A DETAILED ANALYSIS OF ENERGY TAX INCENTIVES IN SOUTH AFRICA

by

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ABSTRACT

A DETAILED ANALYSIS OF ENERGY TAX INCENTIVES IN SOUTH AFRICA

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Coupled with the issue of promoting energy efficiency in South Africa is the need to focus on the source of energy production. The country's excessive burning of coal resources has been linked to the global warming crisis.

To address this energy crisis, taxpayers can be encouraged to play an important role in moving the country towards a position of energy stability by conserving energy or decreasing their energy consumption, or contributing towards the research and development of energy-efficient processes as well as cleaner forms of energy.

This study analyses the energy-related tax incentives that are currently legislated and available to South African taxpayers and discusses the feasibility of taking advantage of these incentives. The study may provide guidance to taxpayers that have decided to invest in renewable energy sources and will discuss some of the advantages and perceived challenges facing the renewable energy industry.

This study also provides a worked example that illustrates a detailed calculation of the energy tax saving incentive set out in section 12L of the Income Tax Act, No. 58 of 1962.

A case study guides taxpayers though the practical process of applying for and calculating their energy-saving tax deduction. The case study may be used as a point of reference for

taxpayers planning to implement the section 12L energy efficiency tax incentive for the first time and may highlight complexities and concerns they should consider.

Keywords:

section 12L

energy savings

energy tax incentives

tax incentives

research and development

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DEFINITION OF KEY TERMS

Table 1: Definition of key terms used in this document

Key term	Definition
Double dipping	"Defined as an act of receiving a benefit from two divisions of the same entity, resulting in the same benefit being received twice by the taxpayer." (Your Dictionary, 2016).
Fossil fuel	"Ancient organic remains (fossils) in sediments became sedimentary rock, giving rise to solid, liquid, and gaseous fuels such as coal, crude oil, and natural gas. They are the primary energy source for human societies since the industrial revolution (mid-19th century to early 20th century), are non-renewable, and also a primary source of global warming" (Business Dictionary, 2015a).
Global warming	"Steady increase in the earth's average lower atmosphere (near surface) temperature due to emissions and build-up of greenhouse gases" (Business Dictionary, 2015b).
Renewable energy	"Derived from resources that are naturally regenerative or are practically inexhaustible, such as biomass, heat, moving water, and wind energy" (Business Dictionary, 2015c).

LIST OF ABBREVIATIONS AND ACRONYMS

Table 2: Abbreviations and acronyms used in this document

Abbreviation	Meaning
BRICS	Brazil, Russia, India, China and South Africa
CDM	clean development mechanism
CER	certified emission reduction
CO_2	carbon dioxide
CV	calorific value
DoE	Department of Energy
DST	Department of Science and Technology
DTI	Department of Trade and Industry
FDI	foreign direct investment
GHG	greenhouse gas
GWh	gigawatt-hour
ITA	Income Tax Act
IPCC	Intergovernmental Panel on Climate Change
kg	kilogram
KWh	kilowatt-hour
M&V	measurement and verification
m^2	metres squared
m^3	metres cubed
MDF	medium density fibreboard
MFB	melamine-faced board
MJ/kg	megajoules per kilogram
R&D	research and development
SABS	South African Bureau of Standards
SANEDI	South African National Energy Development Institute
SARS	South African Revenue Service
UNFCCC	United Nations Framework Convention on Climate Change

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Governments around the globe are focusing on promoting a cleaner method for producing energy and are encouraging taxpayers to develop and use renewable energy resources (Garrison (2013:27); Edwards, Merrill, Rousso & Wagner (1998:465); Breaux, Bourgeois, Chiasson & Mauldin (2010:19)). According to Pegels (2010:4949), governments are introducing tax incentives that are encouraging the efficient use of energy and the use of renewable energy sources in an attempt to change the behaviour of taxpayers. These tax incentives are aimed at promoting research that may have the potential of reducing carbon dioxide (CO_2) emissions, and encouraging businesses and institutions to develop, market and purchase products that are highly energy-efficient (Edwards *et al.*, 1998:473).

Energy investment incentives also serve a critical function in promoting more efficient production in the energy industry by reducing the cost of investing in energy-efficient machinery while encouraging the development of new technology and energy-saving processes. These incentives are designed to reward the investor with tax deductions, cash grants or other allowances for their support of renewable energy resources (Tavallali, 2010:58).

According to Garciano (2011:12-14), energy efficiency, achieved through a substantial reduction in the use of electricity, fuel and other energy resources, should be one of the objectives in setting policy initiatives for energy. In South Africa, the Income Tax Act, No. 58 of 1962, hereafter referred to as the "ITA", was amended in 2015 by the insertion of section 12L. Section 12L provides for a tax saving of 95c per kilowatt-hour of energy saved (excluding renewable energy) for all energy users. This tax saving, an increase on the previous 45c per kilowatt-hour, is effective from 1 March 2015, and applies to years of assessment commencing on or after that date (Taxation Laws Amendment Act, 2015:61).

Governments have numerous policy tools in place to influence taxpayer behaviour and can design a country's tax system in a variety of ways to ensure the country achieves a desired result. Governments can offer support via cash grants or fiscal tax incentives (OECD, 2010:111). It is essential to determine which income tax incentives and government grants are currently available in South Africa when addressing the country's approach to energy efficiency and the drive towards renewable energy.

Coupled with the challenge of achieving energy efficiency in South Africa is the need to encourage investment in renewable energy resources (Menyah & Wolde-Rufael, 2010:1374). With the serious threat of global warming there is an increasing focus on energy usage and a worldwide drive to reduce fossil fuel consumption due to harmful carbon dioxide (CO_2) emissions resulting from the burning of fossil fuels (Edwards *et al.*, 1998:465). South Africa is largely dependent on coal, which is a fossil fuel, as a source of energy. The country's excessive reliance on coal has resulted in South Africa being responsible for increasingly high levels of CO_2 emissions (Menyah & Wolde-Rufael, 2010:1374; Pegels, 2010:4945).

1.2 PROBLEM STATEMENT

Ensuring the stability and sustainability of energy resources has been a focal point for Brazil, Russia, India, China and South Africa (BRICS) countries at all seven BRICS summits held to date. There is an urgent need for countries to develop cleaner, cheaper and more sustainable energy systems which promote access to energy-efficient technologies in all sectors. Energy is a vital resource for improving the standard of living of the people in a country as well as ensuring economic growth and development (BRICS, 2010). The focus of the BRICS summits has been on the development and use of renewable energy resources and the cleaner, more efficient use of fossil fuels and biofuels. There has been increasing pressure on the BRICS countries to cooperate with each other in exchanging information, knowledge and best practices with regard to energy resources (BRICS, 2009; BRICS 2010; BRICS 2011; BRICS 2012; BRICS 2013; BRICS 2014; BRICS, 2015).

To address the current energy crisis, taxpayers can be encouraged to play an important role in moving the country towards a position of energy stability by conserving energy or decreasing their energy consumption, or contributing towards the research and development of energy-efficient processes as well as cleaner forms of energy.

1.3 PURPOSE STATEMENT

This study aims, firstly, to address and analyse the different tax incentives that are currently available to taxpayers in South Africa that are committed to achieving energy efficiency or investing in a cleaner form of energy (renewable energy). This study also aims to evaluate the benefits and challenges faced by a taxpayer that wishes to convert to renewable energy sources.

Secondly, a case study is conducted to illustrate the energy savings of a taxpayer that has decided to implement an energy-efficient production line. From this case study, a worked example of the calculation set out in section 12L of the ITA is provided in order to guide taxpayers through the process of applying for and calculating their energy-saving tax deduction. The application of this tax incentive may be complex in nature and may not be fully understood by taxpayers.

1.4 RESEARCH OBJECTIVES

- To critically analyse, and discuss the benefits and limitations of, implementing tax incentives, in general.
- To identify and evaluate tax incentives relating to energy use, focusing on the advantages, disadvantages and challenges of implementing renewable energy sources.
- To identify and analyse the current tax incentives and government grants offered to South African taxpayers that can demonstrate energy efficiency or investment in renewable energy solutions.
- To provide a step-by-step illustration of how to practically calculate the energy-saving tax incentive set out in section 12L of the ITA.

1.5 IMPORTANCE AND BENEFITS OF THE PROPOSED STUDY

This study will contribute to the growing literature on tax incentives by means of a general discussion on the effectiveness of tax incentives, and an analysis and comparison of tax incentive options for renewable energy solutions.

The study will also analyse tax incentives that are currently available in South Africa. The study may provide guidance to taxpayers that have decided to invest in renewable energy sources and will highlight the potential benefits and perceived challenges facing those taxpayers.

This study also provides a worked example of how to calculate the section 12L energy efficiency tax incentive, using data obtained from a South African taxpayer. This example may be used by other South African taxpayers to assist them in understanding how the section 12L application process and calculation could be applied. The case study may also be used as a point of reference for taxpayers using this tax incentive for the first time, highlighting the information required by the assessing authorities as well as the need for measurement and verification experts.

1.6 LIMITATIONS AND ASSUMPTIONS

Limitations of the study

The case study provides an example of how to calculate an energy-efficiency saving in respect of one selected taxpayer. This calculation does not result in a universally applicable formula and may not be relevant to all taxpayers in the country, as each taxpayer's business is unique. This dissertation addresses only the tax incentives available to taxpayers operating under the South African tax regime.

Assumptions

It is assumed that tax incentives are effective and, in the context of this study, that they encourage taxpayers to invest in and implement energy-saving processes and renewable energy projects to benefit from the tax savings available in legislation.

For the purposes of the case study performed in Chapter 5, it is further assumed that the taxpayer used for the illustration has diligently applied the income tax provisions set out in the ITA. It is also assumed that regression analysis is an appropriate means for calculating the statistical figures required for determining an appropriate baseline.

1.7 RESEARCH METHODOLOGY

A detailed comparison between and discussion of the energy tax incentives available in South Africa was performed by way of a non-empirical study, which was based on a review of the existing literature and the ITA.

The first step in conducting this research study was to perform a detailed literature review to determine the results of prior research relating to tax incentives. The literature review addresses the benefits and limitations of general tax incentives as well as the advantages and shortcomings of energy tax incentives. The outcome of the literature review serves as a theoretical basis for drawing conclusions about the energy tax incentives available in South Africa.

The case study performed in Chapter 5 provides a real-world example of the calculation of the section 12L energy-efficiency tax incentive. In order to calculate the adjusted energy-consumption baseline figure, a simple regression analysis was performed for four different models, taking factors such as the baseline period and production into account.

The energy-saving value was calculated by comparing the actual energy consumption of the taxpayer after the implementation of the energy-saving project to an adjusted-consumption baseline figure which represents what the energy consumption would have been for that period had the energy-saving project not been implemented.

All the energy-consumption data used in this case study was obtained from electricity bills, gas bills and coal consumption data of a South African company that remains anonymous for the purposes of this study.

1.8 STRUCTURE OF THE MINI-DISSERTATION

The main outcomes of the present study are presented in the format of a mini-dissertation. The structure of the mini-dissertation is explained and summarised below.

Chapter 1: Introduction

Chapter 1 provides an introduction and background to the present research and also sets out the research objective. The rationale for the present research is discussed, the delimitation of the present research is explained, and the research design and methodology are summarised. This chapter includes a brief discussion of the need for taxpayers to invest in energy-saving and cleaner-energy technologies. It also discusses the purpose of the dissertation.

Chapter 2: Tax incentives

Chapter 2 identifies and defines the theoretical constructs relevant to the main objectives of this study. A literature review identifies the existing literature on tax incentives, focusing on the benefits and limitations of implementing tax incentives in general.

Chapter 3: Tax incentives for energy use

Chapter 3 follows on from the literature review in Chapter 2 and addresses different sources of energy, the need for energy conservation and the conversion to renewable energy sources, and the advantages and challenges associated with implementing renewable energy solutions in South Africa.

Chapter 4: Analysis of energy tax incentives available in South Africa

Chapter 4 provides a detailed analysis of the energy-efficiency tax incentives and government funding defined in South African legislation. Approval processes and administration requirements are analysed and evaluated. The chapter also includes a detailed analysis of the research and development tax incentives and government funding available to taxpayers that have invested in renewable energy sources.

Chapter 5: Case study: section 12L calculation

This chapter presents a real-world case study of a taxpayer applying for the section 12L energy-efficiency tax incentive. The case study compares the energy consumption of the taxpayer before the implementation of an energy-saving project to the energy consumption after the energy-saving project. This is performed through a calculation of adjusted energy-consumption baseline figures, which are used to perform the energy-saving calculation.

Chapter 6: Conclusion

Chapter 6 summarises the findings and conclusions of chapters 2, 3, 4 and 5, explains the contribution and limitations of the present study, and makes suggestions for future research.

CHAPTER 2:
LITERATURE REVIEW: TAX INCENTIVES

2.1 INTRODUCTION

According to Watson and Webster (2002:xiii), a literature review is an essential part of an academic project, as it creates the foundation for advancing knowledge, facilitates theory development, and highlights areas where additional research is needed.

The purpose of this chapter is to clarify the research topic from the literature as well as the theoretical framework underpinning this study. To achieve this, the chapter provides a discussion of relevant published literature on the topic.

2.2 DEFINITION OF TAX INCENTIVES

Tax incentives can be defined as a "broad term that refers to a diverse group of policy strategies that share a common logic for using the tax system as an indirect mechanism to achieve policy goals" (Matkin, 2007:18). Tax incentives commonly aim to encourage corporations to increase their capital investment, relocate their business activities to special economic development zones, hire new employees, perform research and development, and undertake other business development activities (Matkin, 2007:19).

For the purposes of his work, Klemm (2010:315) defines tax incentives as "all measures that provide explicitly for a more favourable tax treatment of certain activities or sectors compared to what is granted in general industry".

According to Matkin (2007:18), most authors define tax incentives by listing several of the most common tax incentive strategies, such as tax abatements, tax exemptions or tax credits, which leaves the reader to deduce the shared traits. However, many others choose to define tax incentives as a subset of a larger concept, being tax expenditure Matkin (2007:18). Matkin (2007:18) concludes that this latter approach is superior as it stipulates the shared traits of the different strategies.

Tax expenditures are "provisions in the tax law that allow a special exclusion or deduction from a tax base, or that provide a special credit, preferential tax rate or deferral of tax liability" (Mikesell in Matkin, 2007:18). Generally, tax incentives have two main purposes, namely, to influence taxpayer behaviour and to provide relief to individual and corporate hardships, such as a tax credit used to offset corporate losses due to a natural disaster (Surrey in Matkin, 2007:19).

2.3 REASONS FOR TAX INCENTIVES

While tax incentives are granted for many reasons, Klemm (2010:316) states that one of the main reasons for the implementation of tax incentives by governments is tax competition. Klemm (2010:316) describes tax competition as a process used to attract foreign direct investment (FDI) activity and profits through the reduction of corporate tax rates. Tax competition has further been defined by Wilson and Wildasin (2001:4) as "non-cooperative tax regimes set by independent governments, under which each government's policy choices influence the allocation of a mobile tax base".

Klemm (2010:320) notes that it is also possible for incentives with a purely domestic intent to attract international investment. An example of this would be a regional incentive, such as a location-specific tax incentive that is implemented to attract development in a less-developed area. This type of incentive may attract domestic investment as well as FDI, as tax incentives relating to the development of an area are available to both domestic and foreign investors.

In today's globalised economy, FDI is essential to stimulating economic growth and ensuring the development of a country, especially in developing economies (Kandpal and Kavidayal, 2014:557). Foreign investors are expected to invest in developing countries with the lowest tax rates in an attempt to decrease their corporate tax liability (this behaviour has not been proven through research) (Abbas & Klemm, 2013:597). This assumption drives countries to decrease their corporate tax rates, sometimes through offering tax incentives, which results in increased tax competition among governments (Abbas & Klemm, 2013:597; Klemm, 2010:316).

Kandpal and Kavidayal (2014:557) concur with Abbas and Klemm (2013:597) that capital formation through FDI is an important determinant of economic growth in a country. They appreciate that while domestic investment contributes to the capital stock of an economy, FDI plays a vital role in the overall capital formation of a country by bridging the gap between domestic savings and foreign investment (Abbas & Klemm, 2013:604; Kandpal & Kavidayal, 2014:557).

2.4 FOREIGN DIRECT INVESTMENT IN DEVELOPING AND DEVELOPED COUNTRIES

Both developed and developing countries apply tax incentives to encourage FDI, but the types and frequency of the incentives offered may differ substantially among different economies (Kandpal & Kavidayal, 2014:557). FDI is vital in a developing economy, so developing countries try to attract more FDI in all the different sectors of their economy (Kandpal & Kavidayal, 2014:557). By offering tax incentives, many developing countries aim to compensate investors for structural weaknesses in the economy. Although advanced economies also offer tax incentives, these are usually aimed at particular regions or sectors, and are therefore more specific in nature (Kandpal & Kavidayal, 2014:557; Klemm, 2010:316).

Abbas and Klemm (2013:597-598) note that developing or emerging economies differ from advanced economies in several ways. A developing economy is smaller, faces a more elastic supply of international capital, and has a smaller base of local investors, thus putting more pressure on local governments to cut tax rates. Developing countries are therefore expected to have lower corporate tax rates than developed countries in order to remain competitive.

In developing countries, tax administration and law enforcement are often restricted as a result of underdeveloped tax policies and procedures, which places a strain on the collection of tax revenue (Abbas & Klemm, 2013:598). To encourage FDI, developing economies also have to rely on more generous tax incentive regimes that compensate investors for the risks of investing in a developing economy. These special regimes can take different forms, such as tax holidays, special investment allowances and special zones (Abbas & Klemm, 2013:598).

