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South African National Energy Development Institute

Strategic Plan 2012/13 – 2016/17

FINAL

Version 9 (FINAL)

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This strategic plan describes the South African National Energy Development Institute (SANEDI)'s mandate, strategic context, objectives, key performance areas and corresponding priority initiatives, and implementation approach that have been developed in support of the country's most imperative energy development needs.

Foreword

The Strategic Plan articulates SANEDI's Vision, Mission, Core Values and Strategic Outcome Orientated Goals; and also describes the six programmes that have been defined to support SANEDI's mandate as energy development institute and for considerably enhanced service delivery over the planning horizon.

The next five years will be pivotal for SANEDI as it seeks to provide essential energy development support at a critical juncture in the global and local energy arena. This is SANEDI's opportunity to establish itself as a pillar of support and important partner to government, to leverage existing activities and opportunities and to create new avenues that will address the evolving needs of the South African energy community. This Strategic Plan is intended to provide SANEDI with a solid foundation for moving forward.

During the period of this plan, SANEDI will focus its attention on:

- Essential applied energy research that is responsive and sensitive to national priorities and the rapidly developing energy environment, and building stronger linkages with local/national and international institutions that offer academic excellence, academic collaboration and funding contributions.
- Collection and consolidation of energy data specific to SANEDI's areas of activity that can feed into the DOE's extensive energy data and information management initiative and can also provide support and stimulus for industry activities and serve its information needs.
- Intensifying the focus on low energy and carbon innovation, i.e. accelerating and facilitating the progress of research projects through demonstration and pilot phases to where these solutions can tangibly transform the South African energy industry and economy.
- Support the development of research and green industry capacity with a view to producing suitable manpower and stimulating economic activity that supports sustainable development.
- Hosting the working for energy programme, which puts clean energy solutions and sustainable development into practice, demonstrates replicable applications and improves the quality of lives in poor and/or rural communicates.
- Pursuing a resource efficient society.

Implementation of the plan and the delivery of a coherent energy development service to government and industry will require that SANEDI continue to develop and explore ways to partner with other agencies and organisations, both public and private.

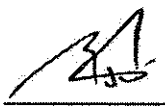
The current draft plan emerges from a thorough process of discussion and review within SANEDI, but also reflects initial discussions with key stakeholders and, importantly, inputs and direction taken from the national Department of Energy (DOE). Their wisdom, advice, and judgment, together with documented national policy direction, serve as the

basis for this strategic endeavour. **SANEDI endeavour to pursue these discussions before finalising the plan to ensure that SANEDI delivers a valuable contribution to the DOE and the South African government and public.**

I wish to emphasize that the Strategic Plan is a statement of intent, the first step in a long and creative endeavour to develop and grow the contribution of SANEDI.

I encourage stakeholders and role players to embrace this plan, but also to engage with SANEDI to continue to refine and evolve SANEDI's contribution to be responsive to the most pressing energy challenges and priorities.

As executive authority, I commit SANEDI to executing the plan and delivering the goals and objectives described, subject to the availability of funding.



Ms Rosette Nothemba Mlonzi
Chairperson of the SANEDI Board
Executive Authority of SANEDI

Official sign-off

It is hereby certified that this Strategic Plan:

Was developed by the management of SANEDI under the guidance of the Department of Energy.

Takes into account all the relevant policies, legislation and other mandates for which SANEDI is responsible.

Accurately reflects the strategic outcome oriented goals and objectives which SANEDI will endeavour to achieve over the period 2012 – 2017.

