to the present IRP 2010-2030.
[17] In 7.3.10.
[18] Nganga et al *Powering Africa through Feed-in Tariffs* (n11) 55-56.
[19] W Rickerson, C Laurent, D Jacobs, C Dietrich and C Hanley *Feed-in Tariffs as a Policy Instrument for Promoting Renewable Energies and Green Economies in Developing Countries* 2012 (United Nations Environment Programme) available at www.unep.org/pdf/UNEP_FIT_Report_2012F.pdf [accessed 28 March 2013] 79.
[20] See Nganga et al *Powering Africa through Feed-in Tariffs* (n11) 10; Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n11) x and M Mendonça, D Jacobs and B Sovacool *Powering the Green Economy: The feed-in tariff handbook* 2010, 67-76.

Africa, with a focus on the elements that should be included in such a policy. These are set out below.

9.2 Key recommendations

Only the key points and recommendations are highlighted here, while the full discussion on which these are based is contained in 8.2 above. An initial recommendation is that the initial form of the recommended feed-in tariff policy not be too complex, which is important in the developing country context.[21]

9.2.1 Institutions

As discussed in 8.2.2, the Department of Energy would be responsible for the introduction and administration of a FIT policy. The NERSA would remain responsible for the issuing of licences and the regulation of tariffs. RES-E generators would enter into power purchase agreements with Eskom or the Independent System and Market Operator (ISMO) once it is established. In this regard, the process of approving the ISMO Bill[22] has been a drawn-out one and it is important that this process be finalised as this would provide more certainty in the sector. The Department of Environmental Affairs would be responsible for the consideration of applications for environmental authorisations.

9.2.2 A binding target for renewable energy

A binding target for RES-E and/or renewable energy should be established as this would signal a 'long-term commitment to [prospective] investors'.[23] In establishing an

[21] Nganga et al *Powering Africa through Feed-in Tariffs* (n11) 14.
[22] Department of Energy *Independent System and Market Operator Establishment Bill* in GN 290 in *Government Gazette* No. 34289 dated 13 May 2011.
[23] Nganga et al *Powering Africa through Feed-in Tariffs* (n11) 24. See also M Ragwitz, A Held, G Resch, T Faber, R Haas, C Huber, PE Morthorst, SG Jensen, R Coenraads, M Voogt, G Reece, I Konstantinaviciute and B Heyder *OPTRES: Assessment and Optimisation of Renewable Energy Support Schemes in the European Electricity Market* (Final Report) 2007 available at http://www.optres.fhg.de/OPTRES_FINAL_REPORT.pdf [accessed 11 July 2011] 23. Specific details regarding the location of such targets was discussed in 8.2.3.2.

appropriate target, reference should be made to the potential for renewable energy in South Africa, which is significant and which has been considered by the South African government and in various studies.[24] The estimates in these studies are considerably more ambitious than the 'target' contained in the Integrated Resource Plan 2010-2030 of 9 per cent contribution of RES-E to electricity supply by 2030.[25] Using the words 'at least' to precede the target, as in Germany,[26] should also be considered as this would ensure that the 'target' does not act as a cap on the uptake of RES-E.

9.2.3 Definitions

Certain terms, including 'renewable energy' and 'purchasing entity' must be defined under the FIT policy in order to avoid ambiguity.

With regard to *renewable energy*, it is submitted that the definition contained in the National Energy Act (discussed in Chapters 6 and 8) is appropriate, and thus the FIT policy could provide that 'renewable energy' has the meaning assigned to it under the National Energy Act. It was noted in Chapter 3 that nuclear energy is not considered to be a renewable source of energy. RES-E could be defined simply in terms of its usual meaning as 'electricity generated from renewable energy sources'.[27]

The *purchasing entity* should be defined as Eskom, and subsequently the ISMO, once it is established.[28] As identified in 8.2.3.3, further technical terms such as 'generator', 'transmitter' and 'distributor' should also be defined, perhaps with reference to the definitions contained in the Electricity Regulation Act.[29]

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[24] As discussed in 3.3.4.3 above.
[25] IRP 2010-2030 (n16). This has been discussed in detail in 6.4.6.
[26] As discussed in 8.2.3.2 above.
[27] As discussed in 8.2.3.3.
[28] In terms of the imminent Independent System and Market Operator Act. As discussed in 8.2.3.3.
[29] Act 4 of 2006.

9.2.4 Eligibility criteria

Establishing which projects should be eligible under a FIT policy is important and as discussed in 8.2.3.4, decisions must be made with regard to a number of elements, including which renewable energy technologies (RETs) should be eligible and regarding the size and the age of projects that may participate.

A key recommendation is that a range of RETs is included under a FIT policy, namely onshore wind energy, solar photovoltaic (PV), concentrated solar power (CSP) (with and without storage), solid biomass, biogas, landfill gas and small hydro.[30] This would encourage the development of a number of RETs including less mature RETs. In this regard, South Africa has substantial potential for solar energy, and it would be beneficial to develop this RET. Including a range of RETs would also provide the opportunity to balance intermittent RETs against more stable RETs. In light of the monopoly of Eskom it is also recommended that at the outset state-owned plants should not be eligible to participate, in order to encourage the entry of independent power producers.[31]

9.2.5 Obligations relating to connecting to, and upgrading of, the grid

Another key recommendation, as discussed in 8.2.3.5, is that an obligation to connect RES-E plants to the grid should be included. Specifying that RES-E plants must be 'immediately' connected to the grid, and 'connected to the grid before conventional power generation units'[32] would serve to prevent delay on the part of the grid operator (Eskom).

The inclusion of a connection obligation would necessitate the upgrading of the grid. Thus, the FIT policy should include an obligation to upgrade the grid if necessary. While concerns might be raised regarding *inter alia* 'the ability of the grid to absorb new generation and/or the technical feasibility (or necessity) of extending

[30] As discussed in 8.2.3.4 these are the RETs that have been included under the erstwhile REFIT and the current REIPPPP.
[31] As discussed in 8.2.3.4 above.
[32] Nganga et al *Powering Africa through Feed-in Tariffs* (n11) 21.

the grid to accommodate all available renewable resource',[33] the implementation of a FIT policy and the uptake of RES-E would complement the current urgent need in South Africa for additional electricity capacity.

9.2.6 Obligation relating to the purchase of RES-E

Another key recommendation is that the FIT policy should specify that the grid operator (Eskom, or the ISMO when it is established) must buy RES-E from RES-E generators and distribute it. This is especially important in light of Eskom's monopoly and would provide security to RES-E developers that the electricity they generate would be purchased.[34] However, allowing for unlimited renewable energy growth would most likely increase the costs of the FIT programme.

There are various ways to contain costs, as discussed in 8.2.3.6, including caps and growth corridors. Cost containment is a complex issue and was not resolved. However, it was highlighted that the costs of FIT programmes have generally escalated due to the uptake of solar energy,[35] and it has been submitted that cost containment measures should focus on solar technologies rather than on all of the RETs contained under the FIT programme.[36] In this regard, it is notable that in South Africa the costs of renewable energy are decreasing while the costs of coal-generated energy are increasing.

9.2.7 Tariffs

A number of decisions must be made in respect of tariffs, including with regard to the tariff level, duration of tariffs, whether they are differentiated (or stepped), whether fixed or premium tariffs should be provided and whether tariffs should be adjusted. All of these elements were discussed in detail in 8.2.3.7.

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[33] Rickerson et al *Feed-in Tariffs in Developing Countries* (n19) 55.
[34] As discussed in 8.2.3.6.
[35] C Kreycik, TD Couture and KS Cory *Innovative Feed-In Tariff Designs that Limit Policy Costs* (National Renewable Energy Laboratory: Technical Report NREL/TP-6A20-50225) 2011 available at http://www.nrel.gov/docs/fy11osti/50225.pdf [accessed 8 April 2013] 1.
[36] As discussed in 8.2.3.6.

A key recommendation is that appropriate tariffs should be established, which are neither too high nor too low, and that tariffs are based on the actual costs of generation. As discussed above, this is considered to be best practice[37] and is consistent with South Africa's legislation.[38] The differentiation of tariffs including with regard to the type of RET or the project size, while introducing complexity, is important as it could increase the cost efficiency of the programme.[39] Another key recommendation is that degression rates that 'correspond… to the cost reduction due to technological learning'[40] should be established. This would ensure that RES-E generators would not earn windfall profits and that costs for consumers would decrease 'as experience is gained'.[41]

9.2.8 Transparency and provision of information

Transparency is important in the South African context and the Constitution of the Republic of South Africa, 1996 specifically includes a right of access to information[42] and the Promotion of Access to Information Act[43] has been enacted to give effect to this right.

As discussed in 8.2.3.8 it is important that a FIT policy includes requirements regarding the provision of information, such as the publication of progress reports by the Department of Energy, which would *inter alia* deal with the growth of renewable energy, the ecological impact of renewable energy plants and any increases in electricity prices.

It was also submitted that a project registry should be established by the Department of Energy to enable any interested person to check the status of the construction of RES-E plants. This would also be important with regard to the issue

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[37] Nganga et al *Powering Africa through Feed-in Tariffs* (n11) 17.
[38] See section 15 of the Electricity Regulation Act 4 of 2006.
[39] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n11) 35.
[40] A Klein, E Merkel, B Pfluger, A Held, M Ragwitz, G Resch and S Busch (Fraunhofer ISI and Energy Economics Group) *Evaluation of Different Feed-in Tariff Design Options – Best practice paper for the International Feed-In Cooperation* 2010 available at http://www.feed-in-cooperation.org/wDefault_7/content/research/index.php [accessed 5 September 2011] 80.
[41] Ragwitz et al *OPTRES Report* (n23) 49.
[42] See Section 32 of the Constitution of the Republic of South Africa, 1996. This was discussed in 8.2.3.8 above.
[43] Act 2 of 2000.

of cost containment as discussed in 8.2.3.6 above. Wind and solar maps should also be made easily accessible.

9.2.9 Other elements

Various other elements should be considered including the promotion of localisation, direct selling and net metering. The promotion of localisation has been identified as an important goal and mechanisms that could be introduced to encourage this include local content requirements, local ownership laws and requiring that RES-E generators pay a percentage of the remuneration received to the municipality in which the RES-E project is located.[44] It was also identified that bonus payments could be offered with regard to local content.[45]

However, such mechanisms would most likely increase the costs of the programme and result in higher electricity costs,[46] and it would be important to achieve a balance between maintaining reasonable costs and promoting localisation. This has been identified in 8.2.3.9 as a contentious issue, which was not resolved, and it has been argued that countries should 'identify appropriate strategies for balancing their national economic development objectives with the cost and complexity of local content policies and with international trade regimes'.[47]

Environmental authorisations should be required for projects under a FIT programme. It would also be possible to include such projects in the list of activities (requiring environmental authorisation) in regulations made in terms of the National Environmental Management Act.[48] Furthermore, it has been recommended that net metering should be included. However, the likely opposition of municipalities would need to be addressed.[49]

A key aspect relates to the financing of the FIT policy and it has been identified that it is preferable for the increased costs of electricity due to the FIT programme to

[44] Ragwitz et al *OPTRES Report* (n23) 125.
[45] As discussed in 8.2.3.9 above.
[46] Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n11) 49.
[47] Rickerson et al *Feed-in Tariffs in Developing Countries* (n19) 34.
[48] Act 107 of 1998. The NEMA environmental impact assessment regulations and Listing Notices were discussed in 6.3.2.1.
[49] These issues were discussed in 8.2.3.9.

be paid by electricity consumers rather than by taxpayers. Consideration should be given to introducing mechanisms to reduce the impacts of the FIT policy on poor households (such as the expansion of the free basic electricity policy) and on energy-intensive industries. It could also be considered whether part of the revenue raised from a carbon tax (which is planned to be implemented in 2015) could be used to finance the FIT programme in part.[50]

However, it should not be assumed that ‘a FIT policy will incur significant additional costs over conventional alternatives’.[51] Indeed, in Germany, overall electricity prices did not increase significantly until the uptake of solar energy began to rise drastically.[52] It has been seen that in South Africa wind energy may cost less than new coal options.[53]

9.2.10 Administrative aspects

It is important that all barriers – administrative and otherwise – are addressed. With regard to administrative barriers, specific measures that could be implemented include the setting of time limits for the approval process[54] and the establishment of a ‘one-stop shop’ to coordinate the entire process.[55]

As discussed in 8.2.3.10 above, a critical decision relates to the choice of legal instrument and it was recommended that specific legislation be enacted to establish the feed-in tariff as this would allow the process to be ‘all encompassing’.[56] The Department of Energy should be responsible for introducing this legislative framework, incorporating the elements outlined above. As discussed in Chapter 8, it would be necessary to address the alleged non-compliance of a FIT policy with South Africa’s preferential procurement rules, if this is found to exist. This could be achieved by amending the relevant legislation.[57] Alternatively, the Minister could