2.5 EFFECTIVENESS, COSTS AND BENEFITS OF TAX INCENTIVES

MacDonald (2009:74) explored whether a direct correlation exists between regions where many multinational firms have located their innovation activities and regions that offer the most beneficial tax incentives. It was concluded that the location of innovation activities is directly associated with the attractiveness of foreign research and development tax incentives in those locations.

Zejun (1998:11) suggests that the connection between FDI and taxes can be stated as follows: “Profit maximisation implies maximising the rate of return on FDI. This requires minimising all variables that would act to decrease profits in their gross or net form”. Therefore, a decreased tax liability would be beneficial and a key factor to consider when attempting to maximise profits.

One theory about using tax incentives to attract FDI is based on the principle that as taxes increase in direct relation to increases in net profits, the higher the net profit of a company, the greater the company’s tax liability (Zejun,1998:11). Therefore, in order to attract FDI, an appropriate government policy would be to decrease taxes on investment income (Zejun,1998:11). However, Zejun (1998:11) points out that this theory is now criticised for its failure to adequately explain the link between the complex behaviours of multinational enterprises and FDI, and suggests tax incentive policies based on this theory should be reconsidered.

In contrast to the views expressed by MacDonald (2009:74) and Zejun (1998:11), Kandpal and Kavidayal (2014:557) suggest that some studies conclude that tax incentives do not play a key role in attracting FDI. An investor’s decision to invest in a country depends on the country's overall environment and the investor’s appetite for risk. Tax competition is merely one contributing factor for the investor to consider, it is not one of the driving forces. FDI is believed to be influenced by many economic indicators, such as market size, export intensity and infrastructure (Kandpal & Kavidayal, 2014:557).

According to Klemm (2010:318), previous empirical research on tax incentives shows that they are sometimes successful in attracting FDI, but it remains uncertain as to whether or not they are beneficial overall. Econometric research performed by Klemm and Van Parys (2012:419) suggests that some tax incentives are successful in increasing FDI but as this may be a result of companies moving their investment to a region that is offering the incentive, the aggregate investment and growth in a country do not improve. Klemm (2010:318) proposes that incentives are beneficial only if certain requirements are met and the correct design is chosen, and even then the benefits may not be obvious if not all the costs are correctly accounted for.

Another factor to consider when implementing tax incentives is whether investment in a specific area comes at the expense of investment in surrounding areas. Klemm and Van Parys (2012:419) suggest that an increase in FDI in a specific region (where the tax incentive is offered) will come at the expense of decreased investment in another region. However, Bunker's (2013:118) evaluation of the impact of regional tax incentives offered in regions specified in the Gulf Opportunity Zone Act of 2005 concluded that incentives provided in a specified zone did not have a significant negative impact on the surrounding region.

Even if there is a case for tax incentives, the costs and benefits of a tax incentive scheme need to be considered by the policymaker. The costs of tax incentives can be extensive and may go beyond any immediate revenue loss and administration costs. These costs may also include distortions to the economy as a result of the preferential treatment of the investment qualifying for incentives, as well as losses due to corruption and fraud (Klemm, 2010:322).

The advantages of tax incentives can be even harder to measure. Tax incentives are ordinarily used to stimulate the economy and achieve long-term growth, which may be affected by many factors besides tax incentives. It is therefore difficult to determine the benefits arising from the implementation of a certain tax incentive and even more difficult to predict what the performance of an economy would have been in the absence of an incentive or what would have happened under another tax regime (Klemm, 2010:323).

Another factor to consider when measuring the impact of a tax incentive is the number of taxpayers that take advantage of the tax incentive on offer. One study found that, despite an increase in available incentives, 36% of companies said they had not taken advantage of these incentives due to a lack of knowledge, lack of personnel, and government bureaucracy (Anon, 1995:44).

2.6 PRINCIPLES FOR APPLYING TAX INCENTIVES

The principles for applying tax incentives are the same as those required for an effective general tax policy, and include the principles of transparency and predictability (Klemm, 2010:323-324). The principle of predictability is essential, as potential investors need to be able to understand tax incentive schemes if they are to base their investment decisions on them. Investors also require a certain level of stability, as once a country offers a tax incentive, an expectation is created that this incentive will continue to be available in the future (Klemm, 2010:323-324).

Transparency is also important when considering the application of tax incentives, as transparency reduces the risk of corruption. Tax incentives should also be structured in such a way as to ensure they are not susceptible to tax evasion. If incentives open new routes for tax evasion, their costs can increase drastically (Klemm, 2010:323-324).

Smith (1999:21-23) addresses the principles for the creation of R&D tax incentives. He stresses that countries should aim to structure their tax incentives to include elements of simplicity, costs of compliance, reliability, and stability. Tax incentives should be long-term in nature and the costs of administration and compliance should be minimal. Countries should take a more business-like approach to offering and evaluating tax incentive schemes, and should also consider creating standards and policies to ensure that tax incentives are implemented as envisaged. Non-compliance should result in punishment for corporations that fail to meet the requirements for the incentive (Smith, 1999:21-23).

2.7 CONCLUSION

Tax incentives are a tool that has been implemented by governments around the world to encourage FDI and influence investor and taxpayer behaviour. Based on the literature reviewed, it can be determined that there is no conclusive evidence that tax incentives actually achieve what they set out to achieve. Many authors believe that tax incentives are not a key deciding factor for investors, and their effectiveness is thus undermined. Some support the use of tax incentives, others hold opposing views. There is, therefore, no agreement regarding the effectiveness of tax incentives.

CHAPTER 3: TAX INCENTIVES FOR ENERGY USE

3.1 INTRODUCTION

This chapter addresses tax incentives pertaining to energy use in South Africa as well as government grants relating to energy efficiency and investment in renewable energy sources. The literature review commences with the need for energy and its conservation, addresses the three main sources of energy and concludes with a description of barriers to implementing renewable energy sources.

3.2 HUMAN CIVILIZATION AND ENERGY USE

Energy is linked to many of the most basic human needs, such as the provision of heat for warmth and for the cooking of food. Years of civilization have depended heavily on harnessing various forms of energy and using it to improve global populations' standard of living. Energy is essential to eradicating poverty and ensuring that a population's basic needs are met (Asif & Muneer, 2007:1391). The need for energy is ever-increasing due to population growth, global urbanisation and modernisation (Asif & Muneer, 2007:1391; Musango, Amigun & Brent, 2011:124).

According to Asif and Muneer (2007:1391) and Sadorsky (2009:4027), population growth is occurring largely in developing countries. Energy demand in developing countries, especially China and India, is rising faster than in developed countries due to their rapid growth (Asif & Muneer, 2007:1403-1404). According to Pegels (2010:4945-4946), developing countries' share of global greenhouse gas (GHG) emissions has been increasing, mainly due to rapid economic growth in these countries and the burning of more fossil fuels to meet a growing demand for energy. Energy demand in China and India is expected to account for 45% of the total increase in energy demand worldwide over the period 2005 to 2030 (Sadorsky, 2009:4027). Coupled with the increase in population, the inevitable need to increase economic output has placed undue pressure on the natural resources of the respective countries. A major global concern of our times is ensuring sustainable economic growth within the constraints of our planet's limited natural resources.

3.3 ENERGY SOURCES

There are numerous forms of energy that can be used worldwide to meet human energy needs. Asif and Muneer (2007:1394-1396) have categorised these different forms of energy into three main types, namely: fossil fuel, nuclear and renewable energy. These sources of energy are investigated in the sections below to determine whether they are viable options for implementation in South Africa and for taxpayers that wish to conserve energy and the environment.

3.4 FOSSIL FUEL ENERGY

Historically, coal was a stable and sustainable energy source which was responsible for producing the majority of society's energy, globally. Coal resources were in abundance and were sufficient to meet the energy demands of the population (Asif & Muneer, 2007:1394). With the increase in population and advancement of technology has come a need for increased quantities of energy as well as energy efficiency. The use of fossil fuels has developed over the years, first used in the form of coal, then oil and now in the form of gas, with each form of fuel becoming more efficient than the last (Asif & Muneer, 2007:1394-1396).

Currently, the world relies greatly on fossil fuels to meet its energy requirements – fossil fuels are used to meet almost 80% of global energy demands (Asif & Muneer, 2007:1394-1396). According to Pegels (2010: 4947), over 60% of South Africa's total energy supply and more than 80% of its electricity are derived from coal.

South Africa, like many coal-abundant countries, relies mainly on coal resources for energy generation. South Africa has developed an efficient, large-scale, coal-based power generation system that generates low-cost electricity which is then fed onto a grid system to provide electricity to rural areas as well as to residential, commercial and institutional consumers (Department of Minerals and Energy, 2003:vii). As a result of this well-established method of generating electricity, the use of coal resources is likely to remain an economically viable option for energy production in South Africa (Department of Minerals and Energy, 2003:vii).

South Africa is facing a critical policy issue regarding the use of coal and the development of alternative energy sources. There are concerns about harmful gas emissions, commonly known as greenhouse gases (GHGs), being emitted from the burning of fossil fuels such as coal and contributing to global warming, and the issue of depleting coal resources (Menyah & Wolde-Rufael, 2010:1374; Musango *et al.*, 2011:124).

3.4.1. Global warming

There is an intimate relationship between energy and the natural environment (Asif & Muneer 2007:1399-1400). It is widely understood that the continuous production of CO_2, which is released into the atmosphere from the burning of fossil fuels, has caused global warming (Department of Minerals and Energy, 2003:vii; Pegels, 2010:4945). The production and use of all forms of fossil fuels has resulted in undesirable environmental effects. The environmental impact of burning fossil fuels varies based on the health of the existing natural environment, the size and health of the human population, the energy technology used and the specific chemical properties of the fossil fuel used (Asif & Muneer, 2007:1399-1400).

Environmental damage caused by the emission of harmful GHGs is expected to have catastrophic consequences for the earth, including rising sea levels, altered rainfall patterns and increased intensity of storms, which will affect all aspects of society. The impact of climate change may differ in the various regions of South Africa, with some regions experiencing severe water scarcity and desertification (Pegels, 2010:4946). Climate change may also be the cause of deteriorating health, with higher temperatures increasing the occurrence of skin rashes, dehydration and heat stroke. Higher temperatures and altered rainfall may also create larger breeding grounds for diseases such as malaria and bilharzia (Pegels, 2010:4946).

Even though the South African government is aware of increasing global concerns regarding the use of fossil fuels and their link to global warming, alternative energy resources remain largely untapped despite South Africa's great potential to make use of renewable energy resources such as solar and wind (Department of Minerals and Energy, 2003:vii; Sadorsky, 2009:456). Menyah and Wolde-Rufael (2010:1381) conclude that South Africa has to forgo economic growth or decrease its energy consumption per unit of output, or both, in order to reduce emissions that pollute the atmosphere. Through the development of alternative energy sources to coal, it may be possible to meet the energy demands of the country and reduce its CO_2 emissions in the long term. Pegels (2010:4946) stresses the importance of decoupling energy generation from GHG emissions so that increased energy usage and decreased GHG emissions can be achieved simultaneously. In order to achieve this outcome, low-carbon technologies need to be part of the solution (Pegels, 2010:4946).

3.4.2. Energy security

The economic growth of a country in both developing and developed economies relies heavily on energy security, which can be defined as the "consistent availability of sufficient energy in various forms at affordable prices" (Asif & Muneer 2007:1401). Energy must therefore be readily and consistently available over the long term in order to contribute to the sustainable development and growth of a country (Asif & Muneer 2007:1401).

Most countries rely on the major oil producers in the Middle East for oil reserves. The five major oil producers – Saudi Arabia, Iraq, Iran, Kuwait and United Arab Emirates – are at an early stage of depleting their oil reserves and will not be able to supply the world with oil reserves indefinitely (Asif & Muneer 2007:1401). With a decline in oil reserves, a global energy gap will arise and will need to be filled by alternative energy sources (Asif & Muneer 2007:1398-1399). As the Middle East has a volatile geopolitical situation, the security of energy reserves may be seen as a risk for countries relying on the import of oil from this region (Asif & Muneer, 2007:1401).

One of the key outcomes of the South African government in addressing energy security, as addressed in the White Paper on Energy Policy (Department of Minerals and Energy, 2003:viii), is to meet the need for energy security by diversifying the energy supply in South Africa. As a large portion of the country's energy expenditure relates to imported fuels and these imported fuels are financed through dollar-denominated loans, any negative exchange rate impact can place a financial burden on the economy (Department of Minerals and Energy 2003:viii).

In order to address the concern of energy security, the South African government has, as part of its Integrated National Electrification Plan, devised a scheme for providing solar photovoltaic systems to households in rural areas. This will replace the use of candles and paraffin lamps for lighting, and diesel for charging generators (Department of Minerals and Energy, 2013:viii). The government has also developed a strategic Programme of Action to develop South Africa's renewable energy resources, thereby ensuring energy security through alternative energy sources (Department of Minerals and Energy, 2013:viii).

3.5 NUCLEAR ENERGY

Nuclear energy, despite its controversies and costs, is being promoted as one of the leading energy sources of the future (Menyah & Wolde-Rufael, 2010:1374). Countries such as the United States of America, France and Russia are making use of nuclear energy (Nuclear Energy Institute, 2016). Nuclear energy has contributed significantly to reducing the global use of oil for electricity generation and meets approximately 7% of global energy demands (Asif & Muneer, 2007:1395-1396).

Nuclear power plants operate by splitting uranium atoms inside a reactor through a process called fission. The heat generated from the fission process is used to generate steam, which in turn is used to spin a turbine and produce electricity (Nuclear Energy Institute, 2016).

Nuclear energy does not produce any GHGs when generating electricity, as there are no emissions of CO_2, nitrogen oxides or sulphur dioxides during the process. However, nuclear energy cannot be considered a renewable energy source, which, by definition, represents a limitless supply of resources, such as wind or solar (Nuclear Energy Institute, 2016).

Despite the positive factors associated with nuclear energy, this energy source has four critical factors that need to be considered by any country considering generating nuclear energy: cost, radioactive waste, safety, and possible use for weapons (Asif & Muneer, 2007:1395-1396).

3.5.1. Cost of nuclear energy

The costs of building a nuclear power plant can be extremely high as nuclear power plants are capital-intensive projects with large upfront construction costs. The building of a nuclear plant involves intricate designs by experts and rigid safety requirements that need to be complied with, which results in an increased capital cost (Asif & Muneer, 2007:1395). The operation of a nuclear power plant also involves a large number of staff, which drives up the cost of the power generated (Asif & Muneer, 2007:1395-1396; Nuclear Energy Institute 2016).

According to Odendaal (2016), the South African government has proposed to enter into contracts for the construction of nuclear power plants in South Africa. The cost of implementing the proposed nuclear programme in South Africa will be between R400 billion and R800 billion over the next 20 years. Should the country decide to implement nuclear energy, government assistance would be required to fund this type of project (Asif & Muneer, 2007:1395-1396).

Research has shown that nuclear power is twice as expensive as generating electricity from gas or wind. It has also been proven that gas- and wind-energy preservation measures are approximately seven times more economical than nuclear power (Asif & Muneer, 2007:1395-1396).

Greenpeace (2016) advocates that, among other factors, South Africa needs to find an immediate solution to its energy crisis, not a solution that takes more than a decade to build, at a massive cost. The public cannot afford the increase in the price of electricity that will be associated with the implementation of nuclear energy solutions (Greenpeace, 2016).

3.5.2. Radioactive waste

Uranium is used to fuel a nuclear power plant. The mining and handling of uranium is very risky and radiation leaks can occur, which can be detrimental to the health of people and the environment (Asif & Muneer 2007:1395-1396). Nuclear power plants also produce radioactive gases, which need to be contained in the operation of the plant. Another concern is the storage of highly toxic radioactive fuel used in the power plant. The handling and disposal of radioactive waste has been an ongoing environmental issue (Asif & Muneer 2007:1395-1396).

However, radioactive waste is not a concern if the used fuel from nuclear plants is “stored in steel-lined concrete pools filled with water, or in airtight steel or concrete containers” (Nuclear Energy Institute, 2016). These measures should be coupled with stringent government regulations as well as industry’s commitment to safety procedures.

3.5.3. Safety of nuclear power plants

Nuclear plants in developed countries have become progressively complex, mainly due to the addition of many safety systems (Asif & Muneer, 2007:1395-1396). However, safety will continue to be a concern, especially after the Fukushima nuclear disaster that occurred in Japan in 2011 (Greenpeace, 2016). This disaster is considered to have exposed the fundamental flaws of nuclear reactors and brought to the world’s attention serious institutional failures in the oversight of nuclear safety (Greenpeace, 2016). Asif and Muneer (2007:1395-1396) express concern about the safety of current nuclear reactors.

3.5.4. Production of weapons material

A requirement for the substantial growth of nuclear power is being able to prevent the creation of material that could be converted into nuclear weapons (Asif & Muneer 2007:1395-1396). Due to its nature and ability to create harmful explosions, nuclear power may attract unwanted publicity in this regard (Asif & Muneer 2007:1395-1396).

3.6 RENEWABLE ENERGY

In order to meet the increased energy requirements of society while conserving the environment, energy must be generated from a source that is not harmful to our natural environment (Asif & Muneer 2007:1397-1398; Pegels, 2010;4946).

The South African government's long-term goals with regard to its energy policy are to establish conditions of security, stability and environmental protection (Department of Minerals and Energy, 2003:viii). In order to achieve these competing goals, it is necessary to turn to sustainable energy generation from renewable resources that are not harmful to the environment and, at the same time, satisfy the energy requirements of the country (Department of Minerals and Energy, 2003:viii).