[Fill in name]
Chief Financial Officer

Signature: _____

Dr Minnesh Bipath
Head Official responsible for Planning

Signature: _____

Mr Kadri Nassiep
Accounting Officer

Signature: _____

Approved by:

Ms Rosette Nothemba Mlonzi
Chairperson of the SANEDI Board
Executive Authority

Signature: _____

Table of Contents

1. Executive Summary 9
2. Vision 14
3. Mission 14
4. Values 14
5. Legislative and other mandates 15
5.1. Constitutional mandates 15
5.2. Legislative mandates 16
5.3. Policy mandates 18
6. Situational analysis 21
6.1. Performance environment 22
6.2. Organisational environment 24
6.3. Description of the strategic planning process 28
7. Strategic outcome oriented goals of the institution 29
8. Critical Success Factors 36
8.1. Funding 36
8.2. Skills and capacity 37
8.3. Execution capacity 37
8.4. Policy environment and governance structures 37
9. Programme 1: Applied Energy Research Programme 40
9.1. Strategic objectives 42
9.2. Resource considerations 45
9.3. Risk management 47
10. Programme 2: Data and Knowledge Management Programme 48
10.1. Strategic objectives 49
10.2. Resource considerations 50
10.3. Risk management 50
11. Programme 3: Low energy and carbon intensity technology development, demonstration and commercialisation programme 52
11.1. Strategic objectives 52
11.2. Resource considerations 53

11.3. Risk management 53
12. Programme 4: Green industry capacity building and development programme 55
12.1. Strategic objectives 55
12.2. Resource considerations 56
12.3. Risk management 57
13. Programme 5: Working for Energy Programme 58
13.1. Strategic objectives 58
13.2. Resource considerations 59
13.3. Risk management 59
14. Programme 6: Energy efficiency programme 60
14.1. Strategic objectives 60
14.2. Resource considerations 63
14.3. Risk management 63
15. Links to the long-term infrastructure and other capital plans 65
16. Public-private partnerships and donor funding 65
17. Appendix A: Technical Indicator Descriptions for Strategic Outcomes 66
17.1. Applied Research Programme: Technical Indicator Descriptions 66
17.2. Data and Knowledge Management Programme: Technical Indicator Descriptions 70
17.3. Innovation Cultivation Programme: Technical Indicator Descriptions 73
17.4. Green Industry Programme: Technical Indicator Descriptions 74
17.5. Working for Energy Programme: Technical Indicator Descriptions 77
17.6. Energy Efficiency Programme: Technical Indicator Descriptions 79
18. Appendix B: Policy Context 84
19. Appendix C: An overview of the current energy research environment 89
19.1. Role of Department of Science and Technology (DST) 89
19.2. Role of Technology Innovation Agency (TIA) 89
19.3. Role of National Research Foundation (NRF) 90
19.4. Role of Universities in undertaking Energy Research 90
19.5. Role of Eskom Research 90
19.6. CSIR 91
20. Appendix D: Annual Budget Breakdown 92

20.1. SANEDI Operating Scenario 1: Rapid transition of SANEDI into independent entity with parallel programme implementation from 2012/13 92

20.2. SANEDI Operating Scenario 2: Focused establishment and continuation of skeleton functions in 2012/13 93

20.3. SANEDI Operating Scenario 3: Gradual transition into independent entity in parallel with programme implementation over time 94

20.4. SANEDI Operating Scenario 4: SANEDI in survival mode 95

21. Appendix E: SANEDI Matrix Structure (populated) 96

1. Executive Summary

The National Energy Act, 2008 (No 34 of 2008) provides for the establishment of the South African National Energy Development Institute (SANEDI) as a successor to the previously created South African National Energy Research Institute (Pty) Ltd (SANERI) and the National Energy Efficiency Agency (NEEA) (a division of CEF (Pty) Ltd). SANEDI has been listed as a new Schedule 3A Public Entity as of 31 December 2010, and operationalized on 1 April 2011. SANERI and NEEA will be incorporated as divisions (SANEDI Applied Research and SANEDI Energy Efficiency) within SANEDI.

This Strategic Plan defines the strategic purpose of SANEDI and sets out a compelling vision of the direction in which the Institute intends to go. It assists in establishing the priorities, identifies the long-term goals and identifies the best approach to achieve these goