

Energy efficiency: the regulatory framework for SADC and South Africa

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ABSTRACT

Energy is the main driving force behind all human activities. Energy use is blamed for its contribution to greenhouse gas, environmental degradation among others. Energy efficiency has been identified as an important tool to address these issues. Recognising the important role of energy efficiency, the Southern African Development Community (SADC) introduced policy measures to address energy efficiency at both regional and national levels. South Africa (a member state of SADC) followed by introducing policies, legislation, tax incentives and voluntary measures such as SANS standards and ISO 50001 to address energy use via energy efficiency. The aim of this study is to assess South Africa's framework pertaining to energy efficiency and determine whether they correspond to the SADC energy frameworks. In this study, it is indicated that energy efficiency does not have a universally acceptable definition. SADC's frameworks pertaining to energy efficiency are quite vague compared to South Africa's policy framework. South Africa's policies, legal frameworks and voluntary instruments correspond with the SADC frameworks and even go beyond these frameworks. It is recommended that SADC's frameworks should specify measures of attaining energy efficiency within its mandated tools, urge member states to develop legislation as well as voluntary measures as means of attaining energy efficiency. The South African Minister of Energy on the other hand, should fulfil the mandate of the Electricity Regulation Act and the National Energy Act by enacting regulations pertaining to energy efficiency. Incentives for the introduction of voluntary energy efficiency measures should also be developed.

Keywords: Energy efficiency and law; SADC Energy Efficiency Frameworks; South Africa's legal framework for energy efficiency

OPSOMMING

Menslike aktiwiteite word deur energie beheer. Die gebruik van energie word egter geblameer vir onder meer die vermeerdering in kweekhuisgasse en omgewingsagteruitgang. Energiedoeltreffendheid word beskou as een van die wyses om hierdie aangeleenthede aan te spreek. Die Suid-Afrikaanse Ontwikkelingsgemeenskap (SOAG) erken die belangrike rol wat energiedoeltreffendheid kan speel en het verskeie beleide op streeksvlak aanvaar wat op die nasionale vlak geïmplementeer kan word. Suid-Afrika (as 'n lidstaat van die SAOG) het reeds verskeie beleidsdokumente in die verband aanvaar, asook wetgewing en belastingtoegewings uitgereik en vrywillige standaarde ontwikkel soos die van die Suid-Afrikaanse Buro van Standaarde en ISO 50001. Die doel van die studie was om te bepaal of die Suid-Afrikaanse regsraamwerk met betrekking tot energiedoeltreffendheid met die SAOG energiedoeltreffendheidsraamwerk ooreenkom. Uit die studie het dit geblyk dat daar nie 'n universele definisie van energiedoeltreffendheid bestaan nie. Die SAOG energiedoeltreffendheidsraamwerk is vaag in vergelyking met die Suid-Afrikaanse beleidsraamwerk. Daar word aanbeveel dat die SAOG raamwerk met betrekking tot energiedoeltreffendheid meer spesifieke bepalinge met betrekking tot energiedoeltreffendheid insluit en dat lidstate aangemoedig moet word om wetgewing uit te vaardig en vrywillige standaarde te ontwikkel. Suid-Afrika se Minister van Energie, aan die ander kant, moet aan die mandaat van die Elektrisiteitswet en die Nasionale Energiewet voldoen deur regulasies uit te vaardig wat energiedoeltreffendheid reguleer. Daar kan ook insentiewe daargestel word vir die gebruik van vrywillige energiedoeltreffendheidsstandaarde.

Trefwoorde: Energiedoeltreffendheid en die reg; SOAG Energiedoeltreffendheid regsraamwerk; Suid-Afrikaanse regsraamwerk vir energiedoeltreffendheid

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TABLE OF CONTENTS

Abstract

Opsomming

Keywords

Acknowledgments

List of abbreviations

List of figures

List of tables

1 Introduction	1
2 Background	6
2.1 Definition of energy efficiency	7
<i>2.1.1 What is energy efficiency?</i>	<i>7</i>
2.2 Drivers for energy efficiency	9
<i>2.2.1 Climate change</i>	<i>10</i>
<i>2.2.2 Finite nature of fossil fuel</i>	<i>12</i>
<i>2.2.3 Increase demand for energy</i>	<i>13</i>
<i>2.2.4 Energy security</i>	<i>14</i>
<i>2.2.5 Reduced energy related public expenditures</i>	<i>15</i>
<i>2.2.6 Development goals</i>	<i>16</i>
<i>2.2.7 Job creation</i>	<i>17</i>
2.3 Methods	17
<i>2.3.1 Energy efficient domestic appliances</i>	<i>18</i>
<i>2.3.2 Lighting</i>	<i>18</i>
<i>2.3.3 Buildings</i>	<i>19</i>
<i>2.3.4 Transport</i>	<i>19</i>
<i>2.3.5 Industry</i>	<i>20</i>

2.3.6	<i>Energy audits</i>	21
2.3.7	<i>Market-based instruments</i>	22
2.3.8	<i>Education and awareness</i>	22
2.3.9	<i>Voluntary instruments</i>	22
	2.4 Impediments to energy efficiency	23
2.4.1	<i>Low energy prices</i>	23
2.4.2	<i>Financing</i>	25
2.4.3	<i>Poverty</i>	25
2.4.4	<i>Uncertainty</i>	26
2.4.5	<i>Split incentives</i>	27
2.4.6	<i>Capital budgeting</i>	27
2.4.7	<i>Ignorance</i>	28
	2.5 Conclusion	28
	3 SADC's frameworks pertaining to energy efficiency	30
	3.1 SADC Protocol on Energy (1996)	30
	3.2 SADC's Energy Plans	31
3.2.1	<i>SADC Energy Cooperation Policy and Strategy (1996)</i>	31
3.2.2	<i>SADC Energy Action Plan (1997)</i>	32
3.2.3	<i>SADC Energy Activity Plan (2000)</i>	32
3.2.4	<i>SADC Regional Infrastructural Development Master Plan (2012)</i>	32
	3.3 Conclusion	33
	4 South Africa's energy efficiency policy frameworks	34
	4.1. White Paper on Energy Policy (1998)	34
4.1.1	<i>Energy efficiency in industry and commerce</i>	35
4.1.2	<i>Energy efficiency in households</i>	35
4.1.3	<i>Appliance efficiency</i>	36
4.1.4	<i>Energy efficiency in transport</i>	36

4.1.5 Energy efficiency and government capacity	36
4.2 White Paper on Renewable Energy (2003)	37
4.2.1 Household	38
4.2.2 Industries	38
4.3 Integrated Energy Plan (2003)	39
4.4 National Integrated Resource Plan (2003/2004)	40
4.4.1 Residential	41
4.4.2 Commercial	41
4.4.3 Industrial and mining	41
4.5 National Energy Efficiency Strategy for South Africa (2009)	42
4.5.1 Energy efficiency standards	43
4.5.2 Appliance labelling	43
4.5.3 Certification and energy audits	44
4.5.4 Education information and awareness	44
4.5.5 Research and technology	45
4.5.6 Energy efficiency management system	45
4.5.7 Incentives	45
4.5.8 Fee bates	45
4.5.9 Energy pricing	46
4.5.10 Energy service companies	46
4.5.11 Voluntary and retail markets	46
4.5.12 Stakeholders	47
4.6 Integrated Resource Plan for Electricity 2010 to 2030 (2011)	47
4.7 National Climate Change Response White Paper (2011)	49
4.7.1 Industries	49
4.7.2 Building	49
4.8 Conclusion	50
5 Legal frameworks and voluntary instruments	52

5.1 Legal frameworks	52
5.1.1 <i>Electricity Regulation Act 4 of 2006(ER Act)</i>	52
5.1.2 <i>National Energy Act 34 of 2008</i>	54
5.1.3 <i>National Building Regulations and Building Standards Act 103 of 1977</i>	55
5.1.4 <i>Income Tax Act 58 of 1962</i>	56
5.2 Voluntary instruments	58
5.2.1 <i>SANS 941</i>	59
5.2.2 <i>SANS 50001</i>	60
5.3 Conclusion	63
6 Conclusion and recommendations	65
6.1 <i>Summary</i>	65
6.2 <i>Recommendations</i>	69
Bibliography	71
Figure 1 Carbon dioxide emissions per capita from fossil fuel use	11
Figure 2 Electricity price comparisons 2011	24
Figure 3 Share of final energy consumption by sector, 2006	38
Table 1 A comparison of SADC and South Africa's frameworks	68

LIST OF ABBREVIATIONS

ACE	Association for the Conservation of Energy
CSIR	South Africa's Council of Scientific and Industrial Research
DOE	Department of Energy
DTIs	Department of Trade and Industry
ELJ	Energy Law Journal
ERCUCT	Energy Research Centre, University of Cape Town
ERSA	Economic Research Southern Africa
ER Act	Electricity Regulation Act
GCIS	Government Communication and Information System
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
IISD	International Institute for Sustainable Development
IEP	Integrated Energy Plan
IT Act	Income Tax Act
JOCP	Journal of Cleaner Production
JESA	Journal of Energy in Southern Africa
NBRBS Act	National Building Regulation and Building Standard Act
NCCRP	National Climate Change Response White Paper
NE Act	National Energy Act
NERSA	National Energy Regulator of South Africa
NEES	National Energy Efficiency Strategy
NEAA	Netherlands Environmental Assessment Agency
NIRP	National Integrated Resource Plan
IRP	Integrated Resource Plan
OPEC	Organisation of the Petroleum Exporting Countries
Par	Paragraph
PELJ	Potchefstroom Electronic Law Journal
Reg	Regulation

SA	South Africa
SAJS	South African Journal of Science
SAJELP	South African Journal of Environmental Law and Policy
SANEA	South African National Energy Association
SADC	Southern African Development Community
SLJ	SADC Law Journal
SANS	South African National Standards
SAMREC	South African Mineral Resource Committee
WEC	World Energy Council
WEP	White Paper on Energy Policy
WRE	White Paper on Renewable Energy
WEO	World Energy Outlook

1 Introduction

Energy in whatever form (coal, electricity, liquid fuel, electricity, gas), is the main driving force behind all human activities.¹ Electricity is the most widely used form of energy for domestic, commercial as well as industrial purposes. The manner in which energy resources are harnessed and used raises a number of concerns. Firstly, energy use is inefficient. Secondly, the generation of energy causes environmental problems which may be global, regional and local.²

Two ways in which these problems are addressed³include energy efficiency and renewable energy.⁴ The World Energy Council perceives “energy efficiency” as “a sustainable reduction in energy used for a given service or level of activity to decrease energy usage through the reduction of energy services. Energy efficiency involves doing more with less by increasing the ratio of energy output to energy input”.⁵ The International Energy Agency (hereafter as IEA) considers “energy efficiency” as “a way of managing and restraining the growth in energy consumption”.⁶ According to Barton,⁷ “energy efficiency” is the ratio of function, service, or value provided in relation to the energy converted to provide it or the amount of work done in relation to the energy used. It seems as if there is no generally agreed definition of the term.⁸ In trying to ascertain its meaning, one should, however, keep in mind that energy efficiency is usually defined according to the context at stake.⁹

The notion of energy efficiency is driven by factors such as climate change, the finite nature of fossil fuel, increase in energy demand, securing the supply of energy,

1 Joachim, Kennedy and Talukhaba “Energy Efficiency” 154-155. See also WEO 2011 www.iea.org, Winkler *et al* 2006 *ERCUCT* 1.

2 Winkler *et al* 2006 *ERCUCT* 1.

3 Gerrard *The Law of Clean Energy* 1. See Xia and Zhang “Energy Audit” 1200.

4 Renewable energy as a measure to address problems arising as a result of the inefficient use of energy as well as the generation of energy does not form part of this study.

5 World Energy Council 2013 <http://www.worldenergy.org>.

6 International Energy Agency “Working together to ensure reliable, affordable and clean energy” www.iea.org.

7 Barton “The law of Energy Efficiency” 62.

8 See 2.1.

9 Perez-Lombard *et al* 2009 *Energy and Buildings* 273. See Rotenberg “Energy efficiency in deregulated markets” 1, Eusterfeldhaus *The Law of End-Use Energy Efficiency* 3.

reducing energy related public expenditure, developmental goals and job creation.¹⁰ In attaining energy efficiency, options or methods such as appliance labelling, energy efficient lighting, buildings, transport, industries, energy audits, market-based instruments, education and awareness, voluntary instruments among others may be used.¹¹ Though energy efficiency is an important tool in addressing issues such as climate change, the finite nature of fossil fuel, secure energy supply and increase demand for energy, its penetration into society remains somewhat slow.¹²

Energy within the Southern African Development Community is a vital tool for development.¹³ Beyond its use in daily life, fuel and electricity catalyse infrastructure projects that drive both regional integration and economic growth.¹⁴ Southern Africa is richly endowed with abundant energy resources (fossil fuel and biomass) but mostly relies on fossil fuels for its primary energy supply.¹⁵ In order to reduce the reliance on fossil fuel, the Southern African Development Community (hereafter SADC) urged for energy efficiency measures both at regional and national levels.¹⁶ Guidelines on how energy efficiency would be attained at the SADC level and within member states are captured in the SADC *Protocol on Energy* (1996), the SADC *Energy Corporation Policy and Strategy* (1996), the SADC *Energy Action Plan* (1997), the SADC *Energy Sector Activity Plan* (2000) and the SADC *Regional*

10 Due to the extent of this dissertation, only a few drivers for energy efficiency will be discussed. However, it is important to note that there are other drivers. See 2.2. See also WEO 2006 www.worldenergyoutlook.org, Ryan and Campbell "The multiple benefits of energy efficiency" 3-6, Barton "The Law of Energy Efficiency" 61- 63.

11 See 2.3. See also Davis *et al* "Measuring the rebound effect of energy efficiency" 1. See also UNDP *World Energy Assessment* 54.

12 See 2.4. See also Ryan *et al* "Energy efficiency policy and carbon pricing" 13. See also Reddy "Barriers to improvements in energy efficiency" 953, Kellermann *The Most Important Barriers* 52-61, Painuly *et al* 2003 *JOCP* 659-665.

13 SADC Energy Policy Brief 2010 www.sardc.net. SADC was established by the SADC Treaty (1992). The Treaty came into force in 1993 after the requisite two-thirds of the member States ratified. It seeks to achieve development and economic growth, alleviate poverty, enhance the standard and quality of life of the people of Southern Africa and support the socially disadvantaged through regional integration. These objectives are to be achieved through increased regional integration, built on democratic principles and equitable and sustainable development. The SADC member states include Angola, Botswana, the Democratic Republic of Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe. See also Dlamini 2013 www.igd.org.

14 SADC Energy Policy Brief 2010 www.sardc.net.

15 Merven, Hughes and Davis 2010 *JESA* 12-13. See also United Nations Economic and Social Council 2014 www.uneca.org.

16 See 3. Other measures that were introduced to curb the use of fossil fuels include renewable energy that does not form part of this study. For more on renewable energy, see Duvivier *The Renewable Energy Reader* 3-270.

Infrastructural Master Plan (2012).¹⁷ These SADC energy frameworks mandate for energy efficiency policies, projects, programmes and strategies as measures of attaining energy efficiency at regional and national levels.¹⁸

South Africa (a member state of SADC)¹⁹ in promoting energy efficiency, passed policies and strategies such as the *White Paper on Energy Policy* (1998), the *White Paper on Renewable Energy* (2003), the *Integrated Energy Plan* (2003), the *National Integrated Resource Plan* (2003/2004), the *National Climate Change Response White Paper* (2011) and the *National Energy Efficiency Strategy* (2009).

The *White Paper on Energy Policy* (1998) highlights different means through which energy efficiency could be achieved. According to the *White Paper on Energy* (hereafter WEP), energy efficiency would be realised through the development and introduction of energy efficiency incentives in the industrial sector, households and commercial energy consumers. This would be achieved by introducing energy efficiency norms and standards for commercial buildings, the establishment of energy efficiency standards for industrial equipment, the introduction of a domestic appliance labelling programme and the implementation of an energy efficiency programme to reduce consumption in installation.²⁰

The *White Paper on Renewable Energy* (2003) indicates that energy efficiency would be achieved through government intervention in industrial and household sectors. This would be achieved through government housing subsidies which will require thermally efficient house designs and energy efficient standards for electrical appliances and the enforcement of appliance labelling.²¹ The *Integrated Energy Plan* (2003) (hereafter IEP) emphasises that energy efficiency would be achieved through the introduction of energy efficiency policies, legislation, regulation and programmes.²²

The *National Integrated Resource Plan* (2003/2004) highlights the fact that energy efficiency would be attained through energy efficient lighting and best practices in

17 See 3.1-3.3.

18 See section 3.1-3.3.

19 South Africa became a member of SADC on 29 August 1994 by signing the *SADC Treaty* of 1992.

20 DOE WEP (1998) 84. See 4.1, Kiratu “*South Africa’s energy security*” 3.

21 DOE WRE (2003) 36. See also Musango, Amigun and Brent 2011 CCSE 125.

22 DOE IEP (2003) 4. See 4.3.

five demand side management (DSM) programmes (residential energy efficiency, commercial energy efficiency, industrial and mining energy efficiency, residential load management and industrial and mining load management).²³ Furthermore, the *National Energy Efficiency Strategy* (2009) underlines among others, energy labels, energy performance standards, energy audits, energy management and the promotion of efficient technologies as measures aimed at improving energy efficiency. It sets a national target for energy savings, of at least 12% to be achieved by 2015.²⁴ The *Integrated Resource Plan for Electricity 2010 to 2030* (2011) (hereafter IRP) stresses that, energy efficiency would be achieved through, changes in the structure of the economy, higher electricity prices, improvements in technology, financial supports, access to capital, appliances labelling and buildings standards.²⁵ In addition, the *National Climate Change Response White Paper* (2011) (hereafter NCCRP) maintains that as part of the Energy Efficiency and Energy Demand Management Flagship Programme, the Department of Energy should continue to develop and facilitate an aggressive energy efficiency programme in industry, building on the experience of Eskom's Demand Management Programme and the Department of Trade and Industries Cleaner Production Centre and covering non-electrical energy. A government building energy efficiency programme should also be developed. This programme will be led by the Department of Public Works and will initiate energy and emission audit for all government buildings.²⁶

There are only two acts that specifically refer to energy efficiency. These are the *National Energy Act 34* of 2008 (hereafter NE Act) and the *Electricity Regulation Act 4* of 2006 (hereafter ER Act).²⁷ The ER Act regulates electricity as a means to promote energy efficiency.²⁸ The NE Act on the other hand, regulates electrical products as a means of enhancing energy efficiency. It states that the Minister of Energy may issue regulations which lay out steps and procedures for the application of energy efficiency technologies and procedures, labelling for energy efficiency, prohibiting the manufacturing, importing and selling of electric products and fuel

23 DOE *NIRP* (2003/2004) 18-19. See 4.4.

24 See 4.5. See also Rosenberg and Winkler "Policy review and analysis" 18. See Bergh *Energy Efficiency 2012 UCT* 12.

25 DOE *IRP* (2011) 38. See 4.6.

26 DEA *NCCRP* (2009) 31. See 4.7. See also Musango, Amigun and Brent 2011 *CCSE* 126.

27 See 5.1.1.

28 Section 15 (u) and (s) of ER Act. See Murombo and Du Plessis 2012 www.elasa.co.za.

burning appliances for the purpose of poor energy efficiency, standards and specifications for energy carriers and energy efficiency standards for specific technologies.²⁹ Regulations issued in this regard include GN R729 of 2011 in GG 34596 of 16 September issued in terms of section 12 of the *Income Tax Act 58 of 1962*, SANS 10400 and SANS 204 in GN R711 of 2011 in GG 34586 of 9 September issued in terms of the *National Building Regulation and Building Regulation Standards Act 103 of 1977*. GN R729 provides a tax incentive as a means of enhancing energy efficiency. It provides a deduction for energy efficiency savings measures.³⁰ SANS 10400 on its part, stresses that new buildings should conform to the energy efficiency specification requirements spelled out in SANS 204 for building plans to be approved.³¹ These measures, among others, for example, include non-masonry walls and solar hot water heating.³² Some voluntary standards have also been developed to promote energy efficiency.³³

There is no act in South Africa which deals with energy efficiency specifically. It is regulated by different departments and pieces of legislation. It is not clear whether the South African legislation promoting energy efficiency corresponds with the SADC frameworks. The aim of this study is therefore to assess the energy efficiency measures as provided by the SADC energy efficiency framework and to determine whether the South African framework pertaining to energy efficiency corresponds with the SADC framework. In trying to provide an answer to the above question, the background of energy efficiency is discussed (Chapter 2), before paying attention to the SADC guidelines on how energy efficiency should be attained at both regional and national levels (Chapter 3). The South African policy framework is discussed in Chapter 4 followed by the legal framework and voluntary instruments in South Africa (Chapter 5) in order to draw a conclusion and make recommendations on the promotion of energy efficiency in South Africa (Chapter 6).