Renewable energy sources offer a unique opportunity to reduce harmful GHG emissions, enhance energy diversity, ensure energy stability and create a sustainable environment that supports economic growth without the negative consequences of environmental degradation (Musango *et al.*, 2011:125).

Renewable energy can be defined as energy obtained from natural sources and includes wind power, solar energy, hydropower, biomass energy and geothermal energy (Asif & Muneer 2007:1396). The use of renewable sources for energy is not new. Biomass has been used for cooking and heating for hundreds of years, and both hydropower and wind have been used to power mills to produce grain. Renewable energy sources are abundant in nature and are capable of providing the entire world with enough energy for sustainable development without emitting air pollutants and GHGs (Asif & Muneer 2007:1396).

The renewable energy sector is the fastest-growing sector in the energy market due to the significant number of benefits associated with generating this type of energy (Pegels, 2010:4947). In addition to reducing harmful atmospheric gases, the generation of renewable energy can enhance diversity in the energy supply markets, secure long-term sustainable energy supplies and create new employment opportunities (Asif & Muneer 2007:1396; Pegels, 2010:4947).

3.6.1. Sustainable development and energy tax policies

The use of renewable energy sources will contribute positively to sustainable development as most of these sources, such as wind and water, are found in nature and are not dependent on or influenced by international politics or a limited supply. Using renewable energy resources ensures energy security and the sustainable development of the economy (Department of Minerals and Energy, 2003:ix). Garciano (2011:12-14) identifies two main goals that should be achieved when determining energy policy goals and related tax policies: encouraging investment in renewable energy sources to increase the quantity of clean energy produced, and decreasing the quantity of energy consumed (increased energy efficiency), especially energy produced by harmful sources such as fossil fuels.

The next step in drawing up energy tax policies is to identify the taxpayers that qualify for tax incentives. This involves research to determine which taxpayer groups consume the most energy and will benefit from an energy-efficiency tax incentive as well as which taxpayer groups will be most likely to develop and implement renewable energy projects (Garciano, 2011:12-14). In order to achieve the maximum benefits and results from these policies, the correct taxpayer groups need to be targeted (Garciano, 2011:12-14).

3.7 TAX POLICY CHALLENGES AND RECOMMENDATIONS

The greatest challenges with tax policies that encourage energy efficiency and investment in renewable energy sources through the offering of tax incentives are the economic climate and financial condition of a country (Garciano, 2011:12-14). In countries where businesses are struggling financially and generating economic losses, a taxpayer will have limited or no taxable income. In these circumstances, the taxpayer will have a decreased appetite for tax incentives as there is no immediate financial gain for taxpayers (Garciano, 2011:12-14).

In promoting investment in renewable energy technologies, it is necessary to consider which technologies are available in the country in order to benefit from the local equipment that is available. This may assist in minimising the costs associated with the implementation and operation of machinery (Department of Minerals and Energy, 2003:xi). Sourcing the technology and expertise locally will also assist in promoting employment opportunities in the country (Department of Minerals and Energy, 2003:xi).

As investment in renewable energy sources is still relatively new in South Africa, ongoing research and development support should be offered to taxpayers. This can be achieved by offering government funding for research and development undertaken by taxpayers, and establishing technology support centres to promote the ongoing development of renewable energy technologies (Department of Minerals and Energy, 2003:xi-xiii).

In the context of South Africa, certain renewable energy projects, such as photovoltaic and solar water heating, are well developed and readily available. South Africa's challenge is to develop renewable energy technologies that are capable of widespread application, using local labour and resources to ensure that the cost of the technology is minimised, and that renewable energy technologies are affordable for the general population (Department of Minerals and Energy, 2003:xi).

3.8 POLICY IMPLICATIONS IN SOUTH AFRICA

It is important for South Africa to learn from other countries and ensure it is in line with global best practices when it comes to technology development and advancement in the energy sector.

The need to decrease uncertainty and ensure the stability and sustainability of energy resources has been a focal point of the BRICS group at all seven BRICS summits held to date. The BRICS countries have highlighted the urgent need for countries to develop cleaner, more affordable and sustainable energy systems and promote access to energy-efficient technologies in all sectors. Energy is an essential resource for improving the standard of living of the people in a country as well as ensuring economic growth and development, and the BRICS focus has been on the development and use of renewable energy resources and the cleaner, more efficient use of fossil fuels and biofuels (BRICS, 2009; BRICS 2010; BRICS 2011; BRICS 2012; BRICS 2013; BRICS 2014; BRICS, 2015).

Nuclear energy will continue to be an important topic of future energy discussions of the BRICS countries, and safety precautions and strict operational requirements should be of primary concern (BRICS, 2011). There has been increasing pressure for the BRICS countries to cooperate with each other with regard to information exchange, know-how and best practices relating to energy resources (BRICS, 2012). At the seventh BRICS summit, held in Russia in 2015, it was urged that businesses of the BRICS countries jointly develop energy-efficient technologies and equipment (BRICS, 2015).

The Intergovernmental Panel on Climate Change (IPCC) report on technology transfer points out the roles governments should play in facilitating technology transfer, specifically in relation to technologies for renewable electricity generation (IPCC, 2011:882). These roles include "the removal of barriers to technology transfer; providing an enabling environment that is suitable for the investment; provision of infrastructure for research and development; and information transfer and provision of support mechanisms for renewable energy deployment" (IPCC, 2011:882).

In order to promote renewable energy generation, it is important to first highlight and address the barriers that prevent a country from achieving its objectives (Musango *et al.*, 2011:129). Policies should then be designed and implemented to address these barriers (Musango *et al.*, 2011:129-130).

3.9 BARRIERS TO RENEWABLE ENERGY IMPLEMENTATION IN SOUTH AFRICA

3.9.1. Availability of natural resources

In order to use natural resources to generate energy, these resources need to be readily available in the country. As South Africa is a water-scarce country, the scale and quantity of hydropower plants that can be developed are limited. Wind resources in South Africa are concentrated mainly in coastal areas; therefore, the installation of wind farms throughout the country may not be viable (Musango *et al.*, 2011:129-130). However, according to Pegels (2010:4948), all South African provinces have the potential to develop solar-powered energy-generating technologies.

3.9.2. Economic and financial barriers

South Africa is full of natural resources that can be used as renewable energy sources; however, the conversion of these natural resources to renewable energy is not cost-competitive for energy producers when compared with South Africa's fossil-fuel-based energy supply industry (Department of Minerals and Energy, 2003:9).

One of the reasons for the difference in the cost of energy sources is that the cost of using fossil fuel resources does not take into account the negative impact these resources have on the environment (Department of Minerals and Energy, 2003:x). The carbon tax that is proposed to be implemented in 2017 aims to correct this cost discrepancy by placing a tax on the generation of energy produced from harmful, carbon-intensive sources (Draft Carbon Tax Bill, 2016:23).

Financing for renewable energy projects takes into account the risk and the cost of investment (Pegels, 2010:4948). As renewable energy is still a relatively new concept, there is uncertainty surrounding the return on investment for these projects. Renewable energy projects may not be an attractive investment, especially with high interest rates. This limits the financial support and funding available to developers (Musango *et al.*, 2011:129).

3.9.3. Social barriers

There is a need for public awareness and acceptance of renewable energy projects in South Africa. The implementation of renewable energy projects often requires using acres of land, both private and communal. The use of land for such projects may be rejected by local authorities and communities that consider land as an inheritance (Musango *et al.*, 2011:129). Therefore, local communities need to be educated about the environmental damage caused by fossil fuels and the benefits associated with implementing renewable energy projects, so as to obtain their acceptance and support of the renewable energy initiative (Musango *et al.*, 2011:129; Department of Minerals and Energy, 2003:9).

3.9.4. Infrastructure barriers

The development of large-scale renewable energy projects requires a significant initial investment to build the required infrastructure. Coupled with this expenditure is the cost of prospecting. Developers are required to source publicly acceptable sites with adequate resources before the implementation of the project (Musango *et al.*, 2011:130). This process may require that the resources are closely monitored for a certain period to ensure that the site is acceptable. This process could take several years to achieve (Musango *et al.*, 2011:130).

3.9.5. Administrative requirements and processes

There are certain permits that are required when implementing such projects. The requirements and processes for obtaining permits required for conventional energy technology projects are generally well understood by energy providers, and processes and standards for new capacity are well defined in energy standards and regulations. As renewable energy sources involve new types of issues and environmental impacts, standards and regulations are still in a process of development and the requirements for obtaining the necessary permits are unknown (Musango *et al.*, 2011:129-130).

3.9.6. Human resources barriers

The design and implementation of renewable energy projects requires highly skilled technical manpower. The South African government has placed emphasis on job creation. However, it is necessary to clearly understand the training and knowledge required for this field of expertise. In the South African context, while the need for creating jobs is recognised, it needs to be clearly outlined how the supply of skilled labour and manpower will be achieved (Musango *et al.*, 2011:129-130).

3.9.7. Institutional and regulatory barriers

The generation of electricity on a medium to large scale requires numerous legal and regulatory conditions, set by different government authorities, to be met. This represents a major hurdle for renewable energy developers as there are many agencies involved in the process and the approval time to receive the required licences is extremely long (Musango *et al.*, 2011:129). The institutional and regulatory requirements that have to be met have been considered as one of the greatest hurdles in implementing renewable energy projects (Musango *et al.*, 2011:129).

Table 3 highlights the barriers facing renewable energy developers in South Africa.

Table 3: Institutional and regulatory barriers facing renewable energy developers

Category	Barriers
Institutional	▪ Large number of agencies involved in approvals ▪ Long lead time to process approvals for licences, conduct an environmental impact assessment or negotiate a purchasing power agreement ▪ Identifying the right public sector finance partner ▪ Clean development and mechanism process is long and expensive
Regulatory/legal	▪ Environment impact assessment laws, planning legislation, the Public Finance Management Act, Municipal Finance Management Act. ▪ Rights to access property or resources

Source: Adapted from Musango *et al.* (2011:129-130)

In order to address these barriers to the implementation of renewable energy, Pegels (2010:4953) makes the following recommendations to South African policymakers:

- Learn from the best practices of other countries through exchanging experiences.
- Increase the support to independent power producers.
- Include the South African public in the drafting of policies, as programmes are more likely to be beneficial once they have the support of a committed and informed community.
- Stress the importance of energy efficiency through information campaigns, and the implementation of policies and standards.

3.10 FINANCING ENERGY PROJECTS

Successful renewable energy developers must be able to secure and retain project financing, funded through a combination of equity, and short- and long-term debt provided by lenders (Cook & Hall, 2012:41).

Cook and Hall (2012:42) define financing as the "process of accumulating funds from lenders and equity investors to develop a project. Lenders will demand a security interest in the project's assets, and lenders and equity investors will require contractual and economic concessions from the developer".

Renewable energy projects involve specific risks that may not be found in other types of projects. To compensate for this increased risk, investors demand an increase in the cost of finance (Cook & Hall, 2012:42-43; Curnow, Tait & Millar, 2010:104).

According to Curnow *et al.* (2010:101), renewable energy projects in Asia face a number of specific financing and operational barriers, including: "security of resource supply; relatively high technology and capital costs; lack of financier familiarity with technology; and high transaction costs, given the often small scale of projects in these countries". These barriers prevent conventional power-sector financing techniques from being used to finance renewable energy projects, as the financier is skewed towards technologies that are more familiar, such as conventional fossil fuel technologies (Curnow *et al,* 2010:101). Pegels (2010:4949) states that these risks are also prevalent in the South African context. In South Africa, none of the renewable energy technologies can compete with the currently used coal-fired power stations. This is due to the high capital investment needed to fund these new technologies, and unfamiliarity with the new technology (Pegels, 2010:4949).

3.11 COST-COMPETITIVENESS OF RENEWABLE ENERGY PROJECTS

As renewable energy is a fairly new concept, with only a few countries boasting established renewable energy systems, renewable energy projects may be more expensive to implement in the short term as the technologies have not yet achieved commercial maturity, cost reductions and economy of scale (Curnow *et al.*, 2010:103). This can make it difficult for renewable energy projects to compete against established producers of fossil-fuel energy. Renewable energy projects are also relatively capital-intensive compared with conventional energy projects, requiring the majority of the investment to be made upfront (Curnow *et al.*, 2010:103).

3.12 TECHNOLOGY PERFORMANCE RISK

As renewable energy technologies have not been in operation for a number of years, they have not been subjected to rigorous testing and ongoing performance monitoring. Therefore, investors may be more cautious about investing in new technology as the entire system may fail (Curnow *et al.*, 2010:104).

3.13 ENERGY SUPPLY RISKS

Some renewable energy resources, such as wind and solar energy, are intermittent by nature. There is no guarantee that the sun will shine or the wind will blow. Although developers are aware of the geographical areas that are known for sunshine and strong winds, the energy generated is still dependent on the climate in which the renewable energy projects are situated (Curnow *et al.*, 2010:104).

3.14 FINANCING TOOLS IN SUPPORT OF RENEWABLE ENERGY

According to Curnow *et al.* (2010:104-105), there are a number of financing tools available to support investment in renewable energy projects. These tools include targeted policies and regulatory measures designed to support renewable energy. These policies generally result in renewable energy projects generating additional revenue from preferential feed-in tariffs or the sale of carbon credits. This additional revenue can be used to provide financial security for lenders.

3.15 GOVERNMENT GRANTS

When investing in a renewable energy project, the initial upfront costs are usually high. Therefore, the availability of government funding in the form of government grants may be essential to the investor. A successful developer of and investor in a renewable energy project will need to acquire the necessary funds and resources at the lowest possible cost and risk, and should therefore consider all government incentives and how to most effectively make use of such incentives (Cook & Hall, 2012:44).

3.16 CONCLUSION

Based on the above analysis of the three main sources of energy, it can be concluded that there is a global urgency for countries to move away from the use of fossil fuels and towards the more sustainable solution of using renewable energy sources. Investment in nuclear energy remains controversial. Investment in renewable energy sources will enable countries to address global warming concerns as well as the issue of energy sustainability. However, there are many barriers to implementing renewable energy sources, the greatest challenge being the large upfront capital investment required. Tax incentives as well as government funding may assist taxpayers in reducing this initial funding required.

CHAPTER 4:
ANALYSIS OF AVAILABLE TAX INCENTIVES AND FUNDING FOR ENERGY EFFICIENCY AND RENEWABLE ENERGY IN SOUTH AFRICA

4.1 INTRODUCTION

This chapter provides an overview and summary of the tax incentives for energy efficiency and investing in renewable energy sources that are available in South Africa. This will enable taxpayers to identify which energy tax incentives may be applicable to their businesses and may highlight possible tax savings that may be claimed.

Tax incentives have been a large part of driving change in the South African energy industry, whether to support the growth of certain sectors or a move towards an environmentally stable economy. Table 4 summarises the sections of the ITA that are applicable when considering income tax incentives relating to energy.

Table 4: Applicable sections of the Income Tax Act relating to energy

Section of the Income Tax Act	Description
Section 12L: Energy efficiency tax incentive	"Businesses can claim a deduction against taxable income in the form of an amount equal to the monetary value of proven energy efficiency savings."
Section 11D: Research and development tax incentive	"There is a 150% income tax deduction for scientific and technological research and development expenditure."
Section 12I: Industrial Production Policy tax incentive	"Energy efficiency-related criteria are given in the Industrial Production Policy incentive scheme."
Section 12B: Renewable energy depreciation allowance	"An accelerated depreciation allowance exists for capital equipment used for renewable electricity generation from wind, solar, small scale hydro and biomass at the rate of 50%:30%:20% over three years."
Section 12K: Tax exemption for certified emission reductions	"Revenues generated from the sale of certified emissions reductions resulting from projects under the CDM [clean development mechanism] are exempt from income tax."

Source: Adapted from the Carbon Tax Policy Paper (National Treasury, 2013a:69)

4.2 ENERGY EFFICIENCY TAX INCENTIVE: SECTION 12L

Energy management is an important part of doing business and has now been developed into something that is expected to add real value to the bottom-line profits of a business (National Treasury, 2009a:29). The introduction of energy efficiency savings can be viewed as "one of the quickest ways to address the issues relating to climate change and energy security" (National Treasury, 2009a:29).

Section 12L of the ITA became effective from 1 November 2013 (SANEDI, 2014a:1). The rationale for the energy efficiency tax incentive described in section 12L is to promote the efficient use of energy in order to safeguard the security of the country's energy supply. The key aspect addressed by this legislation is the efficient use of energy by taxpayers as opposed to the resources used by taxpayers to generate the energy (the use of fossil fuels as opposed to the use of renewable energy) (SANEDI, 2014b:3).

The conversion of old technologies to new technologies in order to achieve energy efficiency often involves a substantial amount of upfront capital expenditure to be made by the taxpayer. Coupled with long payback periods and high interest rates, this discourages taxpayers from upgrading their energy technologies. This tax incentive is therefore designed to encourage taxpayers to invest in energy-efficient technologies and encourage greater levels of energy efficiency savings (National Treasury, 2009a:29).

Section 12I was inserted into the ITA and grants an investment incentive for manufacturing-related projects that will reduce the demand for energy by at least 10% (SANEDI, 2014a:1). Section 12L of the ITA, effective from 1 November 2013, allows an amount in respect of energy efficiency savings made by a person to be deducted from the income of that person for a year of assessment (SANEDI, 2014a:1).

4.2.1. <u>Deduction in respect of energy efficiency savings</u>

In terms of section 12L (1) of the ITA, any person may, "for the purpose of determining the taxable income from the carrying on of any trade in respect of any year of assessment ending before 1 January 2020, be allowed a deduction calculated at 45 cents (revised to 95 cents) per kilowatt-hour or kilowatt-hour equivalent of energy efficiency savings" (Income Tax Act, 2015).