[50] South Africa’s proposed carbon tax was discussed in detail in 7.5.1.5.
[51] Rickerson et al *Feed-in Tariffs in Developing Countries* (n19) 79.
[52] As discussed in 5.2.4.8 above.
[53] As discussed in 7.4.1.1 above.
[54] Nganga et al *Powering Africa through Feed-in Tariffs* (n11) 23.
[55] Ibid, 24.
[56] REFIT Regulatory Guidelines (n7) 29-30.
[57] Preferential Procurement Policy Framework Act 5 of 2000. This possibility was referred to in 7.3.10 and 8.3.10 above.

exercise his discretion and exempt the relevant organs of state from the provisions of the Preferential Procurement Policy Framework Act,[58] specifically the provisions regarding competition on price on the basis that 'the likely tenderers are international suppliers'[59] or that 'it is in the public interest'.[60]

9.3 Concluding remarks

It has been argued that in promoting energy, the concern should not simply be with installing capacity, but with 'provid[ing] the conditions for [the] creation of a sustained and profitable industry, which, in turn, will result in increased renewable energy capacity and generation, and will drive down costs'.[61]

Creating a sustainable renewable energy industry would have environmental benefits and would contribute to job creation, which is consistent with the goal of sustainable development contained in the Constitution of the Republic of South Africa[62] and which underpins the National Environmental Management Act.[63] This would also be consistent with the long-term goal of government, as set out in the White Paper on the Renewable Energy Policy of the Republic of South Africa, namely

> '*the establishment of a sustainable renewable energy industry* with an equitable BEE [black economic empowerment] share and job market that will offer in future years a fully sustainable, non-subsidised alternative to fossil fuel dependence'[64] (*own emphasis*).

While the South African government has gone the renewables tendering route, it has been seen that there is no acknowledged renewables tendering success story at the international level. In light of the disadvantages noted with regard to renewables tendering programmes, it is regrettable that the South African government has gone this route.

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[58] Act 5 of 2000.
[59] Ibid, section 3(b).
[60] Ibid, section 3(c). These issues were considered more fully in 7.3.10 above.
[61] Sawin *National Policy Instruments: Policy Lessons* (n13) (executive summary).
[62] Constitution of the Republic of South Africa, 1996. Section 24(b)(iii).
[63] Act 107 of 1998. See section 2(3) and section (2(4). This was discussed further in 6.3.2.1 above.
[64] Renewable Energy White Paper (n9) 20.

The REIPPP Programme has been implemented in respect of specific amounts of RES-E capacity, which only provides an incentive to prospective RES-E generators to bid to supply capacity during the set bidding windows. There is no obligation on the grid operator (Eskom) to purchase RES-E outside of this mechanism. Such stop-and-go cycles would arguably not contribute to a sustainable renewable energy industry. Furthermore, since the REIPPPP has only been implemented in respect of certain amounts of capacity, this does not point to the indefinite implementation of the REIPPP Programme, which arguably leaves the door open for a FIT policy to be introduced with regard to the uptake of RES-E in the future.

While feed-in tariff policies have been criticised as being expensive, it has been shown that this need not be the case and that they can 'function well in both developed and developing countries, provided that proper care is taken in the policy design and accompanying policies'.[65] This research has also shown that a FIT policy could provide security and stability to investors, which is necessary to encourage investment and growth in the renewable energy industry.[66]

It is thus submitted that a feed-in tariff for renewable energy in South Africa should be revisited, and it is suggested that the proposed framework for a feed-in tariff policy, as outlined above, would go some way towards the creation of a sustainable renewable energy industry in South Africa. In addition to all of the benefits that this would have for South Africa, this would arguably have implications for the entire continent and would also provide South Africa with an opportunity to become a leader in the renewable energy industry in Africa.

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[65] Nganga et al *Powering Africa through Feed-in Tariffs* (n11) 10. See also Couture et al *A Policymaker's Guide to Feed-in Tariff Policy Design* (n11) x.

[66] Lipp 'Lessons for Effective Renewable Electricity Policy' (n12) 5483. See also REFIT Regulatory Guidelines (n7) 27.

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