29 Section 19 (1) of the NE Act. See 5.1.2.

30 GNR 729 in GG No. 34596 of 16 September 2011 issued in terms of section 19 of the *National Energy Act 34 of 2008* read in conjunction with section 12L of the *Income Tax Act 58 of 1962*.

31 GN 711 in GG No. 34586 of 9 September 2011. This Regulation incorporated SANS 10400-XA (Energy Usage in Buildings) and SANS 204 (Energy Efficiency in buildings), into the South African building law. See Mnguni and Tucker 2012 www.en.occa.mard.gov, Lemmer, Date Unknown www.kznia.org.za.

32 See 5.2.1 and 5.2.2.

33 See 5.2.

2 Background

Energy is the main driving force behind all human activities worldwide.³⁴ Centuries ago, civilisation was built from human labour which was mostly provided by slaves and domesticated animals.³⁵ Sun was the main source of light and biomass (especially wood) was used in cooking and provided light at night.³⁶ Emissions (ashes from fire) as a result of these activities were released into the environment and due to its limited population at the time, the environment was able to absorb such pollution through natural cleaning processes.³⁷

With the advent of the Industrial Revolution, fossil fuels became the main source of energy.³⁸ In the early 1900s, internal combustion and the use of petroleum in the transport sector and other fossil fuels increased. Electricity demand in the industrial sectors equally grew and this greatly changed the energy sector (the demand for more energy).³⁹ The more energy was used, the more emissions were discharged and it became impossible for the environment to absorb them through natural processes.⁴⁰

In the 1970s, the energy sector suffered a series of oil crises and this compelled countries to re-examine efficiency in the production of energy, its use as well as alternatives to fossil fuel.⁴¹ The world realised the need to reduce the negative consequences of the use of fossil fuels. The introduction of energy efficiency measures (appliance and product labelling, building standards, energy efficiency standards, energy audits among others) were seen as measures to reduce the increase demand for energy.⁴² In this chapter, energy efficiency is defined for the purpose of this study, the drivers for energy efficiency, energy efficient methods as

34 Winkler *et al* 2006 *ERCUCT* 1.

35 Duvivier *The Renewable Energy Reader* 3.

36 Duvivier *The Renewable Energy Reader* 3.

37 Strydom and Surridge "Energy" 765.

38 Winkler *et al* 2006 *ERCUCT* 1. The amount of energy demand increased as more was needed to support industrial development.

39 Winkler *et al* 2006 *ERCUCT* 2.

40 Strydom and Surridge "Energy" 765-770. England the world economy before the industrial revolution was for example, initially based on agriculture. Energy demand was limited and could be met by biomass and animal power. With the advent of the industrial revolution, England and other countries became highly dependent on fossil fuel (especially oil) to support the new industrial demand (Winkler *et al* 2006 *ERCUCT* 2).

41 Winkler *et al* 2006 *ERCUCT* 2.

42 Winkler *et al* 2006 *ERCUCT* 2. Other measures that were introduced to curb the use of fossil fuels include renewable energy that does not form part of this study.

well as impediments to such methods are discussed to serve as background to the discussion of the SADC legal frameworks,⁴³ South Africa's policy frameworks,⁴⁴ legal frameworks and voluntary instruments.⁴⁵

2.1 Definition of energy efficiency

It is necessary to define "energy efficiency" as the notion of "energy efficiency" remains contested as a consequence of its many possible multi-layered and context dependent meanings.⁴⁶ Engineers, economists, non-governmental organisations, national policies, regional documents, among others, have different conceptions of what energy efficiency entails.⁴⁷ Definitions of "energy efficiency" found in the literature and in dictionaries are examined below.

2.1.1 What is energy efficiency?

The *Cambridge Business Dictionary* defines "energy efficiency" as "things that use only as much energy as needed without wasting any, for example, energy-efficient lighting, energy efficient building, appliances among others".⁴⁸ The *Concise Oxford English Dictionary* on the other hand, considers "energy efficiency" as "the ratio of the work performed by a machine or in a process to the total energy expended or heat taken in".⁴⁹ The dictionary meanings provide only a partial solution to the meaning of energy efficiency as it only refers to the function thereof.

Engineers look at energy efficiency from a thermodynamic perspective. Some of them believe "energy efficiency" entails "maximising the fit between the quality and quantity of energy needed to perform a task and the quality and quantity of energy embedded in our resources".⁵⁰ Economists describe "energy efficiency" from an economic perspective as "the use of electricity at a level set by consumers in a market where the price reflects the true social cost in the absence of information and

43 See chapter 3.

44 See chapter 4.

45 See chapter 5.

46 Perez-Lombard *et al* 2009 *Energy and Buildings* 273. See also Rotenberg "Energy efficiency in deregulated markets" 1, Eusterfeldhaus *The Law of End-Use Energy Efficiency* 3.

47 Perez-Lombard *et al* 2009 *Energy and Buildings* 273-274.

48 Cambridge Business English dictionary 2011 www.dictionary.combridge.org.

49 Concise Oxford English dictionary 2011 www.oxforddictionaries.com.

50 Rotenberg "Energy efficiency in deregulated markets" 4.

transaction costs”.⁵¹ Economists link energy efficiency to the cost of energy used in the market, while engineers link energy efficiency to the actual measures of input and output. The British Geological Survey perceives “energy efficiency” as “using less energy in heating and cooling to achieve a satisfactory temperature. For example, a fluorescent light or a skylight may be installed rather than incandescent lights to attain the same amount of energy without any increase in energy input”.⁵² The International Energy Agency (hereafter as IEA) considers “energy efficiency” as a way of managing and restraining growth in energy consumption. A thing is more energy efficient if it supplies more service for the same energy input, or the same service for less energy input. For example, when a compact fluorescence light bulb uses less energy than an incandescent bulb to produce the same amount of light, the compact fluorescence bulb is regarded as being more energy efficient.⁵³ Notably, the definitions place emphasis on the use of energy efficient products to attain energy efficiency. According to the United States of America (hereafter US) Department of Energy, “energy efficiency” is “simply doing more with less”. According to them, “efficiency” is naturally linked to the manner in which energy is consumed at the point of end use, production as well as distribution.⁵⁴ This definition accentuates efficient energy use and consumption as a means through which energy efficiency could be achieved.⁵⁵

The World Energy Council defines “energy efficiency” as “a reduction in the energy used for a given service (heating, lighting, etc.) or level of activity”. The reduction in energy consumption is most often associated with technological changes, but not always since it can also result from better organisation and management or improved economic conditions in the sector (non-technical factors).⁵⁶ This definition calls attention to technological change, better organisation and management as

51 Rotenberg “*Energy efficiency in deregulated markets*” 4.

52 British Geological Survey “National Environmental Research Council” <http://www.bgs.ac.uk/discovering>. To them, efficient energy use will be achieved through energy efficient buildings, industrial processes and transportation and these could reduce the world’s energy needs in 2050 by one third, and help in controlling global emissions of greenhouse gases.

53 International Energy Agency “Working together to ensure reliable, affordable and clean energy” <http://www.iea.org>.

54 The US Department of Energy “Energy Efficiency in the Power Grid” www.nema.org. According to them, energy efficiency will bring great economic benefits and businesses as well. As a result, a number of initiatives are now underway to increase efficiency in a number of ways.

55 See Du Plessis 2014 SAJS 13-19.

56 World Energy Council 2013 at www.worldenergy.org.

means through which energy efficiency may be achieved. Similarly, the European Union's Action Plan for Energy Efficiency⁵⁷ expands upon this by defining "energy efficiency" as "reducing energy consumption without reducing the use of energy consuming plants and equipment". The aim is to make better use of energy. Energy efficiency therefore implies the promotion of behaviour, working methods and manufacturing techniques which are less energy-intensive. Similar to the World Energy Council, behaviour and management serves as measures through which energy efficiency could be attained.

A wide discrepancy of the views on energy efficiency described above suggests that it is an extremely flexible concept made up of different facets. Nonetheless, aspects pervade the different definitions and they could therefore be used collectively in an attempt to come up with a definition for the purpose of this study. The following notions pervade the above definitions, measures of energy input and output, the cost of energy in the market, energy use or consumption,⁵⁸ alternative equipment and technology (moving from a more energy intensive equipment or technology to less energy intensive ones),⁵⁹ change of behaviour, introduction of energy efficient management among others.

For the purpose of this study and considering the common features of the diverse definitions, "energy efficiency" may be defined as (a) an improvement in energy equipment, technology, practices, products and services (such as lighting, cooling, heating, manufacturing, cooking and transport) or (b) a change in behaviour or (c) the introduction of energy management systems in order to reduce the amount or quality of energy used. It is now necessary to determine what the drivers for energy efficiency are.

57 EU 2012 www.ec.europa.eu/energy/efficiency/eed/eed_en.htm.

58 Using less energy to produce more services, doing more with less, maximising quality and quantity of energy needed to perform a task or obtain a service, reduction in energy used for a given service to produce the same amount of service, supplies more service for the same energy input for less energy input.

59 Reducing energy consumption without reducing the use of energy equipment.

2.2 Drivers for energy efficiency

It is important to understand the drivers for energy efficiency as they influence the development and introduction of legal measures pertaining to energy efficiency. These drivers include, among others, climate change, the finite nature of fossil fuel, increase in energy demand, energy security, the reduction in energy related public expenditures, developmental goals and job creation.⁶⁰

2.2.1 Climate change

The use of fossil fuels is regarded to be one of the primary contributors to climate change.⁶¹ The United Nation's Intergovernmental Panel on Climate Change (hereafter IPCC)⁶² made it clear that climate change is ongoing and human activities, especially the use of fossil fuel, is a primary cause. In 2012, the IEA also stated that the direct combustion of fossil fuels represents by far the largest source of energy-related carbon dioxide (hereafter CO₂) emissions comprising more than 80% of anthropogenic emissions.⁶³

Figure 1 below illustrates the carbon dioxide emissions *per capita* for some developed and developing countries from 1990-2012.

60 Due to the extent of this dissertation, only a few drivers of energy efficiency will be discussed. However, it is important to note that there are definitely more. See WEO 2006 www.worldenergyoutlook.org, Ryan and Campbell "The multiple benefits of energy efficiency" 3-6, Barton "The Law of Energy Efficiency" 61-63.

61 Guayo "Biofuels" 266. See also DOE NEES (2009).

62 IPCC 2007 www.ipcc.ch. See also WEO 2008 www.worldenergyoutlook.org.

63 IEA Statistics 2012 www.iea.org. Anthropogenic emissions refer to human induced emissions, for example emissions from the burning of coal.

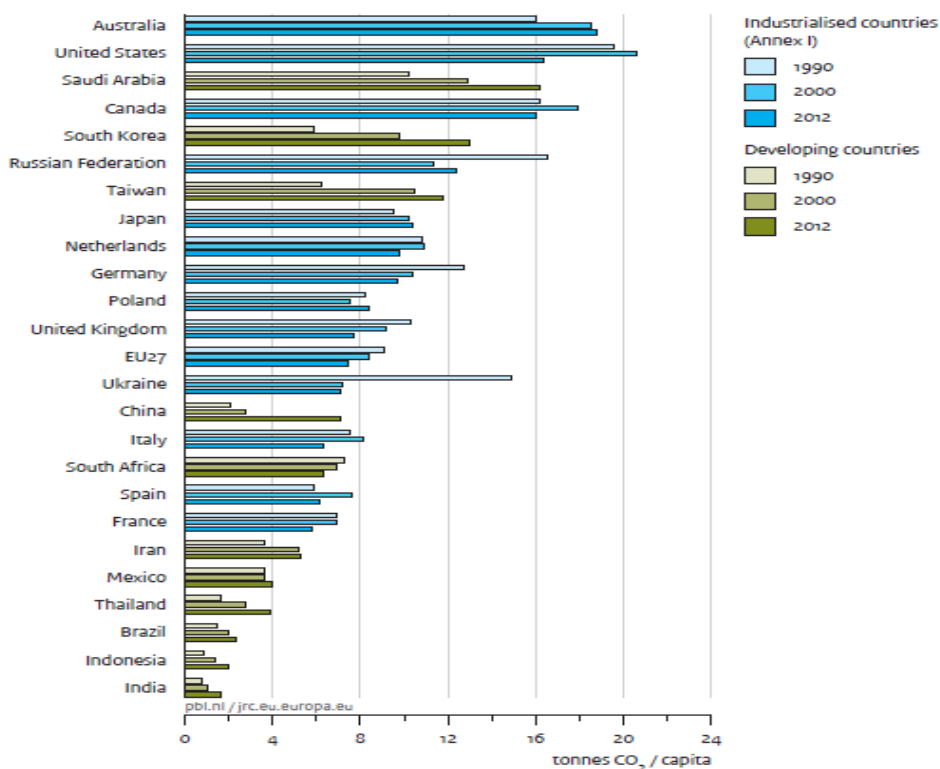


Figure 1: Carbon dioxide emissions per capita from fossil fuel use⁶⁴

According to Figure 1, the burning of coal, oil and natural gas in developed countries and rapidly developing countries such as China, India and South Africa account for the majority of human caused emissions of carbon dioxide, the main greenhouse gas.⁶⁵ About 70% of greenhouse gas emissions are energy related and energy efficiency is seen as one of the tools that can contribute in meeting countries emissions reduction targets.⁶⁶ South Africa is highly energy intensive and this makes the country one of the highest emitters of greenhouse gases (hereafter GHGs) in Africa.⁶⁷ In 2011, South Africa accounted for about 38% of CO₂ emissions from fossil fuel combustion across all of Africa with the largest share of emissions coming from the energy sector.⁶⁸

The IEA in its 2010 report identified that energy efficiency is cost effective and may offer the greatest potential for carbon dioxide reduction which could be achieved by

64 Source: Netherlands Environmental Assessment Agency: Trends in Global Carbon Dioxide Emissions 2013 Report 20.

65 Zillman *et al Beyond the Carbon Economy* 6. See also Olivier *et al* "Trends in global CO₂ emissions" 4.

66 Zillman *et al Beyond the Carbon Economy* 6. See also Barnard 2014 *JESA* 26.

67 WEO 2013 www.iea.org/statistics/mgds.

68 WEO 2013 www.iea.org/statistics/mgds.

2050. A 57% carbon dioxide reduction may be reached every year, if energy efficiency measures are introduced in all sectors, for example, industries (power, cement, steel, mining among others), buildings, household and transport across the world.⁶⁹ It is seen as the best possible short term measure in reducing GHG emissions. In 2010, the South African National Energy Association estimated that a savings of between 10 and 20% of current consumption could be achieved by greater energy efficiency, which in turn, could lead to an estimated increase in Gross Domestic Product of between 1.5 and 3%. However, despite these estimates, there is an increase demand for energy worldwide.⁷⁰

2.2.2 *Finite nature of fossil fuel*

The finite nature of fossil fuel is another important driver for energy efficiency.⁷¹ A century ago, the world consumed large amounts of fuel that have taken millions of years to be formed.⁷² An oil theorist in the US, for example, predicted that US production reached its maximum in the early 1970s and dropped thereafter regardless of the huge incentives to expand it. Presently, it is estimated by peak oil predictors that conventional crude oil and natural gas liquids are set to peak within the decade and this will increase concentration on the reserves of OPEC nations.⁷³ Furthermore, serious doubts have been expressed with regard to the certainty and accuracy of reserve projections of some nations, that is, there may be less fossil fuel than are expected to be.⁷⁴

In South Africa, controversies exist over fossil fuels (especially coal) reserve estimates.⁷⁵ Rogers,⁷⁶ the president of the South African Institute of Mining and Metallurgy, noted that the “reserve and resource estimates as they are known, are not adequate for informed projections on the future of the coal industry, having then recently been downgraded from 55 Gt to 40 Gt”. In the early 2000s, following the first version of a new codification of mineral resource and reserve reporting by the South

69 DOE RSA “Draft Strategy for the Energy Efficiency Campaign” 4.

70 See 2.3.4.

71 Zillman *et al Beyond the Carbon Economy* 8.

72 Zillman *et al Beyond the Carbon Economy* 8.

73 Zillman *et al Beyond the Carbon Economy* 8.

74 Simmons 2005 *Twilight in the Desert* 265-280.

75 Hartnady 2010 SAJS 1.

76 Rogers Presidential Address *Coal – An industry in change* 1999 227–241.

African Mineral Resource Committee (hereafter SAMREC Code)⁷⁷ and the Minerals Bureau (the Department of Energy) issued in March 2000, a re-assessment of the coal resource and reserve estimates was urged.⁷⁸ Assuming South Africa's heavy dependence on fossil fuel (especially coal) for power generation and electricity supply, the economic situation appears to be heading towards a state of severe energy crisis, which will be exacerbated by the anticipated finite nature of fossil fuel (especially coal).⁷⁹ However, the introduction of energy efficient measures in the utilisation of fossil fuels stands a chance to significantly boost the finite nature of fossil fuel and also reduce the increase demand for energy.⁸⁰

2.2.3 Increase demand for energy

Citizens in a number of economies today are improving their living standards and by implication, increasing their energy consumption. This may include homes and offices being heated by fossil fuel, the use of petroleum or diesel driven cars and reliable access to the benefits of electricity.⁸¹ Developing countries such as China, South Africa and India, for example, offer these services to over 2.4 billion customers.⁸² It is estimated that the demand for energy would increase to over 50% by 2030 which may have negative impacts on energy security, resource depletion and environmental damage, especially climate change.⁸³ In 2011, the IEA stressed that the introduction of energy efficiency measures would result in absolute electricity demand reduction. Furthermore, the study also indicated that energy savings from

77 South African Mineral Resource Committee, *The South African code for the reporting of exploration results, mineral resources and mineral reserves*. Resource assessments in the 1980s by the South African Geological Survey now the Council for Geosciences provided the basis of the previous BP figure and the US Department of Energy estimated in 2008 that South Africa has the world's sixth largest recoverable coal.

78 Prevost "SA coal resources and reserves" 99–102. See also De Jager *Coal reserves of the Republic of South Africa* 1-20, Eberhard 2011 www.iis-db.stanford.edu. Between 2003 and 2004, the Department of Minerals and Energy (hereafter DOE) substantially reduced South Africa's coal reserve from about 50 Gt to about 31 Gt, lowering it even further to 26 Gt in 2005. The official authoritative reference work on the Republic of South Africa, the South African Yearbook 2007/2008, provides a coal reserve for 2006 of 31 Gt, ranking eighth in the world, whereas editions prior to 2004 and 2005 provided coal reserve estimates of 55 Gt. The Department of Energy's review in 2007 cites the BP Statistical Review for its country rankings of world coal reserves, except for South Africa, for which the higher figure is replaced by a new estimate of 28 Gt. Nonetheless, severe doubts revolve around the correctness and severity of re-assessed projections of fossil fuel reserves.

79 Hartnady 2010 *SAJS* 4.

80 Simmons *Twilight in the Desert* 265-280.

81 Zillman *et al Beyond the Carbon Economy* 7.

82 Zweig and Jianhai 2005 *Foreign Affairs* 26.

83 Diamond 2005 *Penguin Group* 495.

energy efficiency may greatly assist countries to avoid blackouts, meet countries' electricity demand and other costly results of power shortfalls.⁸⁴ Being energy efficient could perhaps be the most important means of reducing these consequences.⁸⁵

The economy of South Africa suffered fuel shortages in 2005 and blackouts in 2008, with one of the reasons being improvement in living standards.⁸⁶ This draws attention to the vulnerability of the economy to energy shortages.⁸⁷ The 2008 electricity power crisis saw the country's capacity shortfall of over 10 percent leading to load shedding by Eskom, the national power utility, in order to stabilise the national power grid.⁸⁸ South Africa, in meeting the consumer electricity demand and stabilising the 2008 shortfall, is developing new and renovating older power plants. Nonetheless, Eskom warned that before new supply capacity is brought online, peak demand for electricity will exceed supply, thus leading to load shedding such as those experienced in 2014.⁸⁹ With these increase energy demand fears, dependence on fossil fuel may be reduced through improved energy efficiency.⁹⁰ The balance between an increase in energy demand as a result of a better life is a delicate one and if the balance is reached, it may lead to energy security.⁹¹

2.2.4 Energy security

Energy security entails an assurance of sufficient energy supply in order for an economy to function in a politically acceptable manner.⁹² The *World Energy Outlook* emphasises that a threat to the world's energy security is real and growing.⁹³ The world's main energy (petroleum) reserve is found in the Middle East and other OPEC nations, most of which are being upset by political instability and turmoil.⁹⁴ Britain, US and other countries who are major oil importers from Iraq, for example, with their

84 Pasquier 2011 *IEA* 13.

85 Diamond 2005 *Penguin Group* 496.

86 Sebitosi 2008 *Energy* 1591-1596.

87 Sebitosi 2008 *Energy* 1591-1596.

88 Sebitosi 2008 *Energy* 1591-1596.

89 Pieterse *News24* 1.

90 Bergh *Energy Efficiency* 10.

91 Bergh *Energy Efficiency* 10.

92 Ciuta 2010 www.discovery.ucl.ac.uk.

93 WEO 2006 www.worldenergyoutlook.org.

94 WEO 2006 www.worldenergyoutlook.org.

superior military forces during the Iraq war, found it very difficult to provide political stability, restore petroleum production and enhance energy for themselves.⁹⁵

The steady growth of the South African economy results in an increasing focus on industrialisation, together with mass electrification programmes to take power into deep rural areas.⁹⁶ South Africa's energy demand is expected to be twice the current levels by 2030.⁹⁷ In order to enhance energy security (assurance of sufficient energy supplies), the Department of Energy, together with Eskom, has embarked on a massive programme to bring the electricity supply and distribution system into balance.⁹⁸ With an estimated amount of about R340-billion, Eskom is expanding its coal generation capacity by building new power stations, including Medupi in Limpopo and peaking power gas turbine plants at Atlantis and Mossel Bay, running on diesel that will make contribution to the power grid and enhance energy supply.⁹⁹ Electricity generation is a high consumer of fossil fuel, especially in the form of coal.¹⁰⁰ The advent of new coal-fired electricity generation stations and new gas to liquid fuel plants are likely to increase South Africa's dependence on fossil fuel.¹⁰¹ To reduce increase dependence on fossil fuel, more efforts and financial support may be put into energy efficiency for it is likely to enhance energy security as well as energy related public expenditures.¹⁰²

2.2.5 Reduced energy related public expenditures

The budgetary status of a state may be improved through lower expenditure on energy, based on benefits accruing from the introduction of energy efficiency measures.¹⁰³ In countries where fuel is imported, there is a related likely positive impact on current reserves and in energy exporting countries, energy efficiency can free up more fuel for export.¹⁰⁴ Furthermore, countries with energy consumption

95 Zillman *et al* *Beyond the Carbon Economy* 6.

96 Roos *"An energy secure South Africa"* 4. See also Kiratu *"South Africa's energy security"* 1.

97 Roos *"An energy secure South Africa"* 4. See also Kiratu *"South Africa's energy security"* 1.

98 Roos *"An energy secure South Africa"* 4. See also Kiratu *"South Africa's energy security"* 1.

99 Roos *"An energy secure South Africa"* 4.

100 Strydom and Surridge *"Energy"* 769. See also Kiratu *"South Africa's energy security"* 2.

101 Strydom and Surridge *"Energy"* 767.

102 Strydom and Surridge *"Energy"* 767.

103 Ryan and Campbell *"The multiple benefits of energy efficiency"* 4. See also Expert Group on Energy Efficiency, 2007: *Realising the Potential of Energy Efficiency: Targets, Policies and Measures for G8 Countries*, United Nations Foundation, 24.

104 Ryan and Campbell *"The multiple benefits of energy efficiency"* 19.

subsidies, reduced consumption means lowered government budgetary outlays to finance these subsidies.¹⁰⁵

Expenditure on energy may improve the public budgetary position in several ways.¹⁰⁶ A drop in end-use energy demand in the public sector may significantly reduce public expenditure in most countries. Countries, for example, with state-owned enterprises and essential utilities, reduced energy demand means less public expenditure on fuel.¹⁰⁷ This can be particularly important in fuel importing countries where foreign currency reserves may be depleted through high fuel imports.¹⁰⁸

On the contrary, in fuel exporting countries, domestic energy efficiency remains vital, as a drop in energy demand domestically saves more fuel for export. Furthermore, for countries with subventions on energy consumption, a decrease in energy use means reduced government expenses to finance these subventions.¹⁰⁹

2.2.6 Development goals

Sustainable development is an international worry and access to modern energy services is an important issue in serving the basic needs for living and the conditions for economic and social development.¹¹⁰ The United Nations in designating 2012 the International Year of Sustainable Energy for All, called on governments to support its Millennium Development Goals (hereafter MDGs) through energy policies with a specific call to double the rate of improvement in energy efficiency.¹¹¹

The MDGs, which have now been transformed into the Draft Sustainable Development Goals,¹¹² form the bedrock of South Africa's National Development

105 Ryan and Campbell *"The multiple benefits of energy efficiency"* 19.

106 Ryan and Campbell *"The multiple benefits of energy efficiency"* 19.

107 Ryan and Campbell *"The multiple benefits of energy efficiency"* 19.

108 Ryan and Campbell *"The multiple benefits of energy efficiency"* 19.

109 Expert Group on Energy Efficiency, 2007: Realising the Potential of Energy Efficiency Targets, Policies and Measures for G8 Countries, United Nations Foundation, 24.

110 Ryan and Campbell *"The multiple benefits of energy efficiency"* 21. The concept of sustainable development is not discussed for the purpose of this study. For more on sustainable development, see Du Plessis and Rautenbach 2010 PRLJ 27-71, Meyer and Odeku *"Climate change, energy, and sustainable development"* 49-53.

111 Ryan and Campbell *"The multiple benefits of energy efficiency"* 22. See chapters 4 and 5.

112 UN Open Working Group 2014 www.sustainabledevelopment.un.org. One of the main outcomes of the Rio+20 Conference was the agreement by member States to launch a process to develop a set of Sustainable Development Goals (SDGs), which will build on the Millennium Development Goals and converge with the post 2015 development agenda. Notably, the SDGs have been published for comments.

Plan, 2010 to 2030. This Plan, in its Chapter Four, stresses that between 2021 to 2025, energy efficiency will have to increase as well as the resilience of the transport network through the introduction of energy efficiency measures.¹¹³

2.2.7 Job creation

The development of energy efficiency programmes has a potential of creating jobs within a short period of time. Improvement in employment rates can be attached to energy efficiency programmes directly through job creation and indirectly through consumer surplus spending.¹¹⁴ The provision of energy efficiency measures is likely to create abundant jobs which are easily measured.¹¹⁵

In South Africa, the energy efficiency market is growing as the private sector comes to grips with increasing energy prices and customer demand for sustainable business practices.¹¹⁶ Various companies offer a variety of services across the board from energy efficiency assessments to the implementation of energy efficiency measures in order to reduce energy demand. In return, this may provide opportunities for work and jobs for a multitude of individuals, such as civil, mechanical and electrical engineering disciplines at various technical levels.¹¹⁷ Greenpeace estimated that energy efficiency can create 27 000 jobs in South Africa by 2030.¹¹⁸

The present increase in the demand for energy, climate change, threat to energy security and finite nature of fossil fuel has driven the world (South Africa inclusive) into realising the need of energy efficiency. These drivers have led to efforts to develop methods to utilise energy efficiently.

2.3 Methods

In order to improve energy efficiency, a number of options to obtain energy efficiency may be considered across all sectors. Energy efficiency involves using less energy

113 National Development Plan Vision for 2030, chapter 4 <http://www.npconline.co.za>.

114 Ryan and Campbell *"The multiple benefits of energy efficiency"* 20. See also Janssen and Dan Staiaszek 2012 www.eroace.org.

115 Ryan and Campbell *"The multiple benefits of energy efficiency"* 20. See also Buildings performance Institute Europe 2011 www.bpie.eu.

116 Rutovitz *"South African energy sector"* 22.

117 Rutovitz *"South African energy sector"* 22.

118 Rutovitz *"South African energy sector"* 22.

to produce the same amount of service required by the end user, thus increasing the benefit which can be achieved from often constrained supplies. Options or methods of energy efficiency among others include appliance labelling, efficient lighting, buildings, transport, industries and the introduction of energy audits, market-based instruments, education and awareness as well as voluntary instruments.¹¹⁹

2.3.1 Energy efficient domestic appliances

Energy efficient appliances are important sources of energy savings.¹²⁰ Considerable monthly electricity reduction can be achieved by switching to energy efficient appliances.¹²¹ While energy efficient appliances may be more costly to buy than relatively lower or average energy efficient ones, the reduced energy bills may pay for the product long before it wears out.¹²² Appliances which can be attached to domestic energy efficient labelling among others, include refrigerators, air conditioners, irons and stoves devices to notify customers on how energy efficient the device is. This may help consumers in choosing efficient devices thereby enhancing energy efficiency.¹²³

2.3.2 Lighting

Lighting is one of the major causes for high energy usage in large buildings. Sophisticated lighting schemes such as high efficiency lighting controls, lamps and light reflectors through lighting standards may greatly reduce electricity consumption.¹²⁴ Novel efficiency compact fluorescent energy saving light bulbs that distribute more light per watt are widely available. Compact fluorescent bulbs use up to five times less power than equivalent incandescent lights and can last up to six

119 Davis *et al* "Measuring the rebound effect of energy efficiency" 1. See also UNDP *World Energy Assessment* 54, section 2.2.1.

120 Amann, Wilson and Ackerly *Consumer Guide* 1.

121 Govender, Okoro and Chikuni Date unknown www.active.cput.ac.za

122 Govender, Okoro and Chikuni Date unknown www.active.cput.ac.za. See also Lyster and Bradbrook *Energy Law and the Environment* 12.

123 Davis *et al* "Measuring the rebound effect of energy efficiency" 1 .In obtaining efficiency when using a stove during cooking for example, the following rules may be considered. Firstly, match pot size with quantity being cooked as large pots require more energy. Secondly, equate the size of the pot with the size of the stove plate for large plates require extra energy and using a large plate for a small pot will waste energy. Thirdly, a pressure cooker should be used when boiling for it builds up steam pressure and cooks at a higher temperature. This reduces cooking time and saves energy. Lastly, frozen foods should be defrosted overnight in order to reduce cooking times which will enhance efficiency.

124 Davis *et al* "Measuring the rebound effect of energy efficiency" 10-12.

times longer.¹²⁵ Light reflectors that produce same amount of light, using about half the number of lamps can be used to improve conventional fluorescent light fittings. Standards providing advanced lighting controls that provide lighting only in areas where personnel are present may as well enhance energy efficiency, especially in buildings where many lights are being used.¹²⁶

2.3.3 Buildings

Buildings offer great potential for saving energy through efficiency gains.¹²⁷ Huge quantities of energy are lost in the cooling and heating of excessive space in buildings as a result of inefficient energy designs and the construction of buildings.¹²⁸ This is because old building regulations provide minute or no attention to energy efficient design. Reports have revealed that it is possible to save about 40 to 50% energy if building regulations are modified.¹²⁹ The putting in place of building standards and best practices containing energy saving measures such as the installation of a ceiling and wall insulation, water heater blankets, solar water heaters and low-flow shower heads, monitored by energy auditors,¹³⁰ could amount to a significant drop in the quantity of energy consumed.¹³¹ The cost of mounting energy efficient measures would be rewarded by the benefits accruing from the energy saved.¹³²

2.3.4 Transport

The transport sector is one of the areas where fossil fuel has not been effectively substituted.¹³³ The most common replacement fuel has become natural gas although a variety of renewable energy sources exist. However, these various forms of fuel substitutes have been established but vehicles intended to use these substitutes seem to be experiencing difficulties.¹³⁴ The development of energy efficient

125 Davis et al "Measuring the rebound effect of energy efficiency" 11-12.

126 Davis et al "Measuring the rebound effect of energy efficiency" 11-12.

127 Lyster and Bradbrook *Energy Law and the Environment* 11. See also US National Research Council 2010 *National Academy of Science* 39.

128 Lyster and Bradbrook *Energy Law and the Environment* 11.

129 Lyster and Bradbrook *Energy Law and the Environment* 11.

130 See 2.4.6.

131 Lyster and Bradbrook *Energy Law and the Environment* 11.

132 Lyster and Bradbrook *Energy Law and the Environment* 11.

133 Lyster and Bradbrook *Energy Law and the Environment* 13. See also European Commission 2007 www.ec.europa.eu.

134 US Department of Energy, Alternative fuels Data www.eere.energy.gov.

standards whose enforcement would be monitored by energy auditors for transport (vehicles and train) is one of the important responses which will be required to move towards an energy efficient world.¹³⁵ Transport is not the only measure through which energy efficiency might be achieved. Energy efficiency may as well be achieved through industries' energy efficiency.

2.3.5 Industry

A major portion of the energy supplied is consumed by the industrial sector.¹³⁶ Energy savings in industry may be achieved through energy efficient industrial motors, wiring and cogeneration plants. Firstly, industrial motors present a significant occasion to save energy. Large industrial motors, such as those used in the paper industry, consume electricity costing about ten times its own capital cost per year. Savings in energy can be obtained through the replacement of standard induction motors with high energy efficiency motors that save electricity, run cooler and last twice as long.¹³⁷ Furthermore, the switching off of idling motors that are not in use will also save a significant amount of energy and reduce costs.¹³⁸

The use of larger diameter electrical cables (wiring) from the distribution board to industrial machines can also reduce power loss.¹³⁹ This may be done through wiring regulations that stipulate the minimum wire size in order to reduce the possibility of fires, and not to save energy through reduced power losses and costs. Using wires with twice the required diameter will incur high costs initially but would lead to energy saving within a short period of time.¹⁴⁰

Cogeneration is described as the simultaneous production of electrical energy.¹⁴¹ A cogeneration system operates at an overall thermal efficiency as much as 2.5 to 3 times that of conventional electrical generating systems. The normal wasted exhausted heat during electrical generation systems is captured and used for

135 Lyster and Bradbrook *Energy Law and the Environment* 13.

136 Lyster and Bradbrook *Energy Law and the Environment* 13.

137 Lyster and Bradbrook *Energy Law and the Environment* 14.

138 Lyster and Bradbrook *Energy Law and the Environment* 14.

139 Govender, Okoro and Chikuni Date unknown www.active.cput.ac.za.

140 Govender, Okoro and Chikuni Date unknown www.active.cput.ac.za.

141 Lyster and Bradbrook *Energy Law and the Environment* 14. See also California Energy Commission *Cogeneration Handbook* Report 500-82-054.

electrical energy production, thus saving energy and improving energy efficiency in industry.¹⁴²

2.3.6 Energy audits

Energy audits refer to on-site inspection of existing energy activities of consumers by an energy auditor (energy rating) followed by an identification of energy saving potential.¹⁴³ An energy efficiency auditor refers to a person designated to monitor the application of energy efficiency standards and practices within the different energy sectors based on audit schemes.¹⁴⁴ Audit schemes are a practical way of informing consumers about the possible actions to improve energy efficiency. They have been mainly developed in industry and in nonresidential buildings and are increasingly made mandatory.¹⁴⁵ Energy audits are usually funded by public agencies.¹⁴⁶ Mandatory audits like voluntary audits assume a certain quality of the auditors as well as of the staff responsible for energy management in companies (energy managers). This can be assured by the certification of the auditors and training of energy managers.¹⁴⁷

2.3.7 Market-based instruments

Market-based instruments (hereafter MBIs) are important tools in promoting energy efficiency.¹⁴⁸ MBIs refer to “tools that seek to address market failure either by incorporating the external cost of production or consumption activities through taxes or charges on processes or products and facilitating the establishment of a proxy market for the use of energy services”.¹⁴⁹ The rationale for using MBIs in promoting energy efficiency lies in their proficiency to correct market failures in a cost effective manner.¹⁵⁰ MBIs have the advantage of using market signals in order to address market failures. Examples of MBIs among others include energy efficiency taxes,

142 Lyster and Bradbrook *Energy Law and the Environment* 14.

143 World Energy Council 2013 www.unfccc.int.

144 CIPEC “Energy savings toolbox” 1. See also Rue du Can *et al* “Energy efficiency country study” 18.

145 World Energy Council 2013 www.unfccc.int.

146 World Energy Council 2013 www.unfccc.int.

147 World Energy Council 2013 www.unfccc.int. See 25.3.

148 Rademaekers *et al* 2011 *Cambridge econometrics* 35-36. See also Bent “The use of Market-Based Instruments” 207-228, Kasterine and Vanzetti 2010 *Trade and Environmental review* 6.

149 Rademaekers *et al* 2011 *Cambridge econometrics* 35-36. See also Mwakasonda 2004 *Science Forum* 43.

150 Rademaekers *et al* 2011 *Cambridge econometrics* 35-36. See also Kasterine and Vanzetti 2010 *Trade and Environmental review* 6.

charges, subsidies and pricing.¹⁵¹ MBIs can be implemented across the entire energy sector (for example households, mining, industries, commercial among others). Internationally, the most widely used forms of MBIs are energy pricing, taxes, charges, subsidies and levies.¹⁵²

2.3.8 Education and awareness

Consumers, industry and public authorities alike need to be aware of the importance of energy efficiency issues and be motivated to tackle them.¹⁵³ Making available clear and accessible information about energy efficiency and providing appropriate education and training for stakeholders and individuals are key ways of achieving energy efficiency.¹⁵⁴ Priorities for raising awareness on energy efficiency would include labelling as well as education and training programmes for energy managers in industry and utilities, and teaching aids for primary, secondary and vocational education.¹⁵⁵ The impact of education and awareness campaigns can be evaluated through detailed monitoring. The impact and effect can be increased by providing positive feedback to the target group or sector during programmes of behavioural changes.¹⁵⁶

2.3.9 Voluntary instruments

Worldwide experience with energy efficient voluntary instruments has indicated that aspiring targets can be a push factor for advanced and unceasing energy efficiency improvement.¹⁵⁷ Voluntary instruments refer to “negotiated agreements between public authorities and individual firms or groups of firms, which include targets and timetables for action aimed at improving energy efficiency or reducing GHG emissions and define rewards and penalties”.¹⁵⁸ Voluntary instruments are often combined with other instruments such as energy audits.¹⁵⁹ Factors influencing the success of voluntary programmes and negotiated agreements include social

151 Bent “The use of Market-Based Instruments” 207-228. See also Rademaekers *et al* 2011 *Cambridge econometrics* 35-36.

152 Rademaekers *et al* 2011 *Cambridge econometrics* 35-36.

153 European Commission 2007 <http://www.ec.europa.eu>.

154 European Commission 2007 <http://www.ec.europa.eu>.

155 European Commission 2007 <http://www.ec.europa.eu>.

156 European Commission 2007 <http://www.ec.europa.eu>.

157 Moos “*Realising the potential of energy efficiency*” 42.

158 Rezessy and Bertoini 2011 *Energy Policy* 7121.

159 Moos “*Realising the potential of energy efficiency*” 42.

pressure or systems of social control, supporting instruments and regulations, positive incentives, transparent target setting, clarity on commitments on both sides, adoption of new roles and responsibility and good communication networks among participants.¹⁶⁰ Voluntary programmes have a range of soft effects like capacity building, increasing awareness, empowerment and the transfer of responsibilities from authorities and experts to energy end-users themselves.¹⁶¹

Energy efficiency has the potential in meeting the growing energy needs of countries.¹⁶² However, the penetration of energy efficiency into societies remains somewhat slow due to a range of impediments.¹⁶³

2.4 Impediments to energy efficiency

Energy consumption patterns are shaped by the behaviour of a large number of actors at various levels. These actors include energy consumers, end use equipment manufacturers and providers, producers and distributors of energy carriers, actual and potential cogenerators, financial institutions and governments. For energy efficiency to be achieved, action may be required at all levels from the lowest level of the consumer through to the highest level of global agencies.¹⁶⁴ However, barriers of implementing these improvements, among others, include low energy prices, financing, poverty, uncertainty, split incentives, capital budgeting and ignorance.¹⁶⁵

2.4.1 Low energy prices

Most often, the central objective of energy policies is to keep energy prices low.¹⁶⁶ Low energy prices reduce the zeal to spend money on energy efficiency, for example, to buy or introduce expensive energy efficient appliances.¹⁶⁷ However, the cost of energy in South Africa is very low if compared internationally as indicated in Figure 2 below:

160 Rezessy and Bertoini 2011 *Energy Policy* 7122.

161 Rezessy and Bertoini 2011 *Energy Policy* 7122.

162 See also para 2.3.

163 Brown 2001 *Energy Policy* 1197.

164 Ryan *et al* "Energy efficiency policy and carbon pricing" 13. See also Bhattacharyan and Cropper 2010 *Resource for the future* 22.

165 Ryan *et al* "Energy efficiency policy and carbon pricing" 13. See also Reddy "Barriers to improvements in energy efficiency" 953, Kellermann *The Most Important barriers* 52-61, Painuly *et al* 2003 *JOCP* 659-665.

166 Gerrard *The Law of Clean Energy* 7.

167 Gerrard *The Law of Clean Energy* 7. See also Kohler 2013 *ERSA* 2, Inglesi-Lotz and Pouris 2012 *Energy* 113-120.

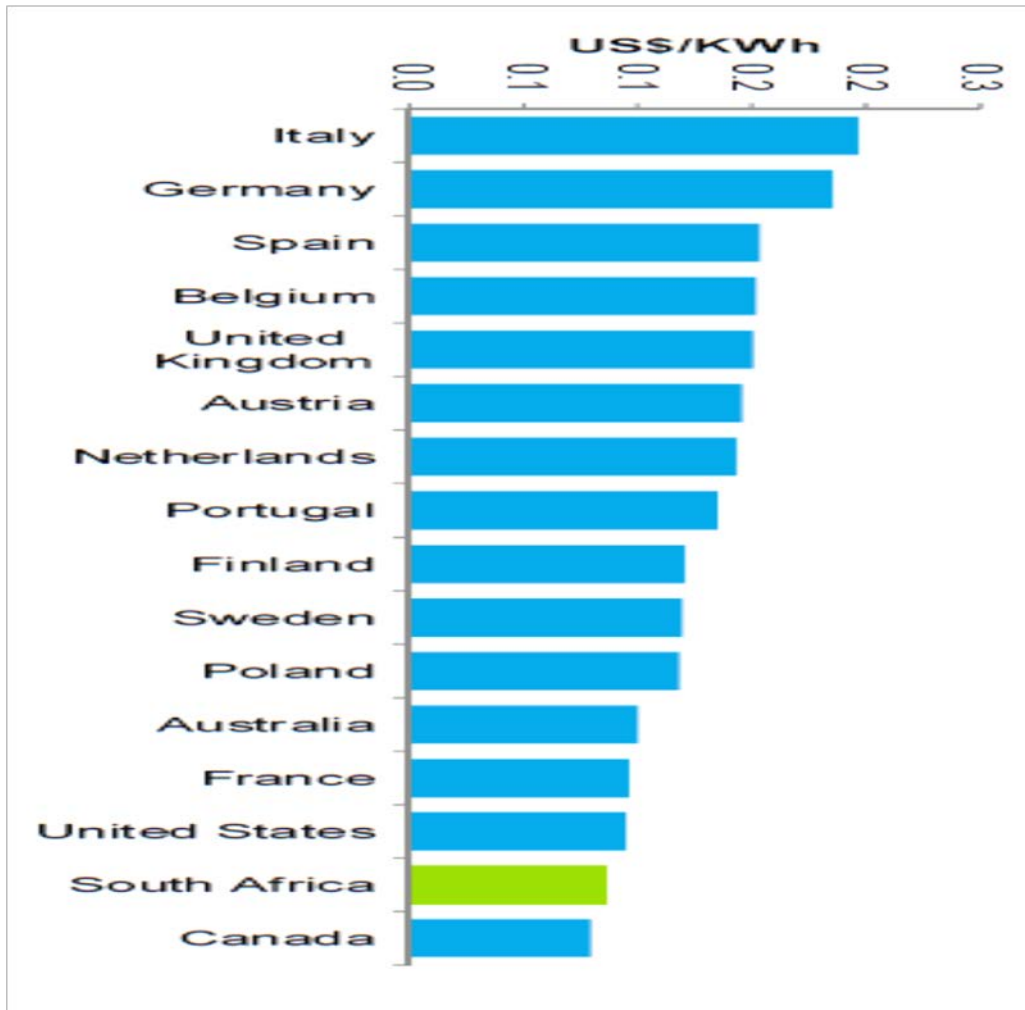


Figure 2: Electricity price comparison 2011¹⁶⁸

The low cost of electricity creates a situation where the investment in energy efficiency measures therefore does not justify savings, due to long-term returns involved.¹⁶⁹ To increase the price of electricity in order to boost an increase in energy efficiency projects may have a substantial impact on the economy, and will normally not be considered. The exclusion to increase electricity prices might, however, be where a government has a long-term strategic plan to become less

168 Source: NUS Consulting Group (June 2011) International Electricity and Natural Gas Report and Price Survey 2010-2011 in "The Economic Impact of electricity price increases in various sectors of the South African economy" 43 [http:// www.eskom.co.za](http://www.eskom.co.za).

169 Gerrard *The Law of Clean Energy*7.

dependent on conventional ways of generating electricity and where this additional revenue will be used to invest in energy efficiency projects to the benefit of all.¹⁷⁰

The rapid increase in energy prices over the last couple of years and the expected rise in future prices will definitely help to lower this barrier internationally as well as in South Africa, and create more and better opportunities for energy efficiency.¹⁷¹ Nonetheless, an increase in energy prices will hopefully result in an increase in finances for energy efficient projects to promote energy efficiency.¹⁷²

2.4.2 *Financing*

Investments in energy efficient projects will sometimes compete for limited capital alongside projects aimed at improving or expanding core business processes.¹⁷³ These projects and associated energy savings are not normally seen as contributing to revenue. Imperfect information on energy efficiency issues as well as flawed perceptions might also influence investment evaluations and thereby favour investments more aligned to core processes.¹⁷⁴

The allocation of capital to energy-efficient projects can even be influenced by company specific procedures where such projects are classified as maintenance related and therefore having a lower priority compared to strategic projects.¹⁷⁵ Further internal obstacles to finance energy efficient projects might also include the lack of such a project having a 'prestigious image' as well as the 'relative power' exercised by individuals responsible for energy management in the company.¹⁷⁶ Individuals and companies may face obstacles in financing or purchasing energy efficient products.

2.4.3 *Poverty*

Most often, even in situations where a consumer is well informed about the profits that flow from energy efficiency improvement, it does not mean such a consumer will

170 Bertoldi, Rezessy and Vine 2006 *Energy Policy* 1818 - 1832.

171 Bertoldi, Rezessy and Vine 2006 *Energy Policy* 1818-1832. See also Schleich and Gruber 2008 *Energy Economics* 449-464.

172 Kohler 2013 *ERSA* 3.

173 Schleich and Gruber 2008 *Energy Economics* 452.

174 Govender *Energy saving mechanisms* 29. See also Schleich and Gruber 2008 *Energy Economics* 452.

175 Schleich 2009 *Ecological Economics* 2153.

176 Schleich and Gruber 2008 *Energy Economics* 454. See also Painuly *et al* 2003 *JOCP* 659-665.

invest in the related energy device, since in most instances, the greater the efficiency of an energy device, the higher its price.¹⁷⁷ Hence, it is normal for the energy consumer to ask if energy savings and other benefits justify the increased investment in efficiency improvement. Energy efficiency can be achieved, for example, by the replacement of incandescent bulbs with compact fluorescent lamps.¹⁷⁸ Making compact fluorescent lamps affordable (as was done in South Africa in 2006 by the national utility Eskom, which distributed more than 7 million CFLs to replace incandescent bulbs for distribution to low-cost housing areas)¹⁷⁹ to the poor may lead to great improvements in energy efficiency.¹⁸⁰

In South Africa, many households do not have the means to pay for energy efficiency implementations. A large percentage of the country's population still earns a salary barely enough to feed, clothe and provide some sort of safe dwelling for all the members of the family, not even considering health and educational expenditures. Spending money on energy efficiency initiatives is therefore not high on the priority lists of many South African.¹⁸¹

Furthermore, local authorities might not be inclined to further the implementation of energy efficiency measures in their residential and commercial constituencies due to the potential loss of a major part of their income.¹⁸² Most South African municipalities act as electrical redistributors and buy electricity from Eskom to sell to local consumers at high profit margins.¹⁸³ Lack of finance just like uncertainty in the prices of energy may negatively affect the implementation of energy efficiency.

177 Ryan *et al* "Energy efficiency policy and carbon pricing" 15. See also Reddy "Barriers to improvements in energy efficiency" 954.

178 See 2.4.2.

179 Eskom distributes Free and Subsidized CFLs. at <http://www.eskom.co.za>.

180 See the *National framework for Municipal Indigent Policy* (2006) which intends to guide the national initiative to improve the lives of indigents and to improve access to Free Basic Services. The Policy was approved by the Social Sector Cluster as part of the social wage package in 2005. Subsequent to that, the guidelines for the implementation of the national indigent policy by municipalities was approved by the Minister in 2006. The guidelines apply specifically to the Free Basic Services programme within municipalities that is Free Basis Water, Free Basic Sanitation, Free Basic Energy/Electricity and Free Basic Refuse Removal. See also Reddy "Barriers to improvements in energy efficiency" 954.

181 Volschenk "Using ESCOs to facilitate sustainable energy interventions" 11.

182 Volschenk "Using ESCOs to facilitate sustainable energy interventions" 11.

183 Volschenk "Using ESCOs to facilitate sustainable energy interventions" 11.

2.4.4 *Uncertainty*

Uncertainty in energy prices poses another barrier to efficiency improvements. Energy efficiency improvements significantly depend on the current and future prices of energy efficient carriers and devices.¹⁸⁴ The existence of uncertainty about these prices tend to make consumers postpone the decision or play it safe and avoid investments.¹⁸⁵ This barrier of the uncertainty in prices can be addressed by slowly changing energy prices over a long period of time.¹⁸⁶

Furthermore, the fears that future technologies will be significantly better and cheaper can be a rational reason for decision-makers to delay an investment in energy efficient technology. Delaying an investment means short-term energy savings may be foregone.¹⁸⁷

2.4.5 *Split incentives*

Split incentives are huge barriers to the implementation of energy efficiency. Split incentives refer to circumstances in which the flow of investments and benefits are not properly shared among the parties to a transaction, impairing investment decisions.¹⁸⁸ Most often, the party that would have to pay for energy efficiency improvement is different from the party that would benefit. For example, in an apartment where the land lord pays for the electricity, tenants may leave their air conditioning throughout the day so they can come home to an already cooled apartment thereby making efficiency ineffective.¹⁸⁹

2.4.6 *Capital budgeting*

Huge expenditures are always required in order to obtain energy efficiency and yield reductions in operating expenses.¹⁹⁰ Energy efficiency organisations (both public and private) have separate operating budgets and capital which are not always well

184 Kiely *et al* "Energy efficiency" 11.

185 Kiely *et al* "Energy efficiency" 11.

186 Kiely *et al* "Energy efficiency" 11.

187 Kiely *et al* "Energy efficiency" 11.

188 Bird and Hernandez 2012 *Energy Policy* 506. See also Ryan *et al* "Energy efficiency policy and carbon pricing" 15.

189 Peretz 2009 *ELJ* 377. See also Ryan *et al* "Energy efficiency policy and carbon pricing" 15.

190 Lackner "Energy efficiency: Comparison of different systems and technology" 863. See also Govender *Energy saving mechanisms* 29.

coordinated. In addition, many entities have little ability to borrow capital even for projects with an assured return for energy efficiency.¹⁹¹ **2.4.7 Ignorance**

Energy efficiency improvements in every sector require the concurrence, support and participation of the ultimate consumer of energy. This requires the involvement of the consumer knowing about energy technology, being aware of the possible efficiency improvements and understanding the costs and benefits of the different options.¹⁹² Nevertheless, many consumers (individuals, households, firms, farms, factories, among others) are quite ignorant of the possibilities of efficiency measures.¹⁹³ However, in overcoming this barrier, information is to be provided to these consumers. This can be done through a door to door canvassing, distribution of leaflets, mail, newspapers, magazines, radio, television, demonstrations as well as training of consumers on the possible advantages of efficiency improvements.¹⁹⁴ Though in many cases incentives¹⁹⁵ may prove more important than information, the effective supply of good quality, relevant information and the education and training of the consumer are important contributions to overcoming this barrier.¹⁹⁶

2.5 Conclusion

Energy efficiency is a concept with different definitions depending on the context within which it is defined and meaning given to it. For the purpose of this dissertation, “energy efficiency” is defined as (a) an improvement in energy equipment, technology, practices, products and services (such as lighting, cooling, heating, manufacturing, cooking and transport) or (b) a change in behaviour or (c) the introduction of energy management systems in order to reduce the amount or quality of energy used.

There are various drivers that can be used to implement energy efficiency measures. They include among others, climate change, increase demand for energy, energy security, the finite nature of fossil fuel, reduced energy related public expenditures, developmental goals and job creation. Energy efficiency in buildings, lighting

191 Lackner “*Energy efficiency: Comparison of different systems and technology*” 863.

192 Wade, Pett and Ramsey 2003 *ACE* 21. See also Mackovich 2008 *CERA* 21-22.

193 Wade, Pett and Ramsey 2003 *ACE* 21. . See also Mackovich 2008 *CERA* 21-22.

194 Wade, Pett and Ramsey 2003 *ACE* 21. See 2.4.8.

195 See section 2.5.3.

196 Wade, Pett and Ramsey 2003 *ACE*. See also Mackovich 2008 *CERA* 21-22.

systems, industries, transport as well as appliances through appliance labelling, energy audits, market-based instruments, education and awareness as well as voluntary instruments are some of the methods through which energy efficiency could be obtained.

Despite the remarkable benefits associated with energy efficiency, the overall permeation of energy efficiency remains somewhat slow and ineffective due to certain impediments such as low energy prices, financing, poverty, uncertainty, split incentives, capital budgeting and ignorance. It seems that the introduction of energy efficiency cannot be left in the hands of consumers alone. Some regulation is necessary whether by law or by self-regulation. There are various methods how energy efficiency can be achieved. These methods could be through policies and legislation. Some actions are however, behavioural and will have to be addressed by way of education and improve awareness through television and radio programmes.

Recognising the benefits associated with energy efficiency and in response to international law, SADC put in place guidelines on how energy efficiency could be attained at both regional and national levels. How energy efficiency would be attained within states, as mandated by the SADC energy frameworks is discussed in the next chapter.¹⁹⁷

197 See 3.

3 SADC frameworks pertaining to energy efficiency

Energy is vital to development within the SADC.¹⁹⁸ Beyond its use in daily life, fuel and electricity drives infrastructure projects that drive both regional integration and economic growth.¹⁹⁹ As the SADC region industrialises on its path to improved human development, energy production and distribution increase in importance.²⁰⁰ Recognising the fundamental role of energy in accomplishing its goals, SADC adopted the *Protocol on Energy* (1996), which provides a framework for cooperation on energy policy among SADC member states.²⁰¹ A host of policy documents have been drafted on the footings of the *SADC Treaty*²⁰² and the *SADC Protocol on Energy*. These include the *SADC Energy Corporation Policy and Strategy* (1996), the *SADC Energy Action Plan* (1997), the *SADC Energy Sector Activity Plan* (2000) and the *SADC Regional Infrastructural Master Plan* (2012). These policy documents play an important role in setting out objectives for energy development in SADC in areas such as energy efficiency and conservation, wood fuel, petroleum and natural gas, electricity, coal and renewable energy.²⁰³ The aim of this chapter is to briefly examine the measures of attaining energy efficiency as provided for in the above-mentioned frameworks. South Africa (a member state of SADC), in developing policies that enhance energy efficiency will have to ensure that they correspond with guidelines as provided for by the SADC frameworks.

3.1 SADC Protocol on Energy (1996)

The *SADC Protocol on Energy* was signed in August 1996.²⁰⁴ Key objectives of this protocol include the harmonisation of national and regional energy policies, strategies and programmes, cooperation in the development of energy in order to

198 SADC Energy Policy Brief 2010 <http://www.sardc.net>. See also Niekerk and Moreira “*Regional integration in southern Africa*” 69-70.

199 SADC Energy Policy Brief 2010 <http://www.sardc.net>.

200 SADC Energy Policy Brief 2010 <http://www.sardc.net>

201 Ruppel 2012 *SLJ* 24. SADC was established by the *SADC Treaty* (1992).

202 SADC as an inter-governmental organisation was established by the *SADC Treaty* (1992), as a successor to the Southern African Development Coordination Conference which was founded in 1980.

203 Iseksen and Tjonneland “*Assessing the restructuring of SADC*” 39-40.

204 The SADC Protocols are instruments by means of which the *SADC Treaty* is implemented. They have the same legal force as the Treaty itself. A Protocol legally binds its signatories after ratification. The *SADC Protocol on Energy* is legally binding on member states (Section 22(9) of the *SADC Treaty*). South Africa ratified the *SADC Protocol on Energy* in 1996 <http://www.dfa.gov.za>. See Ruppel 2012 *SLJ* 25.

ensure the security and reliability of energy supply and the minimisation of cost.²⁰⁵ The *SADC Protocol on Energy* emphasises that the development and use of energy are to be environmentally sound.²⁰⁶ The Protocol contains a specific mandate for co-operation in the development and utilisation of energy in the region and on energy efficiency and conservation, electricity, wood fuel and coal, petroleum, natural gas and new and renewable energy sources. This objective is to be attained through energy policies, energy strategies and programmes at regional and national levels.²⁰⁷ It further states that the national energy efficiency policies, strategies and programmes of member states must correspond with those at the SADC level.²⁰⁸

3.2 SADC Energy Plans

In meeting the goals of its *Protocol on Energy*, SADC developed Energy Plans which set out objectives for SADC and its member states for energy infrastructure development.²⁰⁹ These plans include the *SADC Energy Cooperation Policy and Strategy* (1996), the *SADC Energy Action Plan* (1997), the *SADC Energy Activity Plan* (2000), and most recently, the *SADC Regional Infrastructure Development Master Plan* (2012). The following paragraphs contain a brief overview of the aims and objectives of these instruments.

3.2.1 SADC Energy Cooperation Policy and Strategy (1996)

The *SADC Energy Co-operation Policy and Strategy* (1996) was established in terms of the provisions of the *SADC Protocol on Energy* and encompasses a comprehensive action plan for harmonised regional energy activities.²¹⁰ It identifies policies and strategies for the key areas of energy trade, investment and financing, training and organisational capacity building as well as information and experience exchange at both regional and national levels. The *Energy Cooperation Policy and Strategy* stresses that energy policies, strategic management and strategies of sectoral and subsectoral sectors of energy (energy efficiency and conservation, electricity, coal and natural gas) at SADC and within member states, will play an

205 Article 3 *SADC Protocol on Energy*. See also Ruppel 2012 *SLJ* 25, Barnard 2014 *JESA* 30.

206 Article 2.8 *SADC Protocol on Energy*.

207 Article 3.3 *SADC Protocol on Energy*.

208 Article 2(10) *SADC Protocol on Energy*. Article 22(9) of *SADC Treaty* provides "Each Protocol shall be binding only on the member states that are party to the Protocol in question." See 4.

209 Ruppel 2012 *SLJ* 25.

210 Isaksen and Tjonneland "Assessing the restructuring of SADC" 39.

important role in sustainable growth and development.²¹¹ However, none of these documents spell out the how.

3.2.2 SADC Energy Action Plan (1997)

The *SADC Energy Activity Plan (1997)* established in terms of the provisions of the *SADC Protocol on Energy* merely recommends that energy efficiency within the energy unit (energy efficiency and conservation, electricity and coal) of member states would have to concentrate on priority programmes and projects.²¹²

3.2.3 SADC Energy Activity Plan (2000)

The *SADC Energy Sector Activity Plan (2000)* serves as a key document guiding the activities of the SADC Energy Sector in the short and medium terms. It includes 30 activities and defines priorities in four areas, energy trade, investment and finance, organisational development and capacity building and information and experience exchange.²¹³ The Activity Plan and its related activities revolve around the objective of increasing levels of energy efficiency and access to renewable energy (modern energy sources) in the region and among member states through energy sector programmes, policies and strategic management.²¹⁴ The plan therefore now describes activities while the other document focuses on broader issues providing a framework.

3.2.4 SADC Regional Infrastructural Development Master Plan (2012)

The *SADC Regional Infrastructural Development Master Plan (2012)* (hereafter RIDMP) was approved by the SADC Summit in August 2012.²¹⁵ The plan is to be implemented over a 15 year period from 2013 to 2027 and will serve as a key strategy to guide the creation of efficient, cost-effective trans-boundary infrastructure connecting all SADC member states in areas of energy, water, ICT and transport. Energy efficiency as part of the energy policies is a core ingredient for the purpose of

211 Preamble of SADC Energy Cooperation Policy and Strategy. See also Niekerk and Moreira "*Regional integration in Southern Africa*" 68-69, Ruppel 2012 *SLJ* 26. See 4.

212 Isaksen and Tjonneland "*Assessing the restructuring of SADC*" 41. See Barnard 2014 *JESA* 30.

213 SADC Energy Sector Annual Report May 2000-June 2001. See 3.3.1.

214 Niekerk and Moreira "*Regional integration in Southern Africa*" 69.

215 *SADC Regional Infrastructural Development Master Plan (2012)* at <http://www.sadc.int/documents-publications/show/936>.

development.²¹⁶ The recent development of the policy tools mentioned above demonstrates that there is a shift towards energy efficiency development in the regional energy agenda.

Notably, the RIDMP just like the *SADC Protocol on Energy* and the earlier Energy Plans do not specify energy efficiency measures (for example, appliance labelling, incentives among others) which should be included within the energy efficiency policies, management and strategies at the national level. Furthermore, they do not state how or who will check on compliance with energy efficiency or what would be done in cases of non-compliance at the national level.

3.3 Conclusion

This chapter has presented a brief outline of the frameworks pertaining to energy enacted by SADC that provides a guideline on how energy efficiency should be attained. Common measures that states could implement as referred to in these frameworks include among others, energy efficiency policies, strategies, priority programmes and projects. These measures are seen as steps towards the realisation of energy efficiency at both SADC and national (member state) levels. It remains the responsibility of each member state to introduce national legislation that enhances energy efficiency and corresponds with the guidelines set by the SADC frameworks.

Although the SADC energy frameworks can be criticised for being broad and not precise on measures on how energy efficiency may be attained,²¹⁷ the frameworks have the merit of mandating member states to put in place policies, strategies, priority programmes and projects to enhance energy efficiency. Nonetheless, the promulgation of the above legislation alone cannot achieve the goal of energy efficiency. Voluntary instruments may at least be referred to as a tool in attaining energy efficiency.²¹⁸

South Africa has already introduced some policies, strategies and legislation to address energy efficiency. These measures are discussed in Chapters 4 and 5.

216 Para 3.2.1 of the *SADC Regional Infrastructural Development Master Plan* (2012).

217 Luxande and Schutze “*Mid-term review of SADC renewable energy*” 1.

218 See 5.3.

4 South Africa's energy efficiency policy frameworks

As stated in the previous chapter, South Africa and other SADC member states are obliged to develop energy efficiency policies, strategies, programmes and projects pursuant to the SADC frameworks.²¹⁹ South Africa in meeting its SADC obligation over the years, has put in place several policies and strategies that regulate energy efficiency. The policies underpinning efficiency are discussed in this chapter while legislation and voluntary instruments are examined in chapter five. The policies and strategies among others, include the *White Paper on Energy Efficiency* (1998), the *White Paper on Renewable Energy* (2003), the *National Energy Efficiency Strategy* (2009), the *National Climate Change Response White Paper* (2011) and the *Integrated Resource Plan for Electricity 2010-2030* (2011). The present chapter is an enquiry into the extent to which these instruments provide guidelines to achieve energy efficiency and determine whether they correspond to the broad based SADC frameworks.

4.1 *White Paper on Energy Policy* (1998)

The *White Paper on Energy Policy* (1998) (hereafter WEP) is an important document regarding the regulation of electricity and electrical products to enhance energy efficiency in the country. This is due to the fact that the policy was the first energy document published after democratisation.²²⁰ This policy defines energy efficiency as “a measure of the savings of energy, which is used to provide goods and services, while maintaining the desired benefits”.²²¹ Energy efficiency as defined by the WEP is mostly concerned with energy efficiency in its economic context. It refers to the savings of energy in order to provide goods and services. If this definition is compared to the definitions in chapter two and the definition for the purpose of this study,²²² the definition lacks clarity as to which measures of saving energy should be

219 See section 3.

220 The South African government published a *White Paper on Energy Policy* in 1986. With the end of apartheid, South Africa witnessed fundamental shifts resulting in significant changes in the energy policy context. The election of a new government in 1994 necessitated a review of the existing policy. In responding to democratisation, a number of negotiating processes began within the energy sector, especially in the stakeholder-based forums such as the liquid fuel industry task force and the national electrification forum. The government decided to integrate these and to provide policy stability by formally launching a Draft *White Paper on Energy Policy* which was finally released in July 1998. See also Kiratu “*South Africa's energy security*” 3.

221 DOE WEP (1998) 84. See 2.2.1.

222 See section 2.2.1.

conferred upon. For example, should these measures of energy savings be based on improvement in energy practices, improvement in technology or behavioural change? From the vision of the WEP, it seems that energy efficiency will be achieved by greater efficiency in energy use through energy efficiency measures in the industrial, commercial, domestic and transport sectors.²²³ These measures are discussed below.

4.1.1 Energy efficiency in industry and commerce

Industry and commerce are major consumers of energy. They are sometimes unaware and most often, ignorant of the need for and potential of energy efficiency improvements. Studies have proven that about 20% of municipality electricity is used in commercial buildings.²²⁴ In achieving energy efficiency in these sectors, efficiency standards and norms will have to be developed and implemented.²²⁵ Energy audit schemes could also be developed in order to monitor and identify further opportunities for energy efficiency improvements.²²⁶ Energy efficiency standards for industrial equipments should equally be established. Huge amounts of energy saving are possible if more energy efficient electric motors are used in industries.²²⁷ An energy efficient programme should also be implemented in all government buildings in order to reduce consumption in installations.²²⁸

4.1.2 Energy efficiency in households

Energy efficiency in households could be promoted through the establishment of relevant standards and codes of practice. Furthermore, a programme of education for decision-makers such as designers, financiers, builders and home owners should be implemented in order to inform them on cost benefits of building dwellings with good thermal performance.²²⁹

223 DOE WEP (1998) 84. See also Kiratu "South Africa's energy security"3.

224 DOE WEP (1998) 85. See also 2.4.5 and 2.4.3.

225 See 2.4.

226 DOE WEP (1998) 85.

227 DOE WEP (1998) 85. Large amounts of electricity in industries are consumed by electric equipment, for example, electrical motors.

228 DOE WEP (1998) 85.

229 DOE WEP (1998) 86.

4.1.3 Appliance efficiency

Energy efficiency in domestic appliances could be promoted through the establishment of a domestic appliance labelling programmes. In addition, publicity campaigns could be undertaken to ensure consumer awareness of the purpose of appliance labelling as well as benefits of efficient appliances.²³⁰

4.1.4 Energy efficiency in transport

Reduction in motor vehicle fuel consumption would assist in dropping the burden on scarce foreign exchange reserves as a large proportion of transport fuel is imported. Efficiency improvements may also reduce air pollution and increase economic output.²³¹

4.1.5 Energy efficiency and government capacity

Government will further investigate the establishment of appropriate institutional infrastructure and capacity for the implementation of energy efficiency strategies in order to monitor the achievement of these policies. Targets may also be set for energy efficiency improvements in various industries and commercial organisations. Government may monitor and evaluate the results and determine whether these targets have been met. Such targets may not be mandatory and industry and commerce may be asked to participate in the setting of voluntary targets.²³²

Since 1998, pursuant to the mandate of the WEP in achieving energy efficiency, South Africa has been progressively working towards drafting policies to implement measures relating to energy efficiency. Though the WEP can be credited for its exhaustive list of sectors (commercial, industrial, domestic and transport) as well as measures²³³ through which energy efficiency would be achieved, steps and procedures to be followed in achieving these measures within the different sectors have not been provided.

230 DOE WEP (1998) 86. See 2.4.1.

231 DOE WEP (1998) 86 to 87. See 2.4.4.

232 DOE WEP (1998) 87. See 2.4.6.

233 Energy efficiency within the different sectors as provided for by the WEP (1998) could be achieved through measures such as efficiency standards and norms, appliance labelling, efficiency in transport and institutional infrastructure for the implementation of energy efficiency strategies. See 2.4.

Although the WEP does not directly read as an energy efficiency policy, strategy, programme or project as mandated by SADC frameworks,²³⁴ it provides an exhaustive list of sectors as well as measures through which energy efficiency may be achieved. Furthermore, it also calls for the development of an energy efficiency policy after 1998. The WEP corresponds with the SADC frameworks in that it provides a framework for energy efficiency and a basis on which subsequent policies and strategies could be built.

4.2 White Paper on Renewable Energy (2003)

In 2003, the *White Paper on Renewable Energy* (hereafter WRE)²³⁵ was published. Although it focuses on renewable energy, the document also provides for energy efficiency as a measure of energy savings.²³⁶ The document links the use of renewable energy to energy efficiency. The WRE has the same definition of energy efficiency as the one mentioned in the WEP²³⁷ and therefore does not cover all the elements of energy efficiency.²³⁸

In 2003, expenditure on energy represented about 15% of South Africa's GDP, as such energy efficiency remains an important factor to be taken into consideration in reducing this expenditure.²³⁹ Energy efficiency according to the WRE, will only be achieved through energy efficiency interventions in the industrial and housing sectors.²⁴⁰ The WRE also provides a list of sectors within which energy efficiency may be achieved but it is less exhaustive than that of the WEP.²⁴¹ These issues are mentioned briefly in the study.

234 See 3.4.

235 DOE WRE (2003).

236 DOE WRE (2003) 36. See also Musango, Amigun and Brent "Sustainable Electricity Generation Technology in South Africa" 125.

237 The WRE defines energy efficiency as measures of the savings of energy, which is used to produce goods and services while maintaining the desired benefits

238 See 4.2.

239 DOE WRE (2003) 36. See also Winkler "Renewable Energy Policy in South Africa" 29.

240 DOE WRE (2003) 36.

241 Although the WRE only mentions the industrial and households as sectors within which energy efficiency is to be achieved, it is important to note that these two sectors are among the areas where energy consumption is very high. See Figure 3 below.

4.2.1 Households

According to the WRE, energy efficiency in the household sector would be achieved through housing subsidies. The Department of Housing should, in partnership with the Department of Energy, in its guidelines, stipulates that energy efficiency in households should be achieved through the incorporation of passive solar design, replacement of electric geysers with solar water heaters, more efficient home electrical appliances as a result of appliance labelling and enforcement of standards as well as efficient lighting.²⁴²

4.2.2 Industries

Similar to the WEP, the WRE refers to energy efficiency in the industrial sector and states that energy efficient standards for electrical appliances should be developed, implemented and appliances labelled.²⁴³ Industries and households are among the largest energy consuming sectors as illustrated in Figure 3 which refers to the final sectoral energy consumption for 2006.

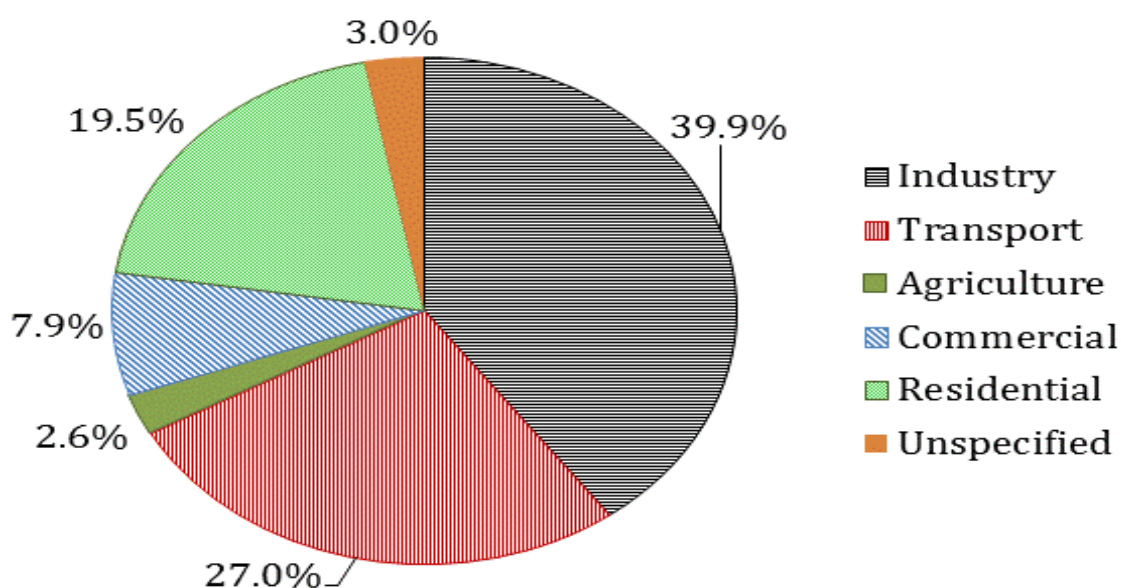


Figure 3: Share of final energy consumption by sector, 2006²⁴⁴

242 DOE WRE (2003) 36.

243 DOE WRE (2003) 37.

244 Source; DOE: Energy balance 2006, also used by the Energy Research Centre of the University of Cape Town "Assumptions and Methodology" 3, 2013 volume 1.0.

Although the WRE can be criticised for only referring to a few sectors²⁴⁵ within which energy efficiency may be achieved, it must be stated that the focus of the WRE is renewable energy and not energy efficiency. The WRE, however, goes further than the WEP by providing alternative solutions to the use of energy.²⁴⁶

Although the WRE cannot specifically be regarded as an energy efficiency strategy, policy, programme or project as mandated by the broad SADC frameworks, it incorporates renewable energy measures as a medium through which energy efficiency may be attained.

4.3 Integrated Energy Plan (2003)

The *Integrated Energy Plan* (hereafter IEP) was drafted in 2003, the same year that the WRE came into existence. The IEP aims at promoting energy efficiency through energy efficiency management and technologies.²⁴⁷ The IEP indicates that energy comprises approximately 15% of the country's GDP and the introduction of energy efficiency measures has the potential of contributing to approximately 3% growth of the country's GDP.²⁴⁸ Furthermore, the introduction of energy efficiency stands a chance of reducing energy demands significantly with a substantial decrease in cost to the energy system.²⁴⁹ Energy efficiency in this regard would be achieved through the introduction of an energy efficiency policy, legislation, regulation and programme.²⁵⁰ In achieving a cross-sector goal, the energy market and the private sector remain potential role players while the government remains the overall regulator of the sector.²⁵¹

245 As per the WRE, energy efficiency is to be achieved through energy efficiency interventions in the industrial and household sectors only. Other sectors such as the commercial mentioned in the White Paper on Energy, 1998 have been left out.

246 The WEP (1998), regarding energy efficiency in the household sector, only refers to the promotion of energy efficiency through appliance labelling, standards and codes while the WRE provides for alternative measures such as the incorporation of passive solar design, replacement of electric geysers with solar water heaters, more efficient home electrical appliances through appliance labelling, enforcement of standards and efficient lighting through which energy efficiency may be attained within households.

247 DOE IEP (2003) 7. See also Kiratu "South Africa's Energy Security" 3.

248 DOE IEP (2003) 8. See also Kiratu "South Africa's Energy Security" 3.

249 DOE IEP (2003) 22.

250 DOE IEP (2003) 4.

251 DOE IEP (2003) 24. See also Winkler *et al* "Energy Policies" 11.

The IEP, similar to the WEP and WRE, aim among others, to promote energy efficiency. The IEP does not provide a definition of energy efficiency.²⁵² It does not specify energy sectors or energy efficiency measures²⁵³ which are to be included in the energy efficiency legislation, policies, regulations and programmes.

The IEP similar to the SADC energy frameworks provides broad based measures through which energy efficiency may be attained.²⁵⁴ Although the IEP does not read as an energy efficiency strategy, policy, programme or project, it aligns itself with the SADC documents by calling for the development of energy efficiency policies and programmes among other issues.

4.4 National Integrated Resource Plan (2003/2004)

A *National Integrated Resource Plan (2003/2004)* (hereafter NIRP2) was introduced in 2003 in response to the WEP's objective relating to affordable energy services. The NIRP2 is a revision of the *first National Integrated Resource Plan (NIRP1)* issued in 2001.²⁵⁵ The National Electricity Regulator of South Africa (hereafter NER) commissioned the plan (NIRP2), in order to provide a long-term (running from 2003 to 2022), cost-effective resource plan for meeting the electricity demand, which is consistent with reliable electricity supply and environmental, social and economic policies commissioned the NIRP2.²⁵⁶ Energy efficiency as per the NIRP2 is targeted in five demand side management (DSM) programmes.²⁵⁷ That is, residential energy

252 See 4.2 and 4.3.

253 See 2.4.

254 The measures which are to be included in the policies, strategies, programmes and projects which are to be developed have not been provided.

255 The first NIRP (NIRP1) was carried out in 2002. The second NIRP was carried out under the auspices of the NER in the period 2003-2004, and follow the footprints of NIRP1. The NIRP2 just like the NIRP1, both focus on residential energy efficiency, industrial, mining and commercial energy efficiency, residential load management, industrial and mining load management for their demand site management options. Nonetheless, the NIRP2 assumes approximately 50% lower penetration of demand side management programmes than NIRP1. The NIRP1 estimates were based on desktop studies while the NIRP2 is based on a more conservative approach in estimating demand site management programmes both in terms of capacity and cost.

256 DOE *NIRP (2003/2004)* 11.

257 Demand-side management is a set of interconnected and flexible programmes which allow customers a greater role in shifting their own demand for electricity during peak periods and reducing their energy consumption overall. DSM programmes comprise of two principal activities, demand response programmes or "load shifting" on the one hand and energy efficiency and conservation programmes on the other hand. See Daviti, Tai and Uhlaner "*The smart grid*" 38.

efficiency, commercial energy efficiency, industrial and mining energy efficiency, residential load management and industrial and mining load management.²⁵⁸

4.4.1 Residential

The NIRP2 goes a step further than the WEP and WRE by focusing on the residential sector. Energy efficiency in the residential sector could be achieved through the introduction of compact fluorescent bulbs, hot water systems efficiency, low flow showerheads, hot water conservation, cooking awareness as well as residential load management (through ripple control).²⁵⁹ The NIRP2 does not refer to appliance labelling, an important measure of achieving energy efficiency in the residential sector.²⁶⁰ The measures referred to have not been previously dealt with in the residential perspective.

4.4.2 Commercial

The NIRP2 similar to the WEP (standard and norms and energy audit schemes), goes further in promoting energy efficiency in the commercial sector through measures such as motor supervision and control, the introduction of premium efficient motors, efficient lighting through lighting retrofits²⁶¹ and best practices in relation to pumps systems, fans and compressors.²⁶² While the WRE does not make mention of the commercial sector, the NIRP2 and WEP provide for the promotion of energy efficiency in the commercial sector differently.²⁶³

258 DOE *NIRP* (2003/2004) 18-19.

259 DOE *NIRP* (2003/2004) 21. Ripple control is a mature and cost-effective technology for tariff and load control. Ripple Control Receivers cover a wide range of applications, from simple remote relay control to low frequency load shedding.

260 See 2.4.1.

261 A lighting retrofit is the practice of replacing components in the system with counterparts that make it use energy more efficiently. Over time, these energy savings can be significant enough to not only pay for the equipment, but to produce a return on investment. See 2.4.2.

262 DOE *NIRP* (2003/2004) 22.

263 The NIRP2 among other measures, introduces premium efficient motors and efficient lighting through retrofits, ideas not provided for in the WEP.

4.4.3 Industrial and mining

The NIRP2 introduced a new sector (mining) within which energy efficiency could be achieved, for example, premium energy efficient motors, through lighting upgrades²⁶⁴ and lighting retrofits, energy efficient heating and cooling systems, best practices on pumps systems, fans and compressors, industrial and mining load management as well as heating and cooling systems.²⁶⁵

Though the NIRP does not read as an energy efficiency policy, programme, project or policy as mandated by the SADC frameworks, the fact that it puts in place measures and takes a step further in the residential, commercial and mining sectors (by providing additional measures) compared to the WEP and WRE, it fulfils the objectives of an energy efficiency policy, programme, project or policy.

4.5 National Energy Efficiency Strategy for South Africa (2009)

In 2009, the *National Energy Efficiency Strategy* (hereafter NEES)²⁶⁶ was published and it is a significant document with regard to energy efficiency. It is the first consolidated government document geared towards the development and implementation of energy efficiency practices in the country. Secondly, it is the only policy document which is specifically directed to regulate energy efficiency. Furthermore, NEES for the first time sets a national long-term target of 12% by 2015 with specific sectoral energy efficiency improvement targets²⁶⁷ and also introduced

264 Lighting upgrade strategies reduce the systems energy use. Energy savings are realised over time that can be significant enough to not only pay for the new equipment, but produce a return on the investment (Dilouie 2009 [http:// www.facilitiesnet.com](http://www.facilitiesnet.com)).

265 DOE NIRP (2003/2004) 22-23. Energy efficiency in the industrial and mining sectors would be achieved through the introduction of premium energy efficient motors, energy efficient lighting through lighting upgrades and lighting retrofits, energy efficient heating and cooling systems, best practices on pumps systems, fans and compressors as well as industrial and mining load management.

266 The first NEES for South Africa was published in 2005. In 2008, the DOE undertook the first review which was finally published in 2009. In 2011, the second review of the NEES was initiated and in 2012, Cabinet approved the release of the second review NEES document for public consultation. Although the 2nd NEES review has been completed, the targets were not revised. Important to note, NEES is to be reviewed every three years. The purpose of this review is to understand the existing energy efficiency policy and regulatory environment, key initiatives and programmes as well as the stakeholders. Government has to develop the framework for monitoring and introduce an action plan to assist in the development of a coordinated, unified and effective approach to energy efficiency, energy conservation and demand-side management. See also Modise "Overview on NEES post 2015" 1-12.

267 NEES sets the following energy efficiency improvement sectoral targets: industry and mining (15%), commercial and public buildings (15%), Residential (10%) and Transport (9%) in order to promote energy efficiency.

economic instruments as measures of attaining energy efficiency.²⁶⁸ The vision of the NEES is to reduce the energy intensity of the economy through energy efficiency.²⁶⁹

Notably, the NEES does not provide a definition for energy efficiency. Energy efficiency according to the NEES, could be achieved through efficiency standards, appliance labelling, certification and accreditation, incentives, fee bates, energy service companies and stakeholder intervention.²⁷⁰

4.5.1 Energy efficiency standards

Energy efficiency standards have brought about significant improvements in efficiencies abroad.²⁷¹ According to the NEES, mandatory energy efficiency standards in the different sectors should be promoted in South Africa.²⁷² NEES therefore provides for energy efficiency standards in order to achieve energy efficiency in the industrial, household and commercial sectors as required by the SADC energy framework documents.²⁷³

4.5.2 Appliance labelling

Energy labelling of appliances represent a significant potential for energy efficiency improvements. Appliance labelling should therefore be promoted and this could be achieved through a mandatory appliance labelling for household appliances.²⁷⁴

268 The WEP and the WRE did not mention economic measures to attain energy efficiency while the NEES refers to economic measures such as certification and accreditation, fee bates as well as energy pricing as measures of achieving energy efficiency. See also Rosenberg and Winkler *"Policy review and analysis"* 4-5, 2.4.

269 DOE NEES (2009) 4.

270 Rosenberg and Winkler *"Policy review and analysis"* 5. See also Letschert *et al* *"Energy efficiency appliance standards"* 18.

271 Letschert *et al* *"Energy efficiency appliance standards"* 21.

272 DOE NEES (2009)20. See also Letschert *et al* *"Energy efficiency appliance standards"* 18, 5.2.3 and 5.2.1.

273 See section 3.

274 DOE NEES (2009) 20. Since 2009, South Africa has been implementing mandatory efficiency standards and appliance labelling. For example, the *National Energy Act* 34 of 2008 which mandates the Minister of Energy to implement mandatory appliance labelling, energy efficiency standards for electrical appliances in the residential sector were drafted (SANS 941), a joint strategy between the Department of Trade and Industry (hereafter DTI) and DOE to phase-out inefficient appliances from the market was developed as well as Industrial Policy Action Plan of 2010. The DTI and the DOE developed a joint strategy to phase out energy inefficient appliances, lighting and equipment in the South African market. A number of studies in South Africa in 2003 researched the feasibility of introducing labelling for household appliances and estimated that a potential savings of about 3JP could be achieve between 2003 and 2012 with the implementation of appliance labelling.

Unlike the IEP and NIRP2, the NEES is more or less in line with the WEP and WRE. While the WRE provides for appliance labelling as a measure for attaining energy efficiency in the industrial sector, the NEES and WEP provide for appliance labelling as a means of attaining energy efficiency in the household sector. Importantly, the NEES provides for mandatory appliance labelling and not appliance labelling in several as provided for by the WEP.

4.5.3 Certification and energy audits

Certification entails a written assurance, or an official representation, that some act has or has not been done, or some legal formality has been complied with.²⁷⁵ According to the NEES, energy efficient auditors should be trained²⁷⁶ to monitor and review energy efficient practices and to collect and analyse data pertaining to energy efficient practices.

Internationally, energy audits have been used across all sectors to identify efficiency measures that can be implemented in a cost-effective manner. An energy efficiency audit entails the evaluation of compulsory energy efficient measures of the different sectors.²⁷⁷ The NEES provides for energy efficiency audits through energy efficient auditors, a novel idea to its predecessors.²⁷⁸ In promoting energy efficiency audits in South Africa, studies would be undertaken to design ways in which audits will achieve the greatest impact. So far, the DTI in collaboration with the DOE and the United Nations Development Organisation (hereafter UNIDO), have started a project in order to ensure the training energy auditors in the industrial sector.²⁷⁹

4.5.4 Education information and awareness

Energy efficiency could also be achieved through the introduction of energy efficiency education in school and post-school programmes.²⁸⁰ Energy efficiency could for example, also become a competence requirement under the National

275 Black's Law Dictionary at <http://thelawdictionary.org>. See 2.4.6.

276 Outline requirements of relevant accredited procedures will be specified by the DOE, professional associations and certificate made by SABS (DOE *NEES* (2009) 20.

277 DOE *NEES* (2009) 22.

278 The *WEP*, *WRE*, *IEP* and *NIRP*.

279 DOE *NEES* (2009) 22.

280 DOE *NEES* (2009) 21. See also Letschert *et al* "Energy efficiency appliance standards" 18.

Qualification Framework training programmes for skilled workers in the relevant construction and building trades. In raising awareness, energy efficiency should be taught and examined at all levels in all appropriate subjects, specifically engineering and architecture.²⁸¹ Education information and awareness pertaining to energy efficiency have not been addressed in earlier documents such as the WEP, WRE, IEP, NIRP and the SADC frameworks.

4.5.5 Research and technology

Research and technology is another measure through which energy efficiency could also be achieved. Support for research and adaptation of all available international technologies and processes should be made available.²⁸² Again, research and technology in relation to energy efficiency were not mentioned in the WEP, WRE, IEP, NIRP or the SADC frameworks.²⁸³

4.5.6 Energy efficiency management system

Energy management entails the evaluation and targeting of energy consumption, the formalisation of monitoring as well as provision of sector-specific benchmarking information.²⁸⁴ Energy management within the industrial and commercial sectors would include training, awareness and motivation as well as green accounts (where companies audit the environmental performance of their operation and its economic performance).²⁸⁵ NEES has introduced for the first time, the idea of an energy efficiency management system.²⁸⁶

4.5.7 Incentives

Energy efficiency could also be achieved through incentives, for subsidies for energy efficiency.²⁸⁷ By 2009, the National Treasury provided a R5 million subsidy to the manufacturing industry through the DTI for cleaner production with energy efficiency as one of the criteria for such production.²⁸⁸ Importantly, incentives as a means of

281 DOE NEES (2009) 21.

282 DOE NEES (2009) 21.

283 See 4.2, 4.3, 4.4, 4.5 and 3.2-3.3.

284 DOE NEES (2009) 22. See Letschert *et al* "Energy efficiency appliance standards" 18.

285 DOE NEES (2009) 22.

286 See 5.2.2.

287 DOE NEES (2009) 23.

288 DOE NEES (2009) 23.

attaining energy efficiency as introduced by NEES, is a new method of promoting energy efficiency, not referred to in preceding policies and strategies.

4.5.8 Fee bates

Fee bates (a market based instrument) presents an important means of attaining energy efficiency. A fee bates entails the implementation of levies on less energy efficient vehicles or technology and the funds collected can be used to cross subsidize more efficient vehicles.²⁸⁹ So far, the government's Motor Industry Development Plan, 2010, has already enjoyed some success in shifting demand towards small more energy efficient cars as a means of achieving the desired impact of fee bates.²⁹⁰ Fee bates is a new method of promoting energy efficiency, introduced by NEES, compared to its predecessors.²⁹¹

4.5.9 Energy pricing

Energy efficiency could also be promoted through energy pricing. This will be done through an increase in energy price.²⁹² That is, moving away from a process of cross subsidies to a cost reflective price. Energy pricing has not been referred to in the WEP, WRE, IEP or the NIRP.²⁹³

4.5.10 Energy service companies

An energy service company refers to a company that sells energy services. Energy service companies will have to improve energy efficiency, manage risk and enhance a competitive edge. This could be achieved by comprehensive energy efficiency audits, financing mechanisms, equipment procurements, installation, commissioning, monitoring and performance of energy efficiency.²⁹⁴

289 DOE *NEES* (2009) 24.

290 DOE *NEES* (2009) 24.

291 See 2.4.7.

292 DOE *NEES* (2009) 26.

293 See 2.4.7.

294 DOE *NEES* (2009) 24.

4.5.11 Voluntary and retail markets

Voluntary markets refer to entities (companies, governments, non-governmental organisations (NGOs) and individuals) that purchase carbon credits²⁹⁵ for purposes other than meeting regulatory targets. The retail market on the other hand, refers to companies and organisations that invest in offset projects²⁹⁶ and then sell off portions of the emission reductions in relatively small quantities with a mark-up. Voluntary markets, in promoting energy efficiency, would have as function, to buy carbon credits resulting from energy efficiency practices of companies and organisations in order to promote energy efficiency.²⁹⁷

4.5.12 Stakeholders

Stakeholders such as the South African Bureau of Standards (hereafter SABS), NGOs, energy users and the financial sector are important role players in attaining energy efficiency. This will have to be done through well-co-ordinated initiatives between stakeholders who are to take the lead in promoting energy efficiency in their different sectors through the provision of information, regulations, publication of public comments, facilitate energy efficient framework development as well as coordination of actions where necessary.²⁹⁸

Though the NEES can be criticised for not providing a definition for energy efficiency, it is important to note that it can be acclaimed for introducing a wide range of new measures²⁹⁹ to attain energy efficiency, not provided for in the WEP, WRE, IEP and NIRP2. Furthermore, the NEES can as well be acclaimed for taking a step further in attaining energy efficiency within the different sectors. The NEES did not only provide for the sectors within which energy efficiency would be attained, but set specific energy efficiency improvement.³⁰⁰

295 The National Treasury Republic of South Africa *Carbon Offset Paper* (2014) 6. A carbon credit refers to the actual reduction in greenhouse gas emissions achieved by organisations that undertake emissions reduction projects, also known as the Clean Development Mechanism (CDM) projects. The Kyoto Protocol, which aims to reduce greenhouse gas emissions, created a market in carbon credits. Notably, the *Carbon Offset Paper* (2014) was published in April 2014 for public comment.

296 The National Treasury Republic of South Africa *Carbon Offset Paper* (2014) defines offset project as a measurable avoidance, reduction or sequestration of carbon dioxide (CO₂) or other GHG emissions.

297 DOE *NEES* (2009) 25.

298 DOE *NEES* (2009) 26.

299 See 4.2.5.3 to 4.2.5.13.

300 See footnote 364.

It is likely that the NEES complies directly with the SADC energy framework. It does not only read as an energy efficient strategy but also provides a wide range of measures to attain energy efficiency across the different energy consuming sectors.

4.6 Integrated Resource Plan for Electricity 2010 to 2030 (2011)

Among other objectives, the IRP aims at promoting energy efficiency by increasing the efficient use of electricity.³⁰¹ The IRP indicates that improvement in energy efficiency could reduce the electricity intensity of a country's economy significantly.³⁰² The IRP defines "energy efficiency" as "the effective use of energy to produce a given output or service". That is, a more energy-efficient technology is one that produces the same service or output with less energy input.³⁰³ It is likely that this definition contradicts previous definitions. It leans more towards the technical definition of energy efficiency. It does not address all aspects of energy efficiency.³⁰⁴

According to the IRP, increased efficiency in the use of electricity could be achieved through changes in the structure of the economy (specifically the move from energy intensive industries to less intensive sectors), higher electricity prices,³⁰⁵ improvements in technology (regular improvements in technology which reduces the energy intensity of production processes and energy requirements on appliances and other elements of electricity consumption), access to capital which may give consumers the ability to undertake the investment required to improve the efficiency relating to their electricity consumption, putting in place national targets and efficiency standards (e.g. building codes) as well as work with industry bodies to provide rating mechanisms for appliances and buildings, among others. Furthermore, energy efficiency could also be attained through the provision of finances for efficiency programmes (where access to financing limits the rollout of new technologies),³⁰⁶ provision of finances for research into new efficiency technologies as well as the implementation of public awareness campaigns and efficiency information.³⁰⁷

301 DOE IRP (2011) 38.

302 DOE IPP (2011) 38.

303 DOE IRP (2011) 6. See 2.2.1.

304 See 2.2.1.

305 See 2.5.1.

306 See 2.5.2.

307 DOE IRP (2011) 38. See 4.2.5.6.

Unlike the WEP, WRE, IEP, NIRP2 and NEES whose aim was to promote energy efficiency through efficiency in electrical products, the IRP, additionally, aims for the efficient use of electricity. Although the IRP does not read as an energy efficiency policy, project, programme or policy as mandated by the SADC energy frameworks, the fact that it provides a wide range of measures to attain energy efficiency and even takes a step further than its predecessors by urging for the efficient use of electricity as a means of promoting energy efficiency implies that the IRP corresponds with the SADC energy frameworks.