"This notional allowance will enable the taxpayer to capture the full profit from energy efficiency savings during each year in which incremental energy efficiency savings are initially realised" (National Treasury, 2009a:30). The allowance is available to "any person that derives an income from the operation of trade, which implies that the allowance is available only to businesses, not to individuals" (SANEDI, 2014a:3).

The following formula should be used to calculate the allowance for each year of incremental savings (National Treasury, 2009a:30):

$$\frac{\textit{Energy efficiency savings x applied rate}}{2}$$

In respect of calculating the allowance, all forms of energy efficiency savings will be taken into account and should be expressed in the equivalent of kilowatt-hours (kWh) to achieve uniformity. The energy efficiency saving is determined by measuring energy usage against an initial baseline as set by a measurement and verification (M&V) professional (National Treasury, 2009a:31).

The applied rate, as per the formula, is 'the lowest feed-in tariff rate at the beginning of the year of assessment, expressed in rands per kWh, as determined by the regulatory guidelines set by the National Energy Regulator of South Africa (NERSA). As the lowest feed-in tariff rate is higher than the current rate per kWh for electricity generated from fossil fuel, the overall formula is divided by two" (National Treasury, 2009:30).

A taxpayer wishing to claim this deduction "must obtain a certificate issued by an institution, board or body prescribed by the regulations in respect of energy efficiency savings". The certificate must contain the following information:

- "the baseline earning at the beginning of the year of assessment;
- the reporting period energy use at the end of the year of assessment;
- the annual energy efficiency savings, expressed in kWh or kWh equivalent, for the year of assessment, including the full criteria and methodology used to calculate these savings; and

- any other information prescribed by the regulations" (National Treasury, 2009a:30).

Based on the South African National Standard (SANS) 50 010, a baseline is defined as "the energy usage representing conditions before the implementation of energy-saving measures under a set of known energy-governing factors and relationships applicable at the time of the baseline measurement period, and the energy in question" (SANEDI, 2014a:9).

There is no predetermined period for the reporting measurement period (SANEDI, 2014a:9). The reporting measurement period should have at least "one normal operating cycle of the facility, which should be determined by the M&V professional". The reason for this normal operating cycle is to "fully characterise the savings effectiveness in all normal operating modes". If SANEDI deems the baseline period to be too short, the baseline will be rejected, which will result in the rejection of the entire application (SANEDI, 2014a:9).

"All the criteria and methodology used by the taxpayer to determine the baseline and energy efficiency savings must be in terms of regulations issued by the Minister of Energy, after consultation with the Minister of Finance and the Minister of Trade and Industry" (National Treasury, 2009a:31). "These regulations will be based on the International Performance Measurement and Verification Protocol of the Efficiency Valuation Organisation" (National Treasury, 2009a:31).

4.2.2. <u>Exclusions from Section 12L</u>

According to Regulation 6, stipulated in the Regulations in terms of the Section 12L of the ITA published by National Treasury, "a person may not receive the allowance in respect of energy generated from renewable sources or co-generation, which means energy from waste and combined heat and power, other than energy generated from waste heat recovery. The renewable sources excluded are listed as biomass, geothermal, hydro, ocean currents, solar, tidal waves or wind" (National Treasury, 2013b:10).

Waste heat recovery is defined as "utilising waste heat or underutilised energy generated during an industrial process." Therefore, the only energy generated that may be considered as part of section 12L is waste heat recovery energy (SANEDI, 2014b:4).

In terms of Regulation 6 (National Treasury, 2013b:10), a person may also not receive the allowance if the energy was generated through a captive power plant, which is defined as the "generation of energy [that] takes place for the purpose of use of that energy solely by the person generating that energy". This refers to self-generated energy that is not fed back into the grid but is used by the taxpayer. An exception to this exclusion is where the captive power plant generates 35% more energy output than energy input in kWh or equivalent kWh in respect of that year of assessment (SANEDI, 2014b:5).

This situation can be interpreted as an exception to the rule that renewable energy is excluded from section 12L (SANEDI, 2014b:5).

4.2.3. Measurement and verification standards

According to Radloff (2012:1), energy saving tax incentives are the hype of the decade and are coupled with a great amount of potential growth. However, this energy efficiency tax-saving potential, through the deduction that can be claimed for the energy saving, may result in the exploitation of the tax incentive and taxpayer fraud. In order to prevent abuse or exploitation of the incentives offered by the government, it is often common for regulators to develop and implement standards. The role of these standards is to reduce uncertainty for all parties. The development and introduction of SANS 50 010 was to make energy efficiency measures more reliable so that a platform could be established for energy management to grow as an industry (Radloff, 2012:1-2).

4.2.4. International energy standard (ISO 50 001)

The International Organisation for Standardisation (ISO) responded to global pressure to reduce GHG emissions by developing and releasing the ISO 50 001 standard for energy management systems in 2011 (National Treasury, 2013b:10). The purpose of this standard is to encourage entities to establish and implement a management system that will improve energy performance (Radloff, 2012:1).

The standard focuses on developing 'an energy management system which includes an energy policy, clear objectives, measurable targets and plans which take into account legal requirements and information pertaining to significant energy use" (Bredenkamp, 2011:1).

According to Radloff (2011:2), these standards "do not establish absolute requirements for energy performance beyond the commitments of the policy", and this is where South Africa leads the world in the development of a standard for the measurement and verification of energy efficiency which can be used independently or in conjunction with ISO 50 001:2011. This led to the development of SANS 50 010:2011 (Radloff, 2012:1).

ISO 50 001 is based on the 'plan-do-check-act' process. This process requires "energy efficiency efforts to be systematically documented and evaluated to ensure continual improvement by the organisation" (Radloff, 2012:2 and Bredenkamp, 2011:1). Bredenkamp (2011:1) emphasises that the implementation of an energy management system is not a one-off initiative but requires a continual effort by organisations to "stay up to date with technology development, tariff increases and other important factors."

It is also essential that this process is run by top management and filtered down to the employees of the organisation. Energy management should become an item on the agenda at board meetings and regular reporting at this level should ensure that the energy objectives of the organisation are met (Bredenkamp 2011:1). All employees should receive regular training on how the entity is committed to saving energy (Bredenkamp 2011:1).

4.2.5. Compliance with ISO 50 001

To ensure compliance with ISO 50 001, organisations will need to maintain accurate records, policy documentation and audit reports to support any reduction in energy usage or substantiate a claim related to energy savings (Bredenkamp, 2011:2). Compliance with ISO 50 001 is a black-and-white process and there is no room for manipulation (Bredenkamp, 2011:2).

According to Bredenkamp (2011:2), some South African companies have already implemented this standard but the majority of South African companies have not. The reason for this may be linked to the perceived administration and documentation requirements associated with the proper implementation of this standard (Bredenkamp, 2011:2). Bredenkamp (2011:2) urges all organisations to consider implementing this standard, as when the "potential benefits are evaluated in relation to the minimal extra admin effort, the implementation of ISO 50 001 becomes a no-brainer". The implementation of an energy management system will allow organisations to police their own energy usage, leading to a more energy-efficient workplace (Bredenkamp, 2011:2).

4.2.6. Development of SANS 50 010 by South Africa

With the development of an energy tax incentive offered by the National Treasury and set out in section 12L of the ITA, the Department of Energy (DoE), the Department of Trade and Industry (DTI) and National Treasury requested the South African Bureau of Standards (SABS) to develop a national standard against which energy efficiency and, in turn, energy savings by taxpayers, could be measured and verified (Radloff, 2012:2).

To prevent fictitious claims from being submitted by taxpayers, the tax incentive could not be implemented until a measurement and verification standard, approved by SANAS, was established. In 2011, South Africa became the first country in the world to develop and release a national measurement and verification standard called, SANS 50 010:2011 (Radloff, 2012:1).

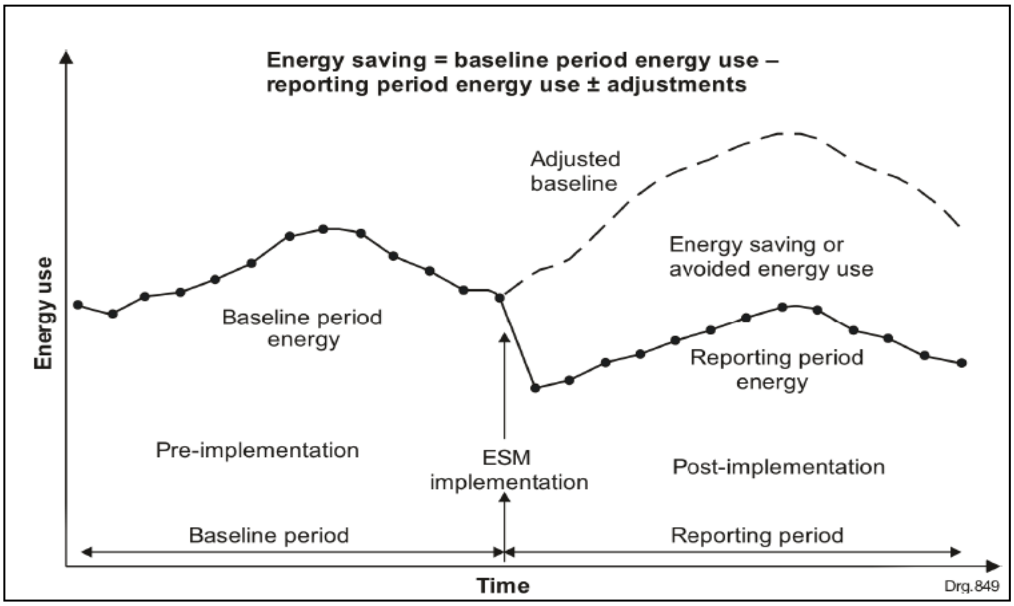
SANS 50 010 is a South African technical standard outlining the requirements for consistently and reliably quantifying energy savings. SANS 50 010 states that:

"… the achievement of savings in energy consumption is a national imperative. SANS 50 010 acknowledges that in order for organisations and regulators to monitor performance towards a range of energy savings objectives, it is imperative that a harmonised approach to measurement and verification be applied by all entities seeking to achieve energy savings or energy efficiency." (Radloff, 2011:2).

ISO 50 001 specifies that energy savings should be performed but does not specify how this should be achieved (Radloff, 2011:2). SANS 50 010 provides a method for companies to calculate their energy savings "by comparing the measured use of energy before and after the implementation of an energy-saving programme, making suitable adjustments for changes in conditions." SANS 50 010 assists in bridging the gap left by ISO 50 001, as it provides a basis for quantifying the energy saving (Radloff, 2011:2).

Figure 1 depicts the basic principles of performing measurement and verification relating to energy savings. The "ESM implementation" in Figure 1 can be defined as the point where the energy-saving mechanism was implemented.

Figure 1: Figure depicting the energy-saving calculation



Source: SANS 50 010 in Radloff (2011:2)

4.2.7. Role of the South African National Development Energy Institute (SANEDI)

Section 7 (2) of the National Energy Act, No. 34 of 2008, provides for SANEDI "to direct, monitor and conduct energy research and development, as well as undertake measures to promote energy efficiency throughout the economy" (National Energy Act, 2008). The role of SANEDI is to provide an assurance function for the South African Revenue Service (SARS) (SANEDI, 2014c:4). SANEDI is ultimately responsible for consolidating and analysing section 12L information received by taxpayers and reporting the consolidated information to the Department of Energy, National Treasury and SARS. SANEDI is also responsible for maintaining an online database to streamline the section 12L process (SANEDI, 2014c:4).

4.2.8. Funding of Section 12L

The energy efficiency tax incentive is funded by National Treasury from the fiscus. The new proposed carbon tax is intended to generate revenue to finance this incentive further and promote efficient energy usage (SANEDI, 2014a:2).

4.2.9. Administration and approval process to qualify for the incentive

SANEDI has published a step-by-step guide on the process of obtaining a tax certificate for the section 12L energy efficiency tax incentive, which is summarised as follows (SANEDI, 2014a:7-8):

- "Once the taxpayer is satisfied that the project meets all the legislative criteria, the project is loaded onto the SANEDI online system. The application is then evaluated by the panel appointed by SANEDI.
- The application must contain satisfactory information to determine whether the baseline report submitted is correct. This approval normally takes between two to four weeks.
- If the baseline report is accepted, the project is approved and registered on the 12L system. All project stakeholders are advised once this is done.
- The project should now be approved by SANEDI for execution by the taxpayer.
- Once the project has been completed, a post-implementation study must be conducted by an M&V specialist. The M&V specialist should produce a performance assessment report which includes the quantum of the energy efficiency savings. The M&V process should be conducted in terms of the SANS 50 010 standard.
- The performance assessment report should be loaded on the SANEDI online system for evaluation of the project. This process takes two to four weeks to finalise.
- Should the performance assessment report be accepted by the panel, the project is approved and registered on the section 12L system and a tax certificate is generated."

4.3 RESEARCH AND DEVELOPMENT TAX INCENTIVE: SECTION 11D

Another way that a taxpayer may qualify for a tax incentive is to be involved in the research and development (R&D) of new technologies relating to energy efficiency or renewable energy. A taxpayer may decide to engage in innovative activities to create either a process to conserve energy or a system to derive energy from a renewable energy source.

The aim of the legislation in introducing a tax incentive for R&D is to promote investment in R&D technologies, especially in the private sector in South Africa. An increased investment in R&D should result in innovation-led development and job opportunities (SAICA, 2012). It will also assist in establishing South Africa as a leader in specialist areas of technological innovation and protect the country from having to pay excessive royalties to other countries for the use of their technology (National Treasury, 2011: 81-83; SAICA, 2012).

Section 11D was inserted in the ITA when the Act was amended in 2006, to encourage taxpayers to invest in scientific or technological R&D, and replaced the old R&D regime under section 11B. The tax incentive introduced in 2006 had two main aspects: firstly, a 150% tax deduction for R&D non-capital expenditure and, secondly, an accelerated write-off period for capital expenditure over three years, at a rate of 50/30/20, for building, plant and machinery, utensils, articles and improvements used in the process of R&D (National Treasury, 2011: 81-83; SAICA, 2012).

In 2011, section 11D was revised in order to streamline and simplify the tax deduction for R&D. This was partly due to the need for a concrete and precise definition of R&D, and to clarify which activities would qualify for the deduction (National Treasury, 2011: 81-83).

The new section 11D was inserted in the ITA when the Act was amended in 2012 and is effective for R&D expenditure incurred on or after 1 April 2012. The section provides for all R&D expenditure to be separated into three categories, as follows:

- “All expenditure incurred in respect of eligible R&D activities will qualify for the automatic deduction of 100%, even if these activities are capital in nature.
- An additional 50% uplift deduction will apply to R&D expenditure that has been approved by the Department of Science and Technology (DST).
- All R&D expenditure that does not qualify for the automatic deduction will remain eligible for deduction if the R&D expenditure satisfies the requirements of the general

deduction formula, as contained in the provisions of section 11(a) of the ITA" (National Treasury, 2011: 81-83).

4.3.1. Definition of research and development expenditure

The definition of R&D expenditure has been revised "to better reflect the government's intention to incentivise activities that constitute technical and scientific R&D as opposed to routine upgrades or applications" (National Treasury, 2011:81-83). In order for expenditure to qualify as R&D expenditure, it must contain "appreciable elements of novelty or high levels of technical risk and contribute to non-obvious scientific or technical knowledge" (National Treasury, 2011:81-83).

In terms of section 11D(2) of the ITA, "a deduction of 150% of the expenditure is allowed for:

- expenditure actually incurred,
- directly and solely in respect of R&D undertaken in South Africa,
- in the production of income
- and in the carrying on of any trade,
- where the R&D is approved by the Minister of Science and Technology
- and the expenditure is incurred on or after the date that the DST receives the application for approval of the R&D expenditure" (Income Tax Act, 2015).

These requirements are discussed in section 4.3.3.

The 150% deduction available to the taxpayer is broken down into the automatic 100% deduction and an uplift deduction of 50%.

4.3.2. Research and development automatic deduction

In terms of the provisions of the current section 11D of the ITA, any R&D expenditure undertaken solely within South Africa by a taxpayer will be eligible for the 100% deduction as long as this expenditure was "incurred solely and directly in respect of separately identifiable R&D activities" (National Treasury, 2011: 81-83). This expenditure does not need written approval from the DST (National Treasury, 2011: 81-83).

In order for the expenditure to be deductible, it must have been "incurred in the production of income and the carrying on of a trade" (National Treasury, 2011: 81-83). These requirements are different from the requirements of the general deduction formula under section 11(a), as the expenditure may be of a capital nature. No distinction is made between revenue and capital expenditure (National Treasury, 2011: 81-83).

4.3.3. 50% uplift deduction

Section 11D provides for a 50% uplift deduction in respect of expenditure incurred for approved R&D activities. In order to qualify for the extra deduction, the expenditure must be approved by the adjudication committee headed up by the DST. The expenditure that qualifies for the deduction must be incurred from the date on which a successful application for approval of the R&D expenditure is submitted to the DST. In cases where the R&D activities are funded by other parties, the legislation now provides the additional 50% deduction to "the party responsible for determining or altering the research methodology" (National Treasury, 2011a: 81-83; SAICA, 2012).

The requirements for claiming deductions under section 11D are analysed as follows:

Expenditure actually incurred

The general principle laid down by the courts is that "expenditure is actually incurred when the taxpayer incurs an unconditional legal liability to pay the amount, and not necessarily when the amount is actually paid." This principle has been confirmed in the judgment in *Edgars Stores Ltd v CIR,* 1988 (3) SA 876 (A) (50 SATC 81) at 83.

Directly and solely in respect of R&D undertaken in South Africa

R&D is defined in section 11D(1) of the ITA and refers to systematic investigative or systematic experimental activities, of which the result is uncertain, for the purposes of discovering non-obvious scientific or technological knowledge; or creating or developing an invention, functional design or computer programme; or a significant and innovative improvement to any invention, functional design, computer programme; creating and developing a multisource pharmaceutical product; and conducting a clinical trial (Income Tax Act, 2015).

Non-qualifying expenditure

The following expenditure items do not qualify for the 100% deduction or the additional 50% uplift deduction under section 11D of the ITA; however, the expenditure may still be deducted in terms of the general deduction formula under the provisions of section 11(a) of the ITA (National Treasury, 2011: 81-83):

- "Market research, market testing, or sales promotions.
- R&D expenditure associated with human resources management, payroll, legal, finance and audit activities.
- Routine testing, analysis, the collection of information, and quality control in the normal course of business (unrelated to a significant R&D project).
- R&D to enhance internal business processes (e.g. typical computer software) except where that R&D is conducted for external exploitation for sale or license to customers.
- Social sciences, including the arts and humanities.
- Oil and gas exploration or mineral prospecting, except R&D carried out to develop technology used for oil and gas or mineral exploration.
- Expenditure to create or develop financial instruments or financial products (e.g. development of financial derivatives).
- Expenditure to create or enhance trademarks or goodwill.
- Expenditure incurred or allowances granted for the acquisition of pre-existing inventions, designs or computer programs (i.e. the acquisition of assets eligible for allowances under sections 11(gB) and (gC) of the ITA)".

All this R&D expenditure must take place in South Africa. "South Africa" is synonymous with the term "Republic" in the ITA. "Republic" is defined in section 1 of the ITA and means the "territory of the Republic of South Africa, including the territorial waters, the contiguous zone and the continental shelf referred to in the Maritime Zones Act, No. 15 of 1994." Activities which are conducted outside the Republic are not eligible for deduction under section 11D of the ITA, even if the expenditure is funded from within the Republic (Income Tax Act, 2015).

In the production of income

In order for R&D expenditure to have been incurred in the production of income, the expenditure must have been incurred for the purpose of earning income as defined in section 1 of the ITA and must be "closely linked to the income earning operations of the business." This principle was established in *Port Elizabeth Electric Tramway Co v CIR,* 1936 CPD 241 (8 SATC 13).

Any R&D expenditure incurred need not give rise to an immediate production of income. This principle has been confirmed in the judgment in *Sub-Nigel Ltd v CIR,* 1948 (4) SA 580 (A) (15 SATC 381) at 394. This case reiterated the "view that it is not necessary for expenditure to have an effect on the income produced in that year. It can relate to income that has been earned in the past, will be earned in the future or that will not produce income at all, as long as it has been incurred for the purpose of earning income."

The test was refined in *CIR v Standard Bank of SA Ltd,* 1985 (4) SA 485 (A) (47 SATC 179), where Corbett JA formulated the following principles:

"In determining whether expenditure was incurred in the production of income, the most important factors are the purpose of the expenditure and what it actually affects; and the closeness of the connection between the expenditure and the income-earning."

Therefore, if the R&D expenditure can be closely linked to the income earning operations of the taxpayer, this expenditure will be considered to have been incurred by the taxpayer in the production of income.

And in the carrying on of any trade

In terms of section 1 of the ITA, "trade includes every profession, trade, business, employment, calling, occupation or venture, including the letting of any property and the use of or the grant of permission to use any patent … or any design … or any copyright … or any other property which is of a similar nature".

In order for a taxpayer to prove that they are carrying on a trade, the taxpayer needs to prove that they have met the "active step" requirement as entrenched in law by *SA*

Bazaars (Pty) Ltd v CIR, 1952 (4) SA 505 (A) (18 SATC 240), where the court held that ‘the mere fact that the company kept running by maintaining a bank account and paying its annual duty did not constitute the carrying on of a trade’, and that the term “trade” requires an active step requirement. “The active step requirement involves more than a mere intention to trade or some preparatory activities to do so.”

4.4 THIRD PARTY FUNDING OF RESEARCH AND DEVELOPMENT EXPENDITURE

In terms of the current law, “the party responsible for determining the research methodology will be eligible to qualify for the 50% uplift deduction.” This party will have the knowledge to properly interact with the government about the facts relating to the R&D process. Special rules apply when the R&D activity is directly funded by the government (SAICA, 2012). If a taxpayer receives a tax-exempt government grant, the 50% additional allowance does not apply to the extent of the grant in order to avoid “double dipping” (National Treasury, 2011: 81-83; SAICA, 2012).

4.4.1. Approval committee role

The role of the approval committee is to review the initial application for recommendation to the Minister of Science and Technology to monitor and report on the approval process annually. The approval committee should “consist of three members appointed by the Minister of Science and Technology and four members appointed by the Minister of Finance” (National Treasury, 2011: 81-83).

4.4.2. Research and development applications procedure

In order to qualify for the 50% uplift deduction, R&D activities need to be approved by the DST. Once approved, R&D expenditure will qualify for the 50% uplift from the date on which a successful application is submitted by the taxpayer to the DST (National Treasury, 2011: 81-83). It is the responsibility of the approvals committee to evaluate all applications and decide whether or not the R&D activities qualify for approval, based on whether or not the expenditure is considered to be innovative in nature and requires specialist skills (National Treasury, 2011: 81-83).

4.4.3. Accelerated write-off for research and development assets

In terms of the provisions of section 12C of the ITA, "any new and unused R&D machinery or plant (or improvements thereto) owned by the taxpayer will be eligible for an accelerated write-off over four years at a rate of 40/20/20/20" (National Treasury, 2011:81-83). Buildings used in the R&D process will qualify for a 5% write-off over 20 years in terms of section 13 of the ITA. These allowances may be claimed without pre-approval from the DST (National Treasury, 2011:81-83).

4.5 INDUSTRIAL POLICY PROJECTS: SECTION 12I

Section 12I was inserted in the ITA when the Act was amended in 2008 to provide for an additional allowance for industrial policy projects (Department of Trade and Industry, 2015:1). The main purpose of the industrial project incentive is "to support industrial development by attracting large industrial projects and enhancing skills training" (Department of Trade and Industry, 2015:1).

Section 12I covers two types of projects, namely, a "brownfield project", which relates to "the expansion or upgrade of an existing industrial project", and a "greenfield project", which relates to a new project that uses new, unused manufacturing assets (Department of Trade and Industry 2015:1). Section 12I provides for an investment allowance for both project types, depending on the status of the project, as well as a training allowance (Department of Trade and Industry 2015:1).

In terms of section 12I(10) of the ITA, the Minister of Finance, in consultation with the Minister of Trade and Industry, must devise regulations governing the factors that need to be considered and met in order to qualify for these allowances.

In terms of the draft regulation issued by National Treasury (2009b:2-3), to determine whether a project will "upgrade the industry by using new technology that results in improved energy efficiency, the Minister of Trade and Industry and adjudication committee must be satisfied that:

- in the case of a brownfield project, the project will attain an energy efficiency improvement of at least 10% from a 2006 baseline, as determined by a National

Energy Efficiency Agency panel throughout the additional investment allowance benefit period; and

- in the case of a greenfield project, the project will use modern, viable, energy-efficient equipment and processes, relative to the industry sector for that industrial project, throughout the additional investment allowance benefit period, not taking into account any period before the month in which the Industrial Policy Project reaches 50% of its production capacity, as determined by a National Energy Efficiency Agency panel."

4.6 ACCELERATED DEDUCTION FOR MOVABLE ASSETS USED IN THE PRODUCTION OF RENEWABLE ENERGY

In terms of sections 12B(1) and (2) of the ITA, a taxpayer may deduct from taxable income "the cost of machinery and implements used to produce biodiesel or bioethanol, or to generate electricity from wind, sunlight or gravitational water forces, over a three-year period, with 50% of the cost being deductible in the year in which the equipment is brought into use, 30% being deductible in year two and 20% in year three" (Income Tax Act, 2015). This allowance is available to taxpayers that own the machinery or acquired the asset in terms of an instalment sale agreement (SAICA, 2011).

Section 12B of the ITA states that the cost of the asset is "deemed to be the lesser of the actual cost to the taxpayer and the costs which a person would have incurred if they acquired the asset under a cash transaction concluded at arm's length, in respect of the direct cost of the acquisition of the asset and the direct cost of installation and erection of the asset" (Income Tax Act, 2015).

4.7 CERTIFIED EMISSION REDUCTIONS – SECTION 12K

The United Nations has developed an instrument called the Kyoto Protocol to govern the reduction of harmful emissions of developed countries and ensure that these countries meet their emission targets (UNFCC, 2015). Similarly, the clean development mechanism (CDM) was included in the ITA to assist South Africa to follow in the footsteps of developed countries and contribute to the reduction of harmful emissions (UNFCCC, 2015).

The reduction of emissions is achieved through the implementation of CDM projects, which are eligible for carbon emission reduction units (CERs) and focus on the development of renewable energy, energy efficiency and other projects that reduce carbon emissions. Each CER is equivalent to one tonne of CO_2 (UUNFCCC, 2015; SAICA, 2011).

The National Treasury explanatory memorandum on the Taxation Laws Amendment Bill (2009a:26-28) states that there has been a limited uptake of CDM projects within South Africa due to the risks associated with their implementation. Before section 12K was inserted in the ITA, the income generated from the disposal of CERs was treated as revenue from trading stock and taxed at 28%.

Section 12K of the ITA provides for the revenue or capital gain generated from the disposal of a CER to be exempt from tax. Section 12K was inserted in the ITA by section 26 of the Taxation Laws Amendment Act, No. 17 of 2009 and "applies to the disposal of CERs occurring on or after 11 February 2009 in respect of CDM projects registered on or before 31 December 2012" (National Treasury, 2009a:26-28).

Section 12K provides that in order for a project to qualify as a CDM project, the project requires both the approval of the Department of Energy and registration with the United Nations Framework Convention on Climate Change (UNFCCC). "Registration is provided by the UNFCCC Executive Board of the Clean Development Mechanism after validation by the UNFCCC-approved Designated Operational Entity (DOE)" (National Treasury, 2009a:26-28).

4.8 GOVERNMENT GRANTS TO FUND EXPENDITURE ON ENERGY PROJECTS

Table 5 lists the government grants available to taxpayers that are implementing energy-saving projects.

Table 5: Government grants to fund expenditure of energy-saving projects

Government grant to fund project	Benefits and purpose of the grant
Venture capital grant Managed by the Investment Development Corporation (IDC)	"To facilitate the development and commercialisation of technology-rich South African intellectual property (IP) that is unique from a global perspective." "IDC may provide equity funding of between R1 million

Government grant to fund project	Benefits and purpose of the grant
	and R30 million per project (maximum first-round funding of R15 million with the right, but not obligation, to provide follow-on funding up to maximum of R30 million)."
Innovation Fund Funded by the DST	"Available to enterprises that invest in research and development from proof of idea/science to proof of concept, and is open to publicly funded institutions, small and medium-sized businesses, and any consortia consisting of these." "The Innovation Fund uses a flexible returns structure, be it royalty, equity, convertible loans or combinations thereof, structured as appropriate for each investment."
Manufacturing Competitive Enhancement Programme (MCEP) Managed by the DTI	"MCEP, which is one of the key action programmes of the Industrial Policy Action Plan 2012/13 – 2014/15, will provide enhanced manufacturing support aimed at encouraging manufacturers to upgrade their production facilities in a manner that sustains employment and maximises value-addition in the short to medium term." "Applicants will be assigned a benefit ceiling based on entity-level manufacturing value-add, which the applicant will have to claim through the seven sub-programmes of the MCEP, within a two-year period. MCEP consists of two categories: a production incentive and industrial financing loan facilities. These two categories have seven components in terms of which an applicant can benefit from MCEP." The cash benefit of the grant can range to up to R200 million per project.

Source: Adapted from the Department of Trade and Industry (2014/2015: 214-224)

4.9 CONCLUSION

There are numerous tax incentives currently available to South African taxpayers. Should a taxpayer engage in energy efficiency activities, an energy-saving deduction is available in terms of section 12L of the ITA. Alternatively, if a taxpayer is achieving energy efficiency and meets the criteria for a brownfield or greenfield project (which includes meeting criteria for energy efficiency), the taxpayer may benefit from the savings of the incentive scheme set out in section 12I of the ITA.

If a taxpayer implements a project to generate energy from renewable energy sources, the taxpayer may benefit from accelerated allowances for capital equipment as defined in section 12B of the ITA. Taxpayers that can prove their expenditure is in respect of eligible R&D activities may qualify for special deductions under section 12D of the ITA. Taxpayers engaged in either energy efficiency or renewable energy projects should consider which tax incentive is most appropriate and beneficial.

CHAPTER 5: CASE STUDY: SECTION 12L CALCULATION

5.1 INTRODUCTION

This chapter is in the form of a case study and illustrates a detailed calculation of the section 12L energy efficiency tax incentive. The purpose of the case study is to illustrate the practical process of applying for and calculating the energy-saving tax deduction. The case study may be used as a point of reference for taxpayers planning on implementing the section 12L incentive for the first time, and may highlight complexities and concerns they should consider.

To illustrate the example, real data was obtained from a South African production company. This company is referred to as “the taxpayer” for the remainder of the chapter. The taxpayer requested to remain anonymous for the purpose of this study.

The chapter commences with the background on the taxpayer, then goes on to calculate the taxpayer’s adjusted energy-consumption baseline figures and the energy tax saving for the assessment period.

5.2 BACKGROUND ON THE TAXPAYER

The taxpayer selected for this study is a company in the wood industry that produces panel products using local wood, with a focus on sustainable forestry management and state-of-the-art production facilities. These production facilities include three board-production plants, a resin plant, a pole-production plant and two sawmills. The financial year of the taxpayer runs from July to June each year.

Upgrade of existing production line and expansion of new facility

The manufacturing technology used to manufacture medium density fibreboard (MDF) had been in operation for 34 years and was no longer commercially viable as a result of the high energy costs involved in operating the plant.

In order to avoid the closure of the MDF plant, the taxpayer invested R240 million in upgrading the pressing and sanding sections of the MDF plant. This upgrade incorporated the latest production technology and contributed to energy efficiency tax savings, ensuring the taxpayer remained competitive in an environment of rising energy costs and taking into account the proposed carbon tax.

The main operational impacts of the upgraded production line were:

- increased production capacity;
- improved board-pressing tolerances; and
- reduced sanding to form the dimensions of the pressed board to market specifications.

The taxpayer also installed a new melamine-faced board (MFB) production line. The taxpayer implemented the new MDF production process on 1 July 2012 and has operated the new MFB production line since January 2013.

The following changes were made to the taxpayer's production facilities:

- The installation of a new forming press (stage 6) and sanding production line (stage 7) for the MDF production line and the decommissioning of the existing production line.
- The installation of a new melamine-faced board (MFB) production line.

The main operational impacts of the new production line include:

- increased production capacity;
- improved board-pressing tolerances; and
- reduced sanding to form the dimensions of the pressed board to market specifications.

Overview of previous MDF production process

Before these changes, the production of MDF consisted of a seven-stage process, summarised in Figure 2.

Figure 2: Seven stages of the old MDF production process

Stage 1: Debarking	**Stage 2:** Chipping	**Stage 3:** Pulping	**Stage 4:** Blow line	**Stage 5:** Mat formation	**Stage 6**: Pressing	**Stage 7:** Finishing

Stage 1: Debarking

Once the MDF plant has obtained suitable logs, the first process is debarking. For optimisation of the final product and to minimise damage to equipment, the bark is removed from the logs, allowing for faster drainage of water during the mat formation stage and improving the surface finish of the product.

Stage 2: Chipping

Although some plants accept chips directly from other operations, chipping was typically done at the taxpayer's MDF plant. A disc or drum chipper is used to create the chips. The chips are then screened and those that are too big may be rechipped. The chips are then washed and a scanner or magnet may be used to remove any impurities.

Stage 3: Pulping

The chips are compacted by a plug screw and fed into a digester where, under pressure, they are heated by steam and soften. The chips are then fed into a defibrator (refiner). The resulting pulp is fine, fluffy, and light in colour with the fibre wall intact.

Stage 4: Blow line

After defibration, the fibres enter the blow line, which they pass through at high velocity. Wax and resin are added into the blow line and fibres are dried with heating coils.

Stage 5: Mat formation

During this process a continuous mat is formed by passing the fibres through a pre-compressor and pre-press to press out any additional air.

Stage 6: Pressing

The mat then enters a continuous roller press and is kept in the press at a specific pressure and temperature for the length of the press. The board is then transported to a cooler.

Stage 7: Finishing

After the pressing process, the boards are cooled in a star cooler. The boards are stored for a couple of days to allow for complete curing of the resin. The boards are then sanded and trimmed. The boards may be upgraded with the application of a coloured melamine laminate or natural-wood veneer.

5.3 PURPOSE AND PROCESS

The purpose of this exercise is to calculate the energy savings resulting from the upgrade of the MDF production line and the introduction of the MFB production line. The energy savings will be used by the taxpayer to claim the energy efficiency tax incentive available in terms of section 12L of the ITA.

In order to calculate the energy savings in terms of section 12L, energy consumption before the implementation of the energy-saving changes (the upgrading of the MDF process and introduction of the MFB line) needs to be measured against energy consumption after the implementation of these changes.

The calculation of the energy consumption before the energy-saving changes had been made is referred to as the *adjusted baseline energy consumption* and is calculated over a specific period, referred to as the *baseline period*.

The first step is therefore to calculate what the adjusted baseline energy consumption is for the baseline period. The second step is to calculate the energy saving for the period after the implementation of the energy-saving processes. The methodology used for this project conforms technically to the most recent version of SANS 50 010.

5.4 PRIMARY ENERGY SOURCES USED AND THE CALIBRATION OF METERING INSTALLATIONS

The production plant uses four sources of energy, namely: electricity, coal, natural gas and biomass. Each electricity source is discussed further below.

Electricity

Electricity is imported from the grid connection operated by the local municipality. Electricity is used during all the manufacturing processes, specifically during the chipping stage, as well as for dust extraction, pumping, sawing, board pressing and sanding. Electricity is also used for lighting, heating, ventilation and air conditioning.

The electricity consumption of the plant, measured in kWh, is metered by a permanently installed billing-class electricity meter. Automated meter readings are taken on the first day of the month. The metering data is available on monthly electricity bills issued by the local municipality.

Electricity billing meters need to comply with Eskom's latest metering specifications, as documented in the Specification for Three-Phase Programmable Energy Meters document. The specification states that all meters must be tested at a SANAS-accredited test facility before delivery (Eskom, 2013:12).

Coal

Coal is purchased from various suppliers and is delivered by truck to an on-site stockpile that maintains a coal supply buffer for a maximum of three production days. The coal is used for steam generation in the drying and heating processes. The coal is tested regularly by accredited laboratories to obtain the calorific values (CV), measured in MJ/kg. The CV measures the energy contained in a substance, this energy is determined by measuring the heat produced through combustion (Business Dictionary, 2016a)

In order to calculate the volume of coal consumed in the process, the following coal consumption formula is used: $Mc = Mcs + Mcd - Mce$

Where:

- *Mc* denotes the mass in kilograms (kg) of the coal consumption for the period;

- *Mcs* denotes the mass in kg of the coal stockpile at the beginning of the period;
- *Mcd* denotes the mass in kg of the coal delivered during the period; and
- *Mce* denotes the mass in kg of the coal stockpile at the end of the period.

The metering of coal consumption relies on metering coal deliveries using an on-site scale and surveyed data of the coal stockpile at regular intervals. The scale is calibrated by a SANAS-accredited service provider once a year. Coal stockpile survey reports are produced by an external service provider.

Natural gas

Natural gas is purchased and imported via a dedicated gas-supply pipeline. The gas is used for steam generation in the drying and heating processes. The calorific value of the plant's imported gas and total energy are provided on the taxpayer's monthly gas bills.

The gas consumption of the plant, measured in cubic metres (m^3), is metered by a permanently installed billing-class gas flow meter. Gas supply data, which includes gas volumes, calorific values and total energy content (measured in GJ/m^3), is obtained from monthly gas bills issued by the supplier.

The supplier stipulates that the gas meters are visually inspected and lubricated every three months before being refilled. The gas meters are fully serviced and retested every three years.

Biomass

Biomass is obtained as a waste product from the sawing, cutting and sanding processes and no biomass is acquired specifically for the purposes of serving as a primary energy source. Biomass from the sawing, cutting and sanding processes is captured throughout the production process by aspiration systems and burned in an on-site boiler to reduce waste. Heat energy from the boiler is used to produce steam for the refining, drying and heating processes.

As section 12L of the ITA includes only energy savings from non-renewable energy sources, with biomass being classified as renewable energy, any energy savings resulting from the use of biomass must be excluded from the energy-savings calculation. The energy consumption from biomass has been captured and recorded in this exercise for completeness purposes as well as to perform a comparison of the energy saving should biomass be permitted in future energy-saving calculations. This comparison is given at the end of this chapter.

Production of MDF and MFB

Production meters form part of the taxpayer's production lines and the calibration of the metering function is performed in-house. Production figures are captured in the taxpayer's financial system and audited annually by external auditors.

5.5 CALCULATION OF THE ADJUSTED BASELINE

To calculate the adjusted baseline, the appropriate measurement and verification method must first be selected. Once the method for the assessment of energy efficiency has been established, the baseline methodology can be applied.

5.5.1. Selection of the measurement and verification option

There are four categories provided for the assessment of energy efficiency (SANS 50 010:2011). Category 3 was selected for assessing the energy saving impacts for this project. Table 6 summarises the four categories and provides reasons for not selecting certain categories for this project.

Table 6: SANS 50 010:2011 assessment options

Category	Description	Considerations that apply to the assessment option
1	Retrofit isolation: key-parameter measurement	Partial isolation of the targeted loads and processes, where the energy consumption of some (but not all) of the constituent parts of the targeted loads and processes are measured. This is not a suitable option as no baseline metering for key-parameter measurement is available.
2	Retrofit isolation: all-parameter measurement	Full isolation of the targeted loads and processes, where the energy consumption of all constituent parts of the targeted loads and processes is measured. This is not a suitable option as no baseline metering for key-parameter measurement is available.
3	Whole facility	The intervention targets major interacting energy-consumption loads and processes in the plant, representing a substantial percentage of the total energy consumption. The energy savings

Category	Description	Considerations that apply to the assessment option
		are therefore expected to be determinable to an acceptable degree of accuracy from the total energy consumption measured at high-level metering points. This therefore represents a suitable option.
4	Calibrated simulation	A simulation approach requires complex modelling of interacting, non-linear loads and processes, requiring an extensive range of measured input/output data and process parameters acquired on an ongoing basis. Due to a lack of input/output data and unknown process models and parameters, this is not a suitable option.

Source: Clean Energy Ministerial (2014:6)

The whole-facility measurement and verification option was selected and applied in this case. The savings determination boundary includes all energy savings from fossil fuels such as electricity, gas and coal, including interactive effects, but excludes the contribution of the renewable energy biomass component.

5.5.2. Baseline methodology

The baseline is represented by a simple linear regression model relating the total energy consumption from electricity, gas and coal, as the dependent variables, and the production of MDF and MFB), as the independent variables, for the baseline period.
The following baseline adjustments were applied to derive the adjusted baseline for the assessment period:

- *Routine baseline adjustments*: Baseline adjustments are made for changes in the monthly production of MDF and MFB.
- *Non-routine adjustments*: There are no foreseen non-routine adjustments for this project.

In order to quantify the pre- and post-implementation energy consumption of the whole facility within reasonable limits, the following data is required for the baseline period:

- Total electricity consumption measured in kWh, obtained from monthly electricity bills.
- Total gas consumption, measured in m^3, and associated CV, measured in MJ/kg, obtained from monthly gas bills.
- Monthly coal consumption, measured in kg, and associated CV.
- Monthly MDF and MFB production data, measured in metres squared (m^2).

5.5.3. Data collection to calculate the appropriate baseline period

Electricity consumption

Table 7 summarises the monthly electricity consumption data used for baseline development.

Table 7: Energy consumption data used for the baseline development

Month	Energy (kWh)	Energy (GWh)	Month	Energy (kWh)	Energy (GWh)
July 2012	2 533 473,75	2,53	September 2013	2 783 497,50	2,78
August 2012	2 919 382,50	2,92	October 2013	490 780,00	0,49
September 2012	2 864 103,75	2,86	November 2013	620 771,25	0,62
October 2012	2 628 387,50	2,63	December 2013	1 899 901,25	1,90
November 2012	2 442 397,50	2,44	January 2014	2 325 675,00	2,33
December 2012	2 714 482,50	2,71	February 2014	2 623 778,75	2,62
January 2013	2 147 252,50	2,15	March 2014	2 641 730,00	2,64
February 2013	2 129 068,75	2,13	April 2014	3 129 943,75	3,13
March 2013	2 422 607,50	2,42	May 2014	3 045 151,25	3,05
April 2013	2 765 065,00	2,77	June 2014	3 217 561,25	3,22
May 2013	2 709 771,25	2,71	July 2014	3 213 609,00	3,21
June 2013	2 910 355,00	2,91	August 2014	3 406 310,00	3,41
July 2013	2 747 738,75	2,75	September 2014	3 123 041,25	3,12
August 2013	2 805 676,25	2,81	October 2014	3 096 311,25	3,10

Source: Taxpayer electricity bills

Gas consumption

Table 8 summarises the monthly gas consumption data used for baseline development.

Table 8: Gas consumption data used for the baseline development

Month	Consumption (m^3)	Energy (GWh)	Month	Consumption (m^3)	Energy (GWh)
July 2012	13 785,00	0,15	September 2013	13 004,00	0,14
August 2012	18 476,00	0,20	October 2013	36 052,00	0,39
September 2012	268 176,00	2,92	November 2013	99 558,00	1,08
October 2012	90 133,00	0,98	December 2013	147 954,00	1,60
November 2012	31 978,00	0,35	January 2014	136 662,00	1,47
December 2012	10 629,00	0,12	February 2014	161 251,00	1,74
January 2013	49 081,00	0,53	March 2014	116 166,00	1,26
February 2013	58 540,00	0,64	April 2014	183 166,00	2,00

Month	Consumption (m^3)	Energy (GWh)	Month	Consumption (m^3)	Energy (GWh)
March 2013	119 022,00	1,32	May 2014	157 869,00	1,72
April 2013	88 417,00	0,98	June 2014	151 726,00	1,65
May 2013	44 247,00	0,49	July 2014	170 570,00	1,86
June 2013	98 112,00	1,08	August 2014	120 457,00	1,31
July 2013	124 682,00	1,36	September 2014	106 806,00	1,17
August 2013	41 416,00	0,45	October 2014	102 710,00	1,12

Source: Taxpayer gas bills

Coal consumption

Table 9 summarises the monthly coal consumption data used for baseline development.

Table 9: Coal consumption data used for baseline development

Month	Consumption (kg)	Calorific value (MJ/kg)	Energy (GWh)
July 2012	1 023 158,00	26,22	7,45
August 2012	1 179 010,00	26,22	8,59
September 2012	144 620,00	26,22	1,05
October 2012	779 930,00	26,22	5,68
November 2012	910 760,00	26,22	6,63
December 2012	668 490,00	26,22	4,87
January 2013	741 060,00	26,79	5,40
February 2013	672 460,00	26,79	4,90
March 2013	838 130,00	26,79	6,10
April 2013	1 129 730,00	26,79	8,23
May 2013	957 340,00	26,79	6,97
June 2013	915 554,71	26,79	6,67
July 2013	1 077 095,29	26,79	7,85
August 2013	1 207 910,00	26,79	8,80
September 2013	0,00	26,79	0,00
October 2013	26 820,00	26,79	0,20
November 2013	1 350 660,00	26,79	9,84
December 2013	1 083 134,00	26,79	7,89
January 2014	1 683 756,00	26,79	12,26
February 2014	1 040 620,00	26,79	7,58
March 2014	1 042 130,00	26,73	7,59
April 2014	876 940,00	26,73	6,39
May 2014	1 104 720,00	26,73	8,05
June 2014	1 089 440,00	26,73	7,94

Month	Consumption (kg)	Calorific value (MJ/kg)	Energy (GWh)
July 2014	1 176 290,00	26,73	8,57
August 2014	916 360,00	26,73	6,67
September 2014	1 001 650,00	26,73	7,30
October 2014	1 120 630,00	26,73	8,16

Source: Adapted from the taxpayer calculations of quantities of coal consumed

Biomass consumption

Table 10 summarises the monthly biomass consumption data used for baseline development.

Table 10: Biomass consumption data used for baseline development

Month	Consumption (m^3)	Density (kg/m^3)	Calorific value (MJ/kg)	Energy (GWh)
July 2012	306 885	950	17,99	3,85
August 2012	341 506	950	17,99	4,28
September 2012	299 795	950	17,99	3,76
October 2012	335 863	950	17,99	4,21
November 2012	377 486	950	17,99	4,74
December 2012	276 628	950	17,99	3,47
January 2013	302 970	950	17,99	3,80
February 2013	334 859	950	17,99	4,20
March 2013	373 949	950	17,99	4,69
April 2013	396 456	950	17,99	4,97
May 2013	431 168	950	17,99	5,41
June 2013	351 770	950	17,99	4,41
July 2013	380 438	950	17,99	4,77
August 2013	384 652	950	17,99	4,83
September 2013	71 328	950	17,99	0,89
October 2013	-	950	17,99	0,00
November 2013	256 731	950	17,99	3,22
December 2013	335 419	950	17,99	4,21
January 2014	491 001	950	17,99	6,16
February 2014	476 381	950	17,99	5,98
March 2014	689 993	950	17,99	8,66
April 2014	599 251	950	17,99	7,52
May 2014	735 365	950	17,99	9,23
June 2014	479 620	950	17,99	6,02
July 2014	782 473	950	17,99	9,82

Month	Consumption (m^3)	Density (kg/m^3)	Calorific value (MJ/kg)	Energy (GWh)
August 2014	659 473	950	17,99	8,27
September 2014	589 947	950	17,99	7,40

Source: Taxpayer reports of biomass consumption

Production data

This section presents the data used for modelling the production of the plant. The production figures include MDF and MFB. Table 11 summarises the production data used for baseline development.

Table 11: Production data used for baseline development

Month	MDF (m^2)	MFB (m^2)	Total board (m^2)
July 2012	296 708	0	296 708
August 2012	330 303	0	330 303
September 2012	289 540	0	289 540
October 2012	328 052	0	328 052
November 2012	367 094	5	367 099
December 2012	266 169	0	266 169
January 2013	297 905	104 187	402 092
February 2013	328 986	223 672	552 658
March 2013	364 673	224 823	589 496
April 2013	390 058	210 057	600 115
May 2013	424 233	188 878	613 111
June 2013	348 114	164 554	512 668
July 2013	370 100	260 977	631 077
August 2013	373 231	152 681	525 912
September 2013	71 328	225 563	296 891
October 2013	102 000	292 201	394 201
November 2013	255 836	256 634	512 470
December 2013	335 419	185 193	520 612
January 2014	491 001	220 048	711 049
February 2014	476 181	215 829	692 010
March 2014	689 993	258 537	948 530
April 2014	599 251	270 445	869 696
May 2014	735 365	243 298	978 663
June 2014	479 620	243 576	723 196
July 2014	782 473	197 490	979 963
August 2014	659 473	182 552	842 025

Month	MDF (m^2)	MFB (m^2)	Total board (m^2)
September 2014	589 947	202 349	792 296
October 2014	766 567	253 380	1 019 947

Source: Taxpayer production reports

Table 12 presents a summary of the monthly data used for baseline development.

Table 12: Summary of monthly data used for baseline development

Month	Energy consumption (GWh)				Board production (m^2)		
	Electricity	Gas	Coal	Total	MDF	MFB	Total
July 2012	2,53	0,15	7,45	10,14	296 708	0	296 708
August 2012	2,92	0,20	8,59	11,71	330 303	0	330 303
September 2012	2,86	2,92	1,05	6,84	289 540	0	289 540
October 2012	2,63	0,98	5,68	9,29	328 052	0	328 052
November 2012	2,44	0,35	6,63	9,42	367 094	5	367 099
December 2012	2,71	0,12	4,87	7,70	266 169	0	266 169
January 2013	2,15	0,53	5,40	8,07	297 905	104 187	402 092
February 2013	2,13	0,64	4,90	7,67	328 986	223 672	552 658
March 2013	2,42	1,32	6,10	9,84	364 673	224 823	589 496
April 2013	2,77	0,98	8,23	1197	390 058	210 057	600 115
May 2013	2,71	0,49	6,97	10,17	424 233	188 878	613 111
June 2013	2,91	1,08	6,67	10,66	348 114	164 554	512 668
July 2013	2,75	1,36	7,85	11,95	370 100	260 977	631 077
August 2013	2,81	0,45	8,80	12,06	373 231	152 681	525 912
September 2013	2,78	0,14	0,00	2,93	71 328	225 563	296 891
October 2013	0,49	0,39	0,20	1,08	102 000	292 201	394 201
November 2013	0,62	1,08	9,84	11,53	255 836	256 634	512 470
December 2013	1,90	1,60	7,89	11,38	335 419	185 193	520 612
January 2014	2,33	1,47	12,26	16,06	491 001	220 048	711 049
February 2014	2,62	1,74	7,58	11,94	476 181	215 829	692 010
March 2014	2,64	1,26	7,59	11,49	689 993	258 537	948 530
April 2014	3,13	2,00	6,39	11,52	599 251	270 445	869 696
May 2014	3,05	1,72	8,05	12,81	735 365	243 298	978 663
June 2014	3,22	1,65	7,94	12,81	479 620	243 576	723 196
July 2014	3,21	1,86	8,57	13,64	782 473	197 490	979 963
August 2014	3,41	1,31	6,67	11,39	659 473	182 552	842 025
September 2014	3,12	1,17	7,30	11,59	589 947	202 349	792 296
October 2014	3,10	1,12	8,16	12,38	766 567	253 380	1 019 947

Source: Taxpayer energy information from electricity bills, gas bills and calculated coal consumption. Production data is obtained from the taxpayer's production records.

5.5.4. Uncertainty in calculating the energy saving

Uncertainty in savings assessments is addressed by biasing reported savings towards conservative reporting, which implies that the actual savings are equal to or exceed reported savings (Clean Energy Ministerial, 2014:4). This is achieved by ensuring that all M&V activities that affect savings assessments, including baseline characterisation, baseline adjustments and savings calculations, are performed in a manner that ensures conservative savings assessments (Clean Energy Ministerial, 2014:4). In practice, this principle implies that the interpretation of metering equipment accuracy, the choice of sample sizes, the energy consumption models adopted and the baseline adjustments used must support conservative savings estimates.

Multiple baseline models are considered with a view to derive the most appropriate model while adhering to the principle of conservative savings reporting. These models represent permutations of the following parameters:

- *Independent variables*: Various independent variables are considered, namely, production figures of MDF only and the combined production figures of MDF and MFB.
- *Baseline period*: Various baseline periods are considered. These differ with regard to the alignment of the baseline period with the financial year of the taxpayer.