4.7 National Climate Change Response White Paper (2011)

The NCCRP,³⁰⁸ among other objectives, aims at mitigating climate change through energy efficiency. Energy efficiency as a climate change mitigation option could be achieved through aggressive energy efficiency programmes in industries and buildings.³⁰⁹ The NCCRP does not provide a definition for energy efficiency.

4.7.1 Industries

The DOE in promoting energy efficiency as a mitigation option in the industrial sector will have to develop and facilitate an aggressive energy efficiency programme based on the experience of Eskom's Demand Side Management programme and the DTI's National Cleaner Production Centre, covering non-electricity energy efficiency as part of the Energy Efficiency and Energy Demand Management Flagship Programme.³¹⁰ A structured programme for energy efficiency could as well be established with appropriate initiatives, incentives and regulation, and a well-resourced information collection and dissemination process in order to attain energy efficiency.³¹¹

308 DEA NCCRP (2011).

309 DEA NCCRP (2009) 31. See also Musango, Amigun and Brent "Sustainable electricity generation" 126.

310 DEA NCCRP (2009) 31.

311 DEA NCCRP (2009) 31. See 2.4.5.

4.7.2 Building

A residential and government building energy efficiency programme will be developed to promote energy efficiency.³¹² The residential energy efficiency programme will be made up of two parts. Firstly, the development of incentives and regulation as well as initiatives will have to be concluded by the DOE and the DTIs. Secondly, regulation of residential and commercial building standards in order to implement green building construction practices will be developed. Green building requirements (controlled ventilation, solar power and recycled materials among others) during construction and operation will be monitored by the National Regulator for Compulsory Specifications (NRCS)³¹³ in collaboration with the National Home Builders Regulation Council.³¹⁴

A government building energy efficiency programme which will be led by the Department of Public Works (hereafter DPW) will also be developed. This programme will initiate energy efficiency and energy emissions audits in all government buildings and develop comparable indicators and benchmarks as well as ambitious goals for energy efficiency in all new government buildings.³¹⁵ At this stage, this has not yet been rolled out to the private sector as far as it can be established.

Just like the WEP, WRE, IEP, NIRP2 and NEES, the NCCRP aims at promoting energy efficiency among other objectives. The NCCRP corresponds to the WRE, indicating that energy efficiency could be achieved in industry and buildings only. Notably, the NCCRP does not provide a definition for energy efficiency and energy efficiency in buildings does not include private buildings.

Though the NCCRP does not read as an energy efficiency policy, project, programme or policy as mandated by the SADC energy frameworks, the fact that it provides for energy efficiency (hereafter EE) to be attained through energy efficiency

312 See 2.4.3.

313 NRCS are a new public entity responsible for the administration of technical regulations, to make sure that the building industry is on track when it comes to energy-efficiency. The NRCS has as function, to report to the Minister of Trade and Industry and is behind the administration of the National Building Regulations and Building Standards Act 103 of 1977. The NRCS has the designated responsibility for the upkeep and maintenance of the National Building Regulations. See 5.2.3.

314 DEA *NCCRP* (2009) 31.

315 DEA *NCCRP* (2009) 31.

programmes (one of the means of attaining EE as mandated by the SADC frameworks) imply that, the NCCRP implicitly correspond with the SADC energy frameworks. South Africa's policies just like its legal frameworks regulate energy efficiency.

4.8 Conclusion

This chapter has evaluated South Africa's policy frameworks that promote energy efficiency. More precisely, the endeavour of the research has been to evaluate or appreciate how South Africa's policy frameworks that enhance energy efficiency correspond with measures of attaining energy efficiency as mandated by the SADC frameworks. The NEES is the only policy document that directly corresponds with the SADC energy frameworks. Common measures to attain energy efficiency within these policy documents include appliance labelling, incentives and standards. It is likely that efforts provided for in policy documents are commendable. Though these policy documents can be eluded for a range of energy efficiency measures provided, the fact remains that they are policy documents and are unenforceable. Energy efficiency is equally promoted by legislation and voluntary instruments. Energy efficiency measures provided for in the legal framework and voluntary instruments are discussed in the next chapter.

5 Legal frameworks and voluntary instruments

In the previous chapter, policy frameworks relating to energy efficiency were discussed. It is now necessary to determine whether South Africa's legislation provides for measures pertaining to energy efficiency as set out in the SADC frameworks and South Africa's policy frameworks. Legislation underpinning the regulation of electricity and electrical products to enhance energy efficiency include the *Electricity Regulation Act 4 of 2006*, the *National Energy Act 34 of 2008*, the *National Building Regulations and Building Standards Act 103 of 1977* and the *Income Tax Act 58 of 1962*. There are a wide range of voluntary instruments that promote energy efficiency. Some have been incorporated into law while others are still to gain this status. Voluntary measures which have not been incorporated into law include, among others, SANS 941 and ISO 50001.³¹⁶ The aim of this chapter is to investigate and evaluate measures of energy efficiency provided for in the said legal frameworks and to determine whether they correspond to the SADC frameworks. Furthermore, the limits within which voluntary instruments provide for energy efficiency will also be ascertained.

5.1 Legal frameworks

The Electricity Regulation Act 4 of 2006 is discussed first.

5.1.1 Electricity Regulation Act 4 of 2006 (ER Act)

Among other objectives, the *Electricity Regulation Act 4 of 2006* aims to promote energy efficiency. According to the ER Act, Energy efficiency could be achieved through energy efficiency conditions which electricity consumers and generators must respect in order to obtain licences. The Act in section 15(1)(u) allows the National Energy Regulator of South Africa (hereafter NERSA)³¹⁷ to place conditions

316 Due to the extent of this dissertation, only two voluntary instruments of energy efficiency will be discussed. However, it is important to note that there are definitely more. They include, among others, SANS 61400 (Wind Turbines), SANS 50285 (Electric Lamps), SANS 10147 (Refrigeration Plant), SANS 50304 (Electric Cooking Range), SANS 20100 (Vehicle Emissions), SANS 959 (Series), SANS 151 (Electric Geysers), SANS 50010 (Energy Savings), SANS 62087 (Audio & Video Equipment) among others. See Modise "Overview on the NEES Post 2015" DOE 14-15.

317 The NERSA is a regulatory authority established in terms of article 3 of the *National Energy Regulator Act 40 of 2004* as a juristic person, to regulate the Electricity Supply Industry (ESI) by ensuring that an efficient and effective ESI is in place to meet the requirements of existing and future electricity customers. Regulatory activities undertaken by NERSA include but are not limited to: issuing of licences related to electricity generation, transmission, distribution activities/operations; granting of licences

in licences dealing with energy efficiency standards and demand side management. Furthermore, the NERSA may as well place energy efficiency conditions on the licensee³¹⁸ and may amend them from time to time in order to fit national energy priorities as set out in policies.³¹⁹ Energy efficiency in terms of GN R721 of 2009³²⁰ must be taken into account when an integrated resource plan is developed.³²¹

The Minister may issue regulations to regulate energy efficiency, the type of energy sources from which electricity must be generated, and the percentages of electricity that must be generated from different energy sources.³²² In 2008, norms and standards (GN R842)³²³ were issued. In buildings where an existing electric water heating facility is required, the regulation specifies that a remote control must be installed in order to control the supply of electricity to any electric geyser that does not incorporate solar heating water.³²⁴ Furthermore, with regard to spatial heating, ventilation or cooling in buildings, a licensee must put in place a facility to remotely control the supply of electricity to heating, ventilation and cooling system in its area of supply and also link a swimming pool drive and heating system to a facility that enables the licensee to remotely control its supply of electricity. In addition, any customer with a monthly consumption of 500kWh and above must have a smart metering system.³²⁵

The focus of the ER Act is on energy efficiency through the regulation of electricity. The ER Act does not include a definition of energy efficiency. Furthermore, energy efficiency standards set out in the regulation simply refer to buildings with no specifications. It is likely to refer mostly to local governments and public buildings as far as it can be established.

pertaining to electricity trading, which encompass both the import and export of electricity; approval of tariffs applications; and provision of both technical and regulatory advisory services to the Minister of Energy on any matter relating to the Electricity Supply Industry.

318 Section 15(s) of the ER Act. See Murombo and Du Plessis 2012 www.elasa.co.za.

319 See 4.2-4.8.

320 GN R721 in GG 32378 of 5 August 2009.

321 See section 4.7.

322 Section 35(4)(k)-(l) of ER Act.

323 GN R842 in GG 31308 of 8 August 2008. Regulation 842 issued in terms of section 35(4) of the ER Act.

324 Reg 2 (b) (i) and (ii).

325 Reg 2 (c) (i) and (ii). See Murombo and Du Plessis 2012 www.elasa.co.za.

5.1.2 National Energy Act 34 of 2008

The *National Energy Act 34 of 2008* (hereafter NE Act) promotes energy efficiency as one of its aims.³²⁶ The Act defines “energy efficiency” as “the economical and efficient production and utilisation of an energy carrier or resource”.³²⁷ Energy efficiency as defined by the ER Act focuses on the demand side and not the supply side of energy management.³²⁸ The definition mainly focuses on the outcomes achieved, namely, economic and efficient utilisation or production. Energy efficiency could rather be defined taking into account the scientific and other definitions,³²⁹ as a minimum quantity of input or output of energy may at least be referred to in the definition.³³⁰

In terms of the NE Act, the Minister of Energy may issue regulations pertaining to energy efficiency.³³¹ These regulations may range from minimum levels of energy efficiency in each sector of the economy,³³² steps and procedures necessary for the application of energy efficiency technologies and procedures,³³³ labelling for energy efficiency purposes of household appliances, devices and motor vehicles,³³⁴ prohibition of the manufacture or importation or sale of electrical and electronic products and fuel burning appliances for reasons of poor energy efficiency,³³⁵ standards and specifications for energy carriers³³⁶ and energy efficiency standards for specific technologies, processes, appliances, devices, motor vehicles and buildings.³³⁷ The Minister has issued GN R729 in terms of section 19 of the NE Act³³⁸ on tax allowances for energy efficiency savings.³³⁹ The *National Building*

326 Section 7(1)(2) “the South African National Energy Development Institute is hereby established as a juristic person whose functions are to, in respect of energy efficiency, undertake energy efficiency measures as directed by the Minister, increase energy efficiency throughout the economy, increase the gross domestic product per unit of energy consumed and optimise the utilisation of finite energy resources”.

327 Section 1 of the NE Act.

328 Du Plessis 2014 SAJS 10.

329 See 2.2.1.

330 Du Plessis 2014 SAJS 4.

331 Section 19 (1) of the NE Act.

332 Section 19 (1) (g) of the NE Act.

333 Section 19 (1) (h) of the NE Act.

334 Section 19 (1) (i) of the NE Act.

335 Section 19 (1) (j) of the NE Act.

336 Section 19 (1) (k) of the NE Act.

337 Section 19 (l) of the NE Act.

338 See section 5.2. 4. GN R729 in GG 34596 of 16th September 2011 made in terms of section 19 of the *National Energy Act 34 of 2008* read in conjunction with section 12L of the *Income Tax Act 58 of 1962*.

Regulations and Building Standard Act on its part, promote energy efficiency in buildings.

5.1.3 National Building Regulations and Building Standards Act 103 of 1977

The *National Building Regulations and Building Standards Act* 103 of 1977 also allows the Minister of Economic Affairs and Technology (hereafter the Minister) to issue regulations pertaining to energy efficiency.³⁴⁰ In 2011, the Minister issued GN R711³⁴¹ which incorporates SANS 10400-XA (Energy Usage in Buildings) and SANS 204 (Energy Efficiency in buildings) into South Africa's building law.

SANS 10400³⁴² makes energy efficiency requirements in a building mandatory. New buildings and extensions of old buildings must be designed and constructed such that they are capable of using energy efficiently without compromising user needs.³⁴³ Furthermore, SANS 10400 also requires that at least 50% of the annual domestic hot water requirement of a building must be provided by sustainable energy efficient means instead of the traditional electrical resistance (element) heating.³⁴⁴

SANS 204 on the other hand, provides for energy efficiency requirements and services in buildings with natural environmental control and artificial ventilation or air conditioning systems.³⁴⁵ These specifications include, building orientation, shading and building design (which includes, general, floors, external walls, fenestration, shading, roof assemblies and roof lights). Specifications regarding building sealing in terms of SANS 204 include air infiltration and leakage and permissible air leakage. Services within buildings include efficient lighting and power, hot water and

339 These regulations are discussed in 5.2.4.

340 Section 17 (1) (a) – (w) of the NBRBS Act.

341 GN R711 in GG 34586 of 9 September 2011. See Mnguni and Tucker 2012 [http:// www.en.occa.mard.gov](http://www.en.occa.mard.gov) Lemmer Date Unknown [http:// www.kznia.org.za](http://www.kznia.org.za).

342 SANS 10400 XA is divided into three parts, that is, XA1 – buildings are to use energy efficiently and reduce greenhouse gas emissions in accordance with a set of requirements, XA2 – not more than 50% of the annual volume of domestic hot water should be supplied by means of electrical resistance heating, that is, 50% or more of the hot water used must be heated by energy sources other than electricity and XA3 – compliance with the XA1 Regulations must be achieved by one of three methods. If practitioners build in accordance with SANS 10400–XA, the buildings will be 'deemed to comply' with National Building Reg XA1.

343 Reg XA1.

344 Reg XA2. See Mnguni and Tucker 2012 www.en.occa.mard.gov. Lemmer Date Unknown [http:// www.kznia.org.za](http://www.kznia.org.za).

345 South African Institute of Architectural Technology "Guidance" [http:// www.buildingcontrol.co.za](http://www.buildingcontrol.co.za). See also Lemmer Date Unknown [http:// www.kznia.org.za](http://www.kznia.org.za), Mnguni and Tucker 2012 [http:// www.en.occa.mard.gov.vn](http://www.en.occa.mard.gov.vn).

appliances. Mechanical ventilation and air conditioning include, air side system design criteria, distribution systems, air side system design criteria, fan systems, water side systems, design criteria, pipe and duct distribution system insulation, cooling and heating equipment, air conditioning controls as well as unitary and packaged equipment.³⁴⁶ It is important to note that non-compliance with SANS 10400 and SANS 204 poses the risk of a penalty under the NBRBS Act.³⁴⁷

SANS 10400 and SANS 204 only provide for efficient use of energy in buildings. It does not include energy used in manufacturing the building materials or the construction of a building. It also does not refer to the energy efficiency of movable appliances within a building (such as computers or fridges).

The NBRBS Act, however, promotes energy efficiency through mandatory standards, but does not provide a definition for energy efficiency. The IT Act on the other hand, also promotes energy efficiency through tax incentives.

5.1.4 Income Tax Act 58 of 1962

Section 12L of the IT Act provides that any person may claim allowance for energy savings.³⁴⁸ The detail of how this allowance can be claimed is described in GN R729.³⁴⁹ The person claiming allowance for energy savings must register with the South African Energy Development Institute (hereafter SANEDI)³⁵⁰ in respect of any

346 South African Institute of Architectural Technology "Guidance" [http:// www.buildingcontrol.co.za](http://www.buildingcontrol.co.za).

347 A person who erects any building without prior approval shall be guilty of an offence and liable on conviction to a fine not exceeding R100 for each day on which they were so engaged in terms of section 4(4) of the NBRSA. Section 24 provides that if a person fails to comply with the provisions of the NBRSA, where no penalties have been stipulated, that person may be convicted of an offence and liable to a fine not exceeding R100 000 or to imprisonment not exceeding 12 months. Furthermore, section 21 permits the local authority to apply to the magistrate court for an order prohibiting a person from commencing or proceeding with the erection of any building or an order authorising the local authority to demolish the building if the magistrate is satisfied that the erection is contrary to or does not comply with the provisions of the NBRSA. See Mnguni and Tucker 2012 [http:// www.en.occa.mard.gov](http://www.en.occa.mard.gov).

348 Section 12L of the IT Act. The IT Act was announced to be in operation as from 8 November 2013. See also Lange "Income Tax Act-based allowances for Energy Efficiency" 1-3.

349 GN R729 in GG 34596 of 16 September 2011 issued in terms of section 19 of the NE Act read in conjunction with section 12L of the IT Act.

350 SANEDI was established in terms of section 7 of the *National Energy Act* 34 of 2008 and the organisation is tasked with the responsibility of adjudicating, evaluating and supporting 12L. Adjudication of section 12L of the tax incentive claims will be based on the reports compiled by registered Measurement and Verification Professionals and South African National Accreditation System (SANAS) accredited Measurement and Verification Bodies to ensure accurate and transparent claims.

energy efficiency savings he or she may want to claim.³⁵¹ The energy efficiency savings must be measured by a measurement and verification professional. A measurement and verification professional is someone who acts under the auspices of SANEDI³⁵² and may measure, report and verify energy efficiency savings.³⁵³ This measurement and verification professional must conduct measurement and verification in terms of ISO 50001³⁵⁴ and compile a report containing the energy efficiency savings for the year that the allowance is claimed. The report from the measurement and verification professional must be submitted to a committee of SANEDI.³⁵⁵ This committee may obtain independent professional advice to confirm that the report complies with ISO 50001 and that it also reflects the energy savings that are claimed.³⁵⁶ The committee makes a recommendation to SANEDI that issues or refuses to issue a certificate.³⁵⁷ SANEDI is also expected to keep and maintain all reports submitted to the committee for evaluation, develop and uphold a database for all certificates issued as well as make available such database and reports to the Minister of Finance and the Commissioner of the South African Revenue Service which claims are to be paid.³⁵⁸

Certificates issued by SANEDI must include the baseline for the first year of assessment for which the allowance is claimed and which must be derived and adjusted in accordance with regulation 5 and determined in accordance with ISO 50001, from data gathered between the first day and the last day of the year of assessment preceding the first year of assessment for which the allowance is claimed.³⁵⁹ The baseline is the time period for which all fixed and variable energy governing factors are known about the facility.³⁶⁰ The certificates must also contain the annual energy efficiency savings expressed in kilowatts hours, initials and

351 Reg 2(1).

352 A body is accredited in terms of section 22 of the Accreditation for Conformity Assessment, Calibration and Good Laboratory Practice Act 19 of 2006.

353 Reg 1.

354 Par 4.6.1 of ISO 50001.

355 Reg 2.

356 Reg 3(3)-(4).

357 Reg 3(5)

358 Reg 3 (6)(a)(b) and (c) (i)(ii).

359 Reg 3(5).

360 Section 1 of the IT Act.

surname of the claimant, accreditation number, date on which the certificate was issued as well as the certificate number.³⁶¹

The IT Act provides details on how savings resulting from energy efficiency may be claimed. The IT Act just like the ER Act, NE Act and the NBRBS all promote energy efficiency. While the NBRBS Act and the NE Act focus on regulations as a measure of promoting energy efficiency, the ER Act imposes energy efficiency conditions as a prerequisite to obtain licences for electricity use. The IT Act on its part, focuses on allowances (tax incentives) awarded as a result of energy savings. Only the NE Act provides a definition of energy efficiency. Notably, the ER Act, NE Act, NBRBS Act and IT Act implicitly rather than directly, correspond with the SADC frameworks. These Acts implement the ideas of strategies, policies, programmes and projects as foreseen by the SADC frameworks.³⁶² Furthermore, the Acts³⁶³ promote energy efficiency in buildings, the use of electricity as well as allowances for energy savings resulting from energy efficiency practices, thereby implicitly corresponding to the SADC frameworks that urge for the promotion of energy efficiency at national level. Voluntary measures as an alternative to legislation are sometimes used to promote energy efficiency.

5.2 Voluntary instruments

According to Gunningham,³⁶⁴ market-based instruments and economic measures such as tax incentives are some of the broader mix of energy policy initiatives. These incentives cannot achieve energy efficiency targets on their own. It may therefore be necessary to introduce voluntary measures, for example, SANS 941 and SANS 50001.³⁶⁵ Voluntary instruments refer to accords or agreements between the government and a sector in the national economy in order to facilitate voluntary action with a desirable social outcome encouraged by the government.³⁶⁶ In this

361 Reg 4(a)-(h).

362 See section 3.

363 The ER Act, NE Act, NBRBS Act and the IT Act.

364 Gunningham 2012 *Transitional Environmental Law* 124. See also Moos "Realising the potential of energy efficiency" 42.

365 Barton "The law of Energy Efficiency" 66.

366 Kornelis *et al* "The effectiveness of policy instruments" 71.

section, SANS 941 and SANS 50001 are discussed.³⁶⁷ The choice of voluntary instrument is based on the fact that SANS 941 is developed by the South African Bureau of Standards (SABS) to ensure energy efficiency while SANS 50001 is an international standard which industries may voluntarily adopt to ensure energy efficiency as well.

5.2.1 SANS 941

SANS 941 “energy-efficiency of electrical and electronic equipment” is a voluntary standard regulated by the National Regulator for Compulsory Specifications (hereafter NRCS) and implemented through an Energy-Efficient Standard and Labelling Programme on the combined effort of the DTI and the DOE.³⁶⁸ The standard aims to empower consumers to make informed choices when buying electronic appliances. This standard covers energy-efficiency requirements, measurement methods and energy-efficiency labelling of certain electrical and electronic equipment. They include, among others, non-ducted air-conditioners that do not exceed 5kW and heat pumps, audio³⁶⁹ and video equipment (including video-recording equipment, set top boxes, audio equipment and multi-function equipment for consumer-use television sets (that include, but are not limited to these with a cathode ray tube (CRT), liquid crystal display (LCD), a plasma display panel (PDP) or projection technologies),³⁷⁰ dishwashers, electric lamps, electric ovens, refrigerators, freezers, tumble dryers, washer-dryer combinations and washing machines). Notably, in the case of dishwashers and washing machines, water consumption is also covered. This standard does not refer to the safety of the apparatus.³⁷¹

367 Due to the extent of this dissertation, only SANS 941 and SANS 50001 will be discussed. However, it is important to note that there are definitely more. See footnote 314, Modise “Overview on NEES post 2015” 14-15.

368 Preamble SANS 941. See also McKenzie 2012 www.urbaneath.co.za, Senatla “Fast tracking the implementation of minimum energy performance standards” 2.

369 Para 1(a). See also Rowel 2012 www.eepublishers.co.za.

370 Para 1 (b).

371 Para 1(c)-(h). See also McKenzie 2012 www.urbaneath.co.za.

SANS 941 grades appliances using capital letters from “A” to “G” to indicate the energy consumption of the product.³⁷² A product with the letter “A” indicates that it uses energy or electricity most efficiently, while a product with a “G” grading indicates the poorest performing product in that product category.³⁷³ The South African National Accreditation System (SANAS) determines the “A”-“G” grading.³⁷⁴ This is described in the relevant standard for each appliance. The “A”-“G” grading will form part of the instruction manual inside the appliance box, but retailers can also display the grading on the actual appliance if it has been unpacked and is on display. The energy label on the household appliances should also be clearly marked with the name of the producer, the model number and the relevant class number indicating the energy consumption of the appliance.³⁷⁵ Washing machines may be graded both in terms of washing performance and spinning performance and water usage, if possible.³⁷⁶

5.2.2 SANS 50001

Another voluntary instrument that may be used is ISO 50001 that was developed at the international level. The energy management standard is recognised as an important tool in promoting energy efficiency.³⁷⁷ On the footings of other countries,³⁷⁸ South Africa drafted SANS 50001 based on the International Organisation for Standards (hereafter ISO) ISO 50001.³⁷⁹ SANS 50001 provides organisations with a method to determine and measure its energy efficiency in terms of a quality management system. SANS 50001 was approved by 75% of the ISO members in 2011. The main requirements of SANS 50001 include general requirements, the responsibility of management, the formulation of energy policy, energy planning,

372 Para 4.

373 Para 4. See also Rowel 2012 [http:// www.eepublihers.co.za](http://www.eepublihers.co.za).

374 A.2.2. See also Rowel 2012 <http:// www.eepublihers.co.za>.

375 A 1.1 and A1.2.

376 A 1.1.

377 Chiu, Shang-Lien and Tsai 2012 *Energies* 5325.

378 The US and Denmark developed energy management standards in 2000. Sweden followed in 2003, the Netherlands in 2004, Ireland in 2007, Korea and Thailand in 2008. See Du Plessis 2014 SAJS 12.

379 ISO 50001.

implementation and operation as well as checking review.³⁸⁰ In discussing SANS 50001, the focus will be on areas where legal requirements play a role.³⁸¹

According to SANS 50001, an organisation must establish, document, implement, maintain and improve an energy management system in accordance with the international standards. The scope and boundary³⁸² of its energy management must be defined and documented and also determine how it will meet the requirements of SANS 50001:2011, in order to attain continual improvement of energy performance³⁸³ and environmental management system.³⁸⁴ In terms of SANS 50001, the organisation must state an energy efficiency policy on how it is going to achieve energy efficiency and how it will achieve continual improvements of its energy performance and energy management systems.³⁸⁵

Before an organisation can determine its energy performance, it must conduct an energy review. The review must analyse the current energy sources and energy use consumption.³⁸⁶ The organisation must be able to demonstrate an improvement in energy efficiency. The review must identify the organisation's facilities, equipment, systems, processes and personnel that may affect energy use and consumption. It must also estimate the future energy use and consumption of the organisation.³⁸⁷ The main objective of the review is to outline areas of significant energy use and also to identify opportunities for improving energy performance.³⁸⁸

380 SANS 50001.

381 See also Du Plessis 2014 *SAJS* 13-19.

382 The boundaries of an organisation are the physical or site limits or organisational limits which may include, for example, a process, a group of processes, a site, an entire organisation etc.

383 Energy performance refers to measurable results related to energy efficiency, energy use and energy consumption (par 3.12).

384 Para 3.12.

385 The scope and boundaries form the bottom line which the organisation has to follow and that determines the legal duties of the organisation. See Du Plessis 2014 *SAJS* 13-19. See also Nel and Du Plessis 2002 *SAJELP* 51.

386 Zhang *et al* 2013 *Applied Energy* 27.

387 A 4.3.

388 A 4.3.

The organisation must then identify energy performance indicators that could assist it to monitor and measure its energy performance.³⁸⁹ The organisation must also draft its energy objectives and targets that could be implemented. In reaching these objectives and targets, legal and other requirements³⁹⁰ should be considered. The objectives and targets must be translated into an action plan.³⁹¹

The organisation must ensure that it has internal and external communication policies in place.³⁹² It must further identify the relevant legal requirements that are applicable to its policies. The organisation must also ensure the availability of the correct version of the legal requirements and identify operations and activities related to its energy.³⁹³ The organisation must consider energy-performance opportunities when designing new, modifying facilities, equipment, systems and processes that may have significant impact on its energy performance. The results must be incorporated into specification, design and procurement activities of projects.³⁹⁴

In obtaining energy services and equipment, the organisation must inform its suppliers that, procurement is evaluated on the basis of energy performance. Where legislation does not provide specific criteria, the organisation must develop and implement criteria to assess energy use, consumption and efficiency.³⁹⁵ This is an opportunity to ensure that the supply chain of the organisation influences its energy behaviour.³⁹⁶

After the organisation has put in place its policy, set its targets and objects and identified the legislation, it is important for it to check.³⁹⁷ The organisation may first conduct an internal audit to determine whether the organisation complies with the

389 A 4.5. An energy performance indicator refers to a simple ratio or a complex model such as consumption per time, energy consumption per unit of production or multi variable models. The methodology used to determine these indicators must be recorded and reviewed by the organisation. See A 4.4.5.

390 A 4.2. Other requirements may include voluntary principles or codes of practice or voluntary practices that the organisation subscribes to.

391 Para 4.4.6 .

392 Para 4.5.3. Energy policy and performance here may include non-compliance with legislation, although compliance is not an explicit requirement.

393 Para 4.5.5.

394 Para 5.4.6.

395 Para 4.5.7.

396 Du Plessis 2014 SAJS 18.

397 Para 4.6.

management objectives and targets and whether the management plan is implemented and maintained. The auditor must also identify whether the energy management standard improved the energy performance.³⁹⁸ The main aim of checking is to evaluate the compliance of the energy management system.³⁹⁹

The energy management standard must from time to time be reviewed to determine its sustainability, adequacy, effectiveness and to ensure continual improvement.⁴⁰⁰ The management usually includes amendments to objectives and targets and the energy policy.⁴⁰¹ Although not enforceable, both SANS 941 and SANS 5001 standards are tools which organisations may use to improve energy efficiency without government intervention.

5.3 Conclusion

In this section, it has been established that South Africa's legislation promotes energy efficiency. The legislation implements the ideas incorporated in the SADC frameworks pertaining to energy efficiency. Common measures of attaining energy efficiency include the efficient use of electricity, energy efficient buildings as well as energy efficient practices based on regulations and standards that should be issued. The legislation does not explicitly indicate how these measures should be introduced. The Minister still needs to issue more regulations in this regard. Currently, there is only one regulation dealing with energy efficiency. Provision is further made for tax incentives for the implementation of energy efficiency measures.

However, legislation alone cannot achieve the goal of energy efficiency. Voluntary instruments may be referred to as an alternative measure to attaining energy efficiency. GN R729 also includes ISO 50001 measurement standards into its regulatory procedures, combining them with tax incentives. The ISO 50001 standard goes further and deals with energy efficiency taking into account all the operations of the organisation.⁴⁰² Energy efficiency is, however, not a goal that can be achieved by experts in a single discipline. An inter-disciplinary approach is required to implement

398 Par 4.6.3.

399 Du Plessis 2014 SAJS 13-19.

400 Par 4.7.2.

401 Para 4.7.3.

402 See 5.2.4.

and enforce statutory as well as voluntary standards. For instance, lawyers will not be working in this field without the input of engineers, energy specialists, tax specialists, architects, environmental managers, accountants among others. On the other hand, engineers will not be able to implement these EE measures without legal input.⁴⁰³ As such, they will, for example, have to work together in order to come up with norms and standards for energy efficiency practices.

403 See Du Plessis 2014 SAJS 13-19

6 Conclusion and recommendations

6.1 Summary

The aim of the study has been to assess South Africa's legislation and determine whether the legislation corresponds with the SADC frameworks in order to enhance energy efficiency. For the purpose of the study, "energy efficiency" was defined as (a) an improvement in energy equipment, technology, practices, products and services (such as lighting, cooling, heating, manufacturing, cooking and transport) or (b) a change in behaviour or (c) the introduction of energy management systems in order to reduce the amount or quality of energy used.⁴⁰⁴ Organisations do not introduce energy efficiency measures out of pleasure. The drivers for energy efficiency include, among others, climate change, the finite nature of fossil fuel, increase in the demand for energy, securing the supply of energy, reduced government expenditures, developmental goals as well as job creation.⁴⁰⁵

There are various methods to introduce energy efficiency measures. These methods include the use of energy efficient domestic appliances, energy efficient lighting, buildings, transport, industries, energy audits, market-based instruments, education and awareness and voluntary instruments.⁴⁰⁶ Nonetheless, the permeation of these methods into societies remain somewhat slow as a result of barriers such as low energy prices, the lack of finance, poverty, uncertainty, split incentives, capital budgeting as well as ignorance.⁴⁰⁷

SADC, in promoting energy efficiency, adopted the *SADC Protocol on Energy* (1996), the *SADC Energy Corporation Policy and Strategy* (1996), the *SADC Energy Action Plan* (1997), the *SADC Energy Activity Plan* (2000) and the *SADC Regional Infrastructural Development Master Plan* (2012).⁴⁰⁸ South Africa followed by issuing policies, namely, the WEP, the WRE, the IEP, the NIRP, the NEES, the NCCRP and the IRP.⁴⁰⁹ South Africa, however, also introduced legislation referring to energy

404 See 2.2.1.

405 See 2.3.

406 See 3.4.

407 See 2.5.

408 See 3.

409 See 4.

efficiency (the ER Act, NE Act), regulations (GN R711, GN R729), standards (SANS 204, SANS 104000) and voluntary instruments (SANS 941, SANS 50001).

The SADC frameworks urge for the development of energy efficiency policies, strategies, programmes and projects at national level. South Africa corresponds with the SADC frameworks by enacting the NEES, the WEP which mandate for the development of an energy efficiency policy and the NCCRP and the IER that provides for the development of energy efficiency programmes. Notably, South Africa has moved beyond the SADC mandate by promulgating legislation as well as voluntary instruments that regulate energy efficiency. The ER Act and the NE Act mandate the issuing of energy efficiency regulations and standards. So far, SANS 10400 and SANS 204 (energy efficiency in buildings) and GN R729 (allowances for energy efficiency savings) have been issued.

Table 1 illustrates how South Africa's policies, legislation, standards and regulations correspond with the SADC frameworks.

Legal instruments	Energy efficiency						Energy efficiency instruments									
	Policy	Strategy	Projects	Standard	Regulation	Legislation	Programme	Lighting	Building	Transport	Industry	Market-based instruments	Appliance labelling	Energy audit	Education	Voluntary instruments
SADC frameworks																
EP ⁴¹⁰	√	√					√									
PS ⁴¹¹	√	√														
EACP ⁴¹²			√				√									
EAP ⁴¹³	√	√					√									
RIDMP ⁴¹⁴	√															
SA policies																
WEP	√			√						√	√		√	√	√	
WRE	√			√									√			
IEP	√				√	√	√									
NIRP2	√							√								
NEES		√		√							√	√	√	√	√	√
IRP							√		√			√	√			
NCCRP					√		√		√		√					
SA legislation																

410 SADC Energy Protocol

411 SADC Energy Cooperation Policy and Strategy

412 SADC Energy Action Plan

413 SADC Energy Activity Plan

414 SADC Regional Infrastructural Development Master Plan

Legal instruments	Energy efficiency						Energy efficiency instruments									
	Policy	Strategy	Projects	Standard	Regulation	Legislation	Programme	Lighting	Building	Transport	Industry	Market-based instruments	Appliance labelling	Energy audit	Education	Voluntary instruments
ER Act					✓			✓			✓					
NE Act					✓			✓			✓		✓			
NBRBS Act					✓				✓		✓					✓
IT Act					✓							✓				
Voluntary standards																
SANS 942				✓									✓			
ISO 50001				✓												

Table 1 A Comparison of SADC and South Africa’s frameworks

The EP, PS, EACP, EAP and the RIDMP all call for policies, strategies, programmes and projects on energy efficiency. The EACP calls for the implementation of energy efficiency projects and programmes while the EP and the EAP only refer to programmes relating to energy efficiency. The EACP, the EP and the EAP therefore deal more with the implementation of energy efficiency on a project and programme level and not only on a policy and strategy level.

The SA Policies go further than the SADC frameworks. The WEP and the NEES provide for energy efficient transport, appliance labelling, energy audits, education and voluntary measures while the WRE only refer to appliance labelling as an instrument within energy efficiency policies and standards. The IEP provides for energy efficiency policies, regulations, legislation and programmes while the NIRP2 only refer to energy efficiency policies. The IEP does not provide instruments within its mandates while the NIRP2 specifically refer to energy efficiency lighting. The NCCRP makes provision for energy efficiency in industries and buildings within regulations and programmes.

The legislation is less specific and only provides in general for energy efficiency regulations. The ER Act, the NE Act, the NBRBS Act and the IT Act all provide for energy efficiency regulations, albeit for different industries or aspects. GN R729 provides for energy efficiency tax incentives as a market-based instrument. The Minister still needs to issue regulations with regard to transport, devices and motor vehicles, specifications for energy carriers among others. The SANS and ISO specifically refer to energy efficiency standards. SANS 942 as a voluntary standard, makes provision for energy-efficiency of electrical and electronic equipment while ISO 50001 provides organisations with a method to measure energy efficiency in terms of a quality management system. It also provides for energy audits. The legislation, however, does not make energy audits compulsory.

South Africa is still lacking with regard to the introduction of energy efficiency projects as prescribed by the SADC frameworks.

6.2 Recommendations

Based on the findings, it is necessary to make some recommendations. The following recommendations are proposed:

- SADC should not just urge member states to develop energy efficiency strategies, policies, projects and programmes but should also indicate specific measures (for example, appliance labelling, standards and incentives among others) to be introduced in legislation. SADC could also stress the importance of voluntary measures.
- There is a need for one definition of energy efficiency. The various definitions of specialists should be taken into account. This definition should be the same in the ER and the NE Acts.
- The Minister should issue regulations for what is in his or her mandate with regard to energy efficiency.
- The ER and the NE Acts could be amended in order to broaden the regulatory mandate of the Minister to include energy efficiency measures as indicated in the policies and strategies. It could also provide for enforcement by way of energy audits, for example.
- The regulations could include references to the SANS standards that already provide for energy efficiency in electrical and electronic appliances promoting and enforcing energy efficiency standards and make it not a voluntary but a regulatory measure.
- Organisations should be encouraged to introduce ISO 50001. Tax incentives could be introduced not only for organisations indicating energy efficiency savings but also for organisations that introduce energy management systems.

Legislation alone cannot address the goal of energy efficiency. A combination of legislation and voluntary instruments stand a chance to better enhance energy efficiency. Experts in a single field cannot implement and enforce statutory as well as voluntary standards single-handedly. An inter-disciplinary approach is therefore required in this regard.⁴¹⁵

415 See Du Plessis 2014 SAJS 13-19.

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