This case study includes a scenario where the baseline period is aligned with the financial year of the taxpayer. Two cases are considered, namely: periods representative of the production of both MDF and MFB for all months, and periods representative of only MDF for some months and both MDF and MFB for some months.

The case study also considers baseline periods not aligned with the financial year of the client. Two cases are considered, namely: periods representative of the production of both MDF and MFB for all months, and periods representative of only MDF for some months and both MDF and MFB for some months.

Table 13 summarises the characteristics of these models.

Table 13: Summary of baseline models considered

Model	Description	Baseline period	Financial year	MDF or total production
A_1	This baseline model is based on non-renewable energy consumption and MDF production data for the entire 2013 financial year. A linear regression model relating to non-renewable energy consumption versus MDF production is used. Baseline adjustments are performed for MDF production only.	2012/07/01 to 2013/06/30	Full	MDF only
A_2	This baseline model is based on non-renewable energy consumption and MDF production data for the second half of the 2013 financial year. A linear regression model relating to non-renewable energy consumption versus MDF is used. Baseline adjustments are performed for MDF production only.	2013/01/01 to 2013/06/30	Half	MDF only
B_1	The same baseline period and methodology as for model A1 applies, but the baseline model is based on non-renewable energy consumption and total board production data. Baseline adjustments are performed for total board production.	2012/07/01 to 2013/06/30	Full	Total production
B_2	The same baseline period and methodology as for model A2 applies, but the baseline model is based on non-renewable energy consumption and total board production data. Baseline adjustments are performed for total board production.	2013/01/01 to 2013/06/30	Half	Total production

Source: Adapted from taxpayer energy information and Clean Energy Ministerial (2014:6)

The accuracy of the baseline regression models is evaluated using the following standard statistical criteria:

- *The coefficient of determination (R^2)*: The coefficient of determination is a statistical measure of "how close the data is to the regression line. The higher the coefficient of determination percentage, the more closely the model explains the variability of the response data around the mean. (Stat Trek, 2015a).
- *Standard error*: The standard error represents the square root of the variance of the sampling distribution of a statistic. The standard error measures how accurately the

sample represents the population of data. The smaller the standard error, the more representative the sample will be of the overall population (OECD, 2007).

- *Model confidence*: The confidence level of a model refers to “the percentage of all possible samples that can be expected to include the true population parameter” (Stat Trek, 2015b). The general recommendation when measuring energy performance improvement is for the accuracy deviation to be no more than 7,5%, with at least 80% confidence (Clean Energy Ministerial, 2014:11).

Consideration of various baseline methods

The tables below provide the results of the adjusted baseline calculations for each assessment model.

Model A_1: Assessment

Table 14: Model A_1: Calculation of adjusted baseline figures

Month	Total non-renewable energy (GWh)	MDF production (m^2)	Adjusted baseline calculation ($y = mx + c$)
July 2012	10,14	296 708	8,61
August 2012	11,71	330 303	9,33
September 2012	6,84	289 540	8,45
October 2012	9,29	328 052	9,29
November 2012	9,42	367 094	10,13
December 2012	7,70	266 169	7,94
January 2013	8,07	297 905	8,63
February 2013	7,67	328 986	9,31
March 2013	9,84	364 673	10,08
April 2013	11,97	390 058	10,63
May 2013	10,17	424 233	11,37
June 2013	10,66	348 114	9,72

Source: Adapted from taxpayer consumption bills and reports

Adjusted baseline calculation

The calculation of the adjusted baseline is represented by a simple regression analysis calculation, denoted by the equation $y = mx + c$. Regression analysis is a statistical process for forecasting change in a dependent variable (denoted by y) on the basis of change of one or more independent variables (denoted by *x*). The *m* depicts the gradient of the line of the equation and *c* depicts the *y*-intercept (Business Dictionary, 2016b).

By using the regression analysis function (slope) in Microsoft® Excel, the following values are calculated:

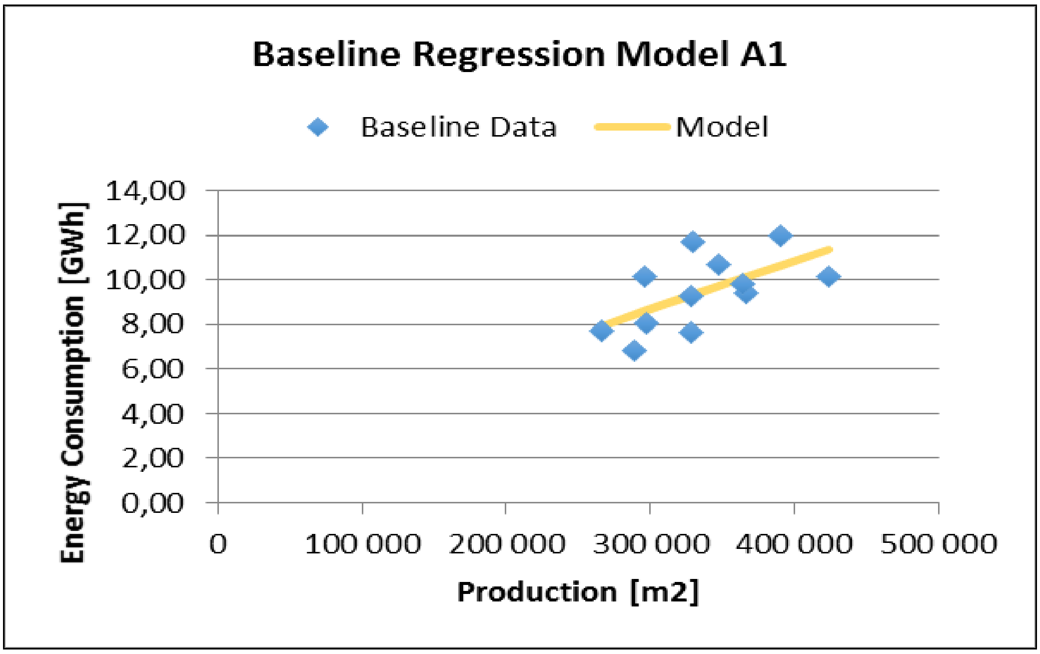
m = 0,0000216942460805204

c = 2,1684230183372

The following statistical figures are calculated using Microsoft® Excel and the dataset above:

Model	**R^2**	**Standard error**	**Confidence**
A_1	0,37	1,35	80%

Figure 3: Baseline regression for Model A_1



Model A_2: Assessment

Table 15: Model A_2: Calculation of adjusted baseline figures

Month	Total non-renewable energy (GWh)	MDF production (m^2)	Adjusted baseline calculation ($y = mx + c$)
January 2013	8,07	297 905	8,19
February 2013	7,67	328 986	8,97
March 2013	9,84	364 673	9,87
April 2013	11,97	390 058	10,51
May 2013	10,17	424 233	11,38
June 2013	10,66	348 114	9,46

Source: Adapted from taxpayer consumption bills and reports

Adjusted baseline calculation: $y = mx + c$

By using the regression analysis function (slope) on Microsoft® Excel , the following values are calculated:

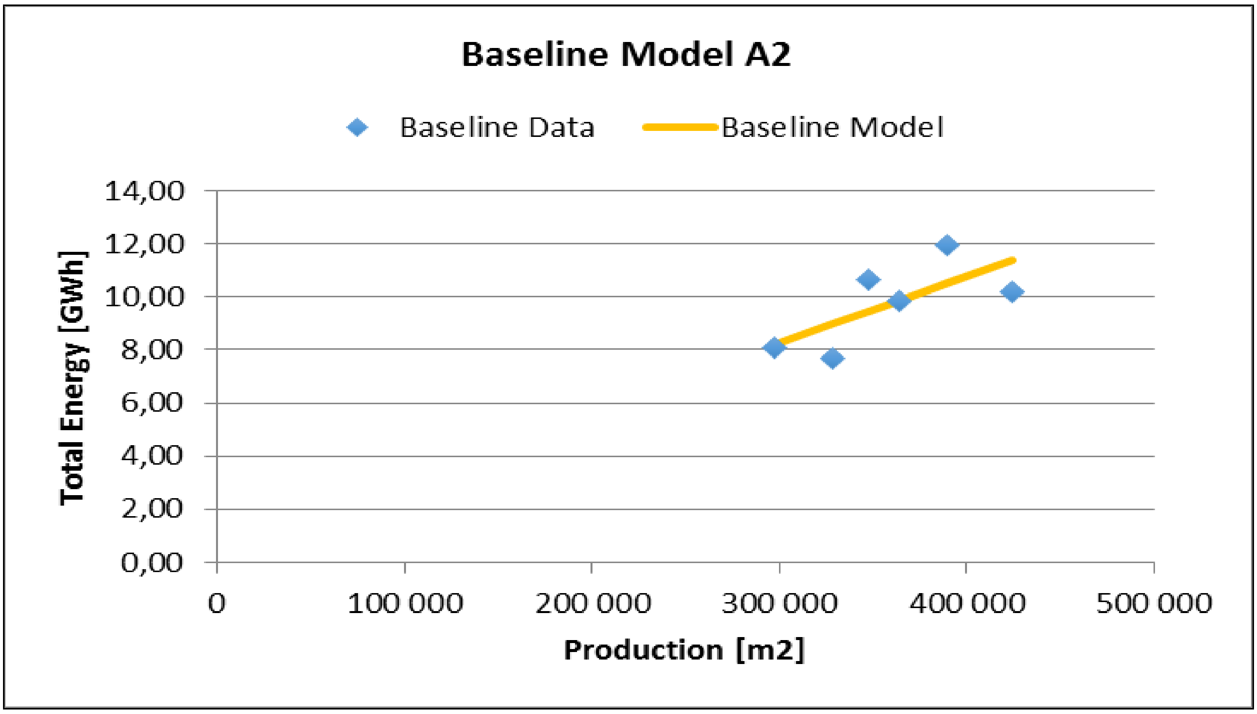
m = 0,0000252079303473328

c = 0,681683674288578

The following statistical figures are calculated using Microsoft® Excel and the dataset above:

Model	R^2	Standard error	Confidence
A_2	0,49	1,30	80%

Figure 4: Baseline regression for Model A_2



Model B_1: Assessment

Table 16: Model B_1: Calculation of adjusted baseline figures

Month	Total non-renewable energy (GWh)	Total production (MFB and MDF)	Adjusted baseline calculation (*y* = *mx* + *c*)
July 2012	10,14	296 708	8,86
August 2012	11,71	330 303	9,01
September 2012	6,84	289 540	8,83
October 2012	9,29	328 052	9,00
November 2012	9,42	367 099	9,18
December 2012	7,70	266 169	8,72
January 2013	8,07	402 092	9,34
February 2013	7,67	552 658	10,02
March 2013	9,84	589 496	10,18
April 2013	11,97	600 115	10,23

Month	Total non-renewable energy (GWh)	Total production (MFB and MDF)	Adjusted baseline calculation ($y = mx + c$)
May 2013	10,17	613 111	10,29
June 2013	10,66	512 668	9,83

Source: Adapted from taxpayer consumption bills and reports

Adjusted baseline calculation: $y = mx + c$

By using the regression analysis function (slope) on Microsoft® Excel, the following values are calculated:

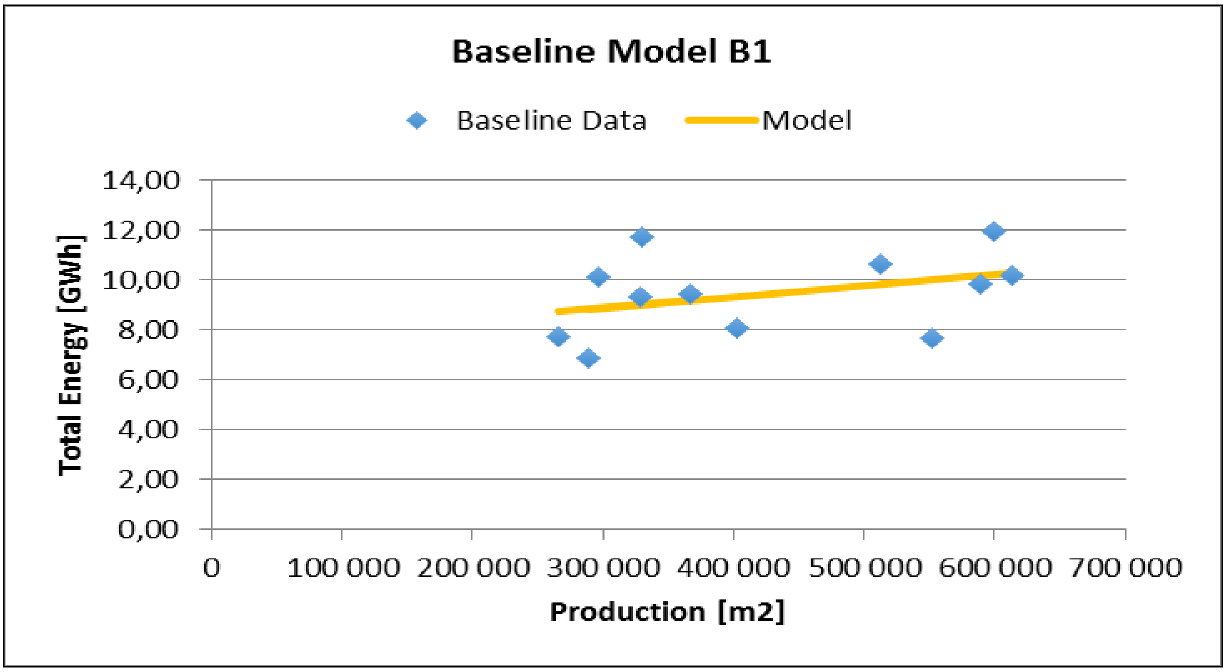
m = 0,0000450942365515359

c = 7,52284452380919

The following statistical figures are calculated using Microsoft® Excel and the dataset above:

Model	R^2	Standard error	Confidence
B_1	0,14	1,58	75%

Figure 5: Baseline regression for model B_1



Model B_2: Assessment

Table 17: Model B_2: Calculation of adjusted baseline figures

Month	Total non-renewable energy (GWh)	Total production (MFB and MDF)	Adjusted baseline calculation ($y = mx + c$)
January 2013	8,07	402 092	8,13
February 2013	7,67	552 658	9,82
March 2013	9,84	589 496	10,23
April 2013	11,97	600 115	10,35
May 2013	10,17	613 111	10,49
June 2013	10,66	512 668	9,37

Source: Adapted from taxpayer consumption bills and reports

Adjusted baseline calculation: $y = mx + c$

By using the regression analysis function (slope) on Microsoft® Excel, the following values are calculated:

m = 0,0000112153447678821

c = 3,61857583813394

The following statistical figures are calculated using Microsoft® Excel and the dataset above:

Model	R^2	Std Err	Confidence
B_2	0,30	1,52	70%

Figure 6: Baseline regression of Model B_2

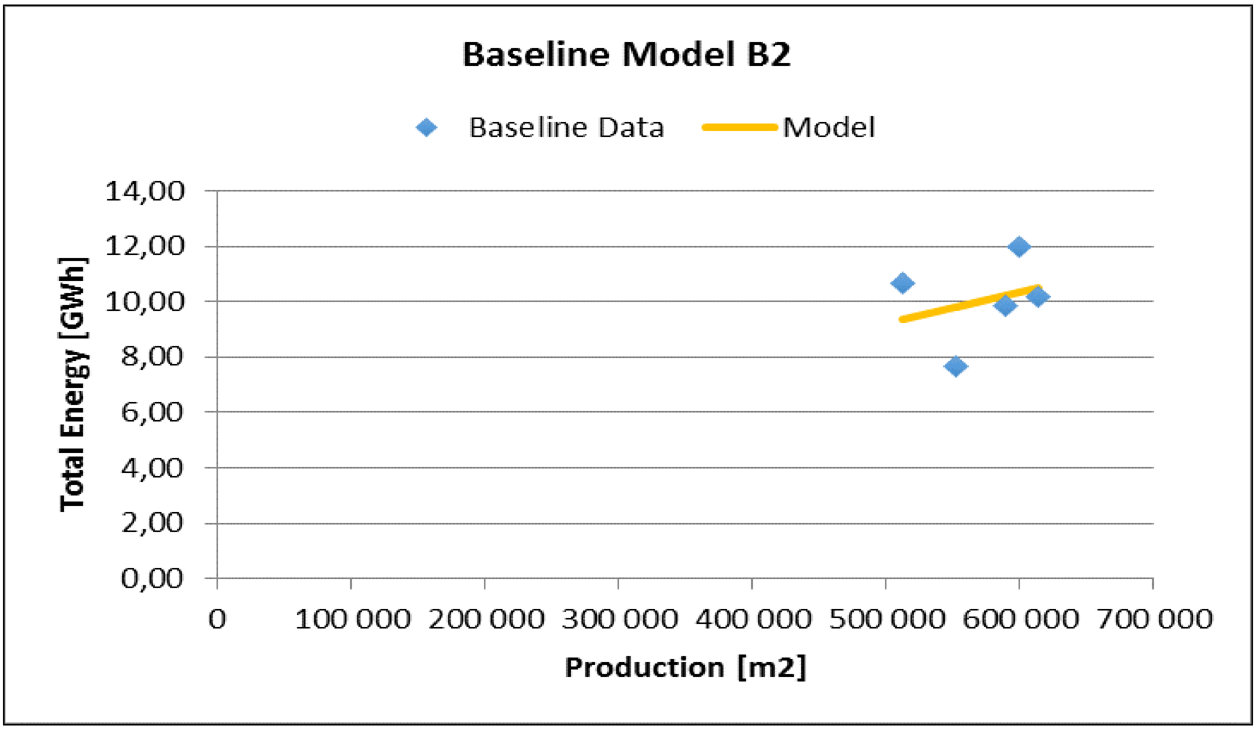


Table 18 shows the statistical indicators as well as model confidence and standard error values for the baseline models. These figures were calculated using the regression analysis function in Microsoft® Excel.

Table 18: Statistical indicators for the baseline models considered

Model	Baseline calculation	Model parameters	R^2	Standard error	Confidence
A_1	$y = mx + c$	m = 2,17-05 c = 2,17	0,37	1,35	80%
A_2	$y = mx + c$	m = 2,52E-05 c = 0,682	0,49	1,30	80%
B_1	$y = mx + c$	m = 4,51E-06 c = 7,52	0,14	1,58	75%
B_2	$y = mx + c$	m = 1,12E-05 c = 3,62	0,30	1,52	70%

Source: Summary of statistical information

The following aspects are considered in selecting the final baseline model:

- Models A_1 and A_2 represent baseline periods that include periods where no MFB was produced. Models B_1 and B_2 represent baseline periods where production included both MDF and MFB.
- Models A_1 and A_2 relate non-renewable energy consumption to the production figures for MDF while models B_1 and B_2 relate non-renewable energy consumption to the production figures for both MDF and MFB.
- Past energy consumption data measured against production figures showed that the production of MDF is much more energy-intensive than the production of MFB, implying a weak relationship between the production of MFB and energy consumption. The principle of conservative savings reporting dictates that the production of MDF rather than total board production must be used for baseline adjustments. This favours the model set consisting of A_1 and A_2.
- Considering the above aspects, only model A_2 is left for consideration. The statistical indicators for the various baseline models show that model A_2 has the best R^2 (closest to one) score, with the lowest standard error, at a confidence level of 80%. As there are currently no requirements set for uncertainty and confidence levels related to calculations performed under section 12L of the ITA, the statistical indicator is the primary consideration for choosing the best model.

Based on the above arguments, baseline model A_2 is proposed as the final baseline model.

5.6 CALCULATION OF ENERGY SAVINGS

In order to calculate the taxpayer's energy efficiency percentage, actual non-renewable energy consumption (in GWh) is compared with adjusted-baseline non-renewable energy consumption (in GWh). The difference between these two amounts represents the taxpayer's energy savings potential.

The following equation represents energy savings:

$$E\ saving = Total\ energy\ consumed - E_B$$

The adjusted monthly consumption of non-renewable energy baseline E_B is calculated using the following linear regression relationship, with monthly production of MDF as the independent variable:

$$E_B = mP_{MDF} + c$$

where:

- P_{MDF} denotes the monthly production of MDF (m^2);
- $m = 2{,}17 \times 10^{-5}$ GWh/m^2; and
- $c = 2{,}17$ GWh

These figures were obtained from model A_2.

5.7 DATA REQUIREMENTS

The following data is required to quantify the post-implementation energy consumption of the production plant using the whole-facility option, within reasonable limits:

- Monthly electricity bills representing the total electricity consumption of the plant, measured in kWh.
- Monthly gas bills representing the total gas consumption of the plant, measured in m^3, and the associated calorific values, measured in MJ/kg.
- Monthly coal consumption of the plant, measured in kg, and the associated calorific values.
- Monthly MDF and MFB production data, measured in m^2.

Electricity consumption

Table 19 summarises the monthly electricity consumption figures obtained from utility bills for the assessment period.

Table 19: Monthly and total electricity consumption for the assessment period

Month	Electricity consumption (GWh)
July 2013	2,75
August 2013	2,81
September 2013	2,78

Month	Electricity consumption
October 2013	0,49
November 2013	0,62
December 2013	1,90
January 2014	2,33
February 2014	2,62
March 2014	2,64
April 2014	3,13
May 2014	3,05
June 2014	3,22
Total:	**28,34**

Source: Taxpayer monthly electricity bills

Natural gas consumption

Table 20 summarises the monthly natural gas consumption and energy content figures obtained from utility bills for the assessment period.

Table 20: Monthly and total gas consumption for the assessment period

Month	Gas consumption (m^3)	Energy content (GJ/m^3)	Energy (GWh)
July 2013	124 682	0,04	1,36
August 2013	41 416	0,04	0,45
September 2013	13 004	0,04	0,14
October 2013	36 052	0,04	0,39
November 2013	99 558	0,04	1,08
December 2013	147 954	0,04	1,60
January 2014	136 662	0,04	1,47
February 2014	161 251	0,04	1,74
March 2014	116 166	0,04	1,26
April 2014	183 166	0,04	2,00
May 2014	157 869	0,04	1,72
June 2014	151 726	0,04	1,65
Total:	**1 369 506**		**14,86**

Source: Taxpayer monthly gas bills

Coal consumption

Table 21 summarises the monthly coal consumption and CV figures obtained from coal delivery documentation, stockpile surveys and laboratory analysis reports for the assessment period.

Table 21: Monthly and total coal consumption for the assessment period

Month	Coal consumption (kg)	Calorific value (MJ/kg)	Energy (GWh)
July 2013	1 077 095,29	26,79	7,85
August 2013	1 207 910,00	26,79	8,80
September 2013	0,00	26,79	0,00
October 2013	26 820,00	26,79	0,20
November 2013	1 350 660,00	26,79	9,84
December 2013	1 083 134,00	26,73	7,89
January 2014	1 683 756,00	26,73	12,26
February 2014	1 040 620,00	26,73	7,58
March 2014	1 042 130,00	26,73	7,59
April 2014	876 940,00	26,73	6,39
May 2014	1 104 720,00	26,73	8,05
June 2014	1 089 440,00	26,73	7,94
Total:	**11 583 225,29**		**84,39**

Source: Taxpayer calculations of coal consumption

Table 22 represents the total non-renewable energy consumed by summing the three types of energy consumed: electricity, natural gas and coal.

Table 22: Total non-renewable energy consumption for the assessment period

Month	Actual non-renewable energy consumption (GWH)
July 2013	11,95
August 2013	12,06
September 2013	2,93
October 2013	1,08
November 2013	11,53
December 2013	11,38
January 2014	16,06
February 2014	11,94
March 2014	11,49
April 2014	11,52
May 2014	12,81
June 2014	12,81

Source: Taxpayer production data

Independent variable data: production data

Table 23 summarises the MDF production figures obtained from the automated production logging system for the assessment period. This data is the actual data for the independent variable, MDF production, for the assessment period.

Table 23: Monthly and total MDF production data for the assessment period

Month	MDF production (m^2)
July 2013	370 100
August 2013	373 231
September 2013	71 328
October 2013	0
November 2013	255 836
December 2013	335 419
January 2014	491 001
February 2014	476 181
March 2014	689 993
April 2014	599 251
May 2014	735 365
June 2014	479 620
Total:	**4 877 325**

Source: Taxpayer production data

Calculation of the adjusted baseline non-renewable energy consumption

Table 24 provides the data used to calculate the adjusted baseline for non-renewable energy consumption.

Table 24: Adjusted baseline non-renewable energy consumption

Month	Independent variable	Adjusted baseline non-renewable energy consumption (GWh)
	MDF production (m^2)	
July 2013	370 100	10,01
August 2013	373 231	10,09
September 2013	71 328	2,48
October 2013	0	0,68
November 2013	255 836	7,13
December 2013	335 419	9,14
January 2014	491 001	13,06
February 2014	476 181	12,69
March 2014	689 993	18,07

Month	Independent variable	Adjusted baseline non-renewable energy consumption (GWh)
	MDF production (m^2)	
April 2014	599 251	15,79
May 2014	735 365	19,22
June 2014	479 620	12,77

Table 25: Calculation of the energy saving in respect of model A_2

Month	Adjusted baseline non-renewable energy consumption (GWh)	Actual non-renewable energy consumption (GWh)	Non-renewable energy consumption impact (GWh)
July 2013	10,01	11,95	-1,94
August 2013	10,09	12,06	-1,97
September 2013	2,48	2,93	-0,45
October 2013	0,68	1,08	-0,40
November 2013	7,13	11,53	-4,40
December 2013	9,14	11,38	-2,25
January 2014	13,06	16,06	-3,00
February 2014	12,69	11,94	0,75
March 2014	18,07	11,49	6,59
April 2014	15,79	11,52	4,27
May 2014	19,22	12,81	6,41
June 2014	12,77	12,81	-0,04
Total:	**131,13**	**127,55**	**3,57**

Based on this calculation, the taxpayer has saved 3,57 GWh of energy, which results in an energy-saving tax incentive of R1 608 116 (using a saving of R0,45 per kilowatt-hour).

5.8 DISCUSSION AND CONCLUSION OF FINDINGS

As a result of performing the section 12L energy efficiency tax incentive calculation, the following points warrant discussion.

5.8.1. Model selected to calculate the adjusted energy consumption baseline

The section 12L energy-savings amount will vary based on which model is selected as the adjusted baseline for the period. There are currently no requirements set for model precision and confidence levels related to calculation performed in terms of section 12L of the ITA. However, in terms of the M&V standards applied, the taxpayer was required to be conservative when performing the calculation. In this case, the energy-saving amount would have been different should a different model have been selected by the taxpayer.

5.8.2. Period selected as the year of assessment

The energy efficiency saving will also change based on the period used for the calculation of the baseline and the period for which the energy saving is calculated.

Baseline period

Currently, Regulation 6, of the Regulations in terms of Section 12L of the ITA, refers to the baseline period as a year of assessment and states that the adjusted baseline value should be updated after each year of assessment. In terms of section 1 of the ITA, "year of assessment" is defined as any year or other period in respect of which any tax or duty is chargeable and, in respect of companies, represents the financial year of the company (Income Tax Act, 2015).

However, there is no predetermined period for the reporting measurement period (baseline period) (SANEDI, 2014a:8). The reporting measurement period should have at least one normal operating cycle of the facility, which should be determined by the M&V professional (SANEDI, 2014a:8). In this case, SANEDI has approved the baseline period as six months, being from 1 January 2013 to 30 June 2013, as reflected in model A_2.

Period over which the energy saving calculation is performed

The energy saving was calculated for the full financial year, running from 1 July 2013 to 30 June 2014.

If an energy-saving project is implemented during a taxpayer's financial year rather than at the beginning of the financial year, this may result in the taxpayer being able to claim the energy saving using the original adjusted baseline for the remaining period of that financial year only, whereafter the taxpayer is required to adjust their adjusted energy consumption baseline amount. It is doubtful that this outcome was the intention of the regulation, as, if the taxpayer is to calculate energy savings strictly according to the wording of the regulation, the regulation would not be sensitive to the timing of the implementation of an energy-saving project, which will result in the taxpayer "losing out" on energy savings if a project is not implemented at the beginning of the taxpayer's financial year.

5.8.3. Exclusion of renewable energy sources from the energy saving calculation

In this case, had the biomass energy been included in the adjusted energy consumption baseline amount as well as in the energy-saving calculation, the total energy saving would have been R1 970 159, as opposed to the calculated energy saving of R1 608 116, in terms of model A_2, resulting in an additional saving of R362 044.

This calculation is performed below:

Table 26: Calculation of the adjusted baseline, using total energy consumption figures

Month	Total energy (GWh)	MDF production (m^2)	Adjusted baseline calculation (*y* = *mx* + *c*)
January 2013	11,88	297 905	12,00
February 2013	11,87	328 986	13,18
March 2013	14,54	364 673	14,53
April 2013	16,95	390 058	15,50
May 2013	15,58	424 233	16,79
June 2013	15,07	348 114	13,90

Adjusted baseline calculation: $y = mx + c$

By using the regression analysis function (slope) in Microsoft® Excel, the following values are calculated:

m = 0,0000379789685723662

c = 0,681683674288687

Table 27: Calculated energy savings using total energy consumption figures

Month	Adjusted baseline non-renewable energy consumption (GWh)	Actual non-renewable energy consumption (GWh)	Non-renewable energy consumption impact (GWh)
July 2013	14,74	16,72	-1,99
August 2013	14,86	16,88	-2,03

Month	Adjusted baseline non-renewable energy consumption (GWh)	Actual non-renewable energy consumption (GWh)	Non-renewable energy consumption impact (GWh)
September 2013	3,39	3,82	-0,43
October 2013	0,68	1,08	-0,40
November 2013	10,40	14,76	-4,36
December 2013	13,42	15,59	-2,17
January 2014	19,33	22,22	-2,89
February 2014	18,77	17,92	0,85
March 2014	26,89	20,15	6,74
April 2014	23,44	19,04	4,40
May 2014	28,61	22,04	6,57
June 2014	18,90	18,82	0,07
Total:	**131,13**	**127,55**	**4,38**

Therefore, the total energy saving when calculating the energy saving with reference to total energy consumption, including biomass energy, is 4,38 GWh and R1 970 159.

The exclusion of non-renewable energy may result in a less realistic energy-saving amount, and may at times prejudice the taxpayer.

5.9 CONCLUSION

The calculations involved in assessing an energy-saving tax deduction may be complex. As highlighted in the case study, it can be concluded that although there is a standard governing the application of this tax incentive (SANS 50 010), there are still areas that require professional judgement, and the need to engage the services of a measurement and verification expert must be considered. All taxpayers wishing to implement this saving should weigh up the costs and benefits involved.

This case study is an example of a section 12L energy efficiency tax saving calculation that was submitted and approved. Each taxpayer’s case should be evaluated on an individual basis and professional judgement applied when calculating the energy-saving deduction.

CHAPTER 6:
CONCLUSION

6.1 INTRODUCTION

Populations are rapidly expanding, especially in developing countries, and the need for energy stability to maintain the current growth is essential (Asif & Muneer, 2007:1391; Musango *et al.*, 2011:124).

This study has provided a comprehensive analysis and comparison of energy tax incentives available in South Africa that encourage taxpayers to focus on energy efficiency and energy conservation as well as moving to environmentally sustainable technologies through the use of renewable energy.

6.2 SUMMARY OF THE CONTRIBUTIONS OF THE STUDY

This study contributes to the literature on tax incentives and addresses the effectiveness of tax incentives in general. It was concluded that no consensus has been reached on whether the implementation of tax incentives is beneficial and should be included as part of government policy. Governments should reconsider whether the tax incentives offered are, in fact, effective, and not merely a factor investors do not consider to be key (Klemm, 2010:318; James & van Parys, 2010:401).

This study also contributes to the literature on energy tax incentives, highlighting the advantages, disadvantages and challenges associated with using different sources of energy. The literature established that the use of fossil fuels is no longer a viable option, concluding that renewable energy is the way of the future while considering the controversial issues associated with nuclear energy. This study also highlights the barriers for taxpayers wishing to invest in renewable energy resources, listing natural resource availability and the initial upfront costs involved as the major barriers (Pegels, 2010:4948; Musango *et al.*, 2011:129-130). South African taxpayers wishing to participate in the conservation of energy or conversion to renewable energy sources may benefit from this study by referring to the analysis of available tax incentives and government grants, detailed in Chapter 4.

Finally, the worked case study of the section 12L application provides a practical example of how a taxpayer should calculate a section 12L energy efficiency tax incentive. There is complexity and professional judgement involved in performing these calculations, as the calculations are normally performed by an M&V specialist. The case study provides the reader with an explanation of the calculations involved and the steps to follow when performing a calculation in terms of section 12L. Shortcomings and anomalies relating to the practical interpretation of how to calculate the adjusted energy consumption baseline are discussed. The regulator for the section 12L calculation, SANEDI, could also benefit from this study, as this study highlights certain issues and anomalies.

6.3 LIMITATIONS OF THE PRESENT RESEARCH

This research assignment addresses the energy efficiency and renewable energy tax incentives currently available to taxpayers operating in South Africa and does not make reference to any incentives available to taxpayers residing in other countries.

The study also elaborates only on the barriers to implementing renewable energy solutions and does not address nuclear energy options.

The case study performed addresses only the practical application and calculation of the section 12L energy efficiency tax incentive. This calculation does not result in a universally applicable formula and may not be relevant to all taxpayers, as each taxpayer’s business is unique, even though they may be operating in the same country. The calculation of the section 12L incentive also requires professional judgement to be exercised with regard to choosing the baseline model; consequently, each taxpayer may require a unique baseline model.

6.4 FUTURE RESEARCH

Based on the literature review performed in Chapter 2, it was concluded that authors have not reached a consensus on whether or not tax incentives are beneficial and effective in encouraging taxpayer and investor behaviour. Further research should be conducted in order to reach such a conclusion.

The focus of this study was to identify and analyse energy tax incentives available to taxpayers in South Africa. This study also focused solely on the practical application of the section 12L energy efficiency tax incentive. Future research could include a comparison of the energy tax incentives available in South Africa with those available in other developing countries, with recommendations for improving South African tax policy. Further research could also include detailed worked examples of other energy tax incentives in South Africa, as this study was limited to section 12L of the ITA.

The literature does not include many articles on nuclear energy. As the South African government has concluded a nuclear-energy deal with Russia, further research should be conducted to adress the safety and operational requirements of nuclear power plants (Asif & Muneer, 2007:1395-1396; Greenpeace, 2016). The South African public should also be educated about the potential health risks associated with residing near a power plant. There are differing opinions as to the risks related to nuclear energy, and further research in this regard is of great importance.

As the proposed carbon tax is new to the South African economy, there is little research regarding whether the tax is, in fact, beneficial in the long term. Future research could include discussions of the effects of the carbon tax as well as taxpayers' reactions to and compliance with this new tax.

6.5 CONCLUDING REMARKS

Given the global concern about the effects of climate change, this study is topical and relevant to current efforts to promote energy efficiency and the use of "clean" energy. In this context, this study provides useful insights into renewable energy, including a discussion of the potential barriers to the implementation of renewable energy in South Africa. Taxpayers should take active steps towards finding sustainable solutions to the global energy crisis and participate in the tax incentives currently available.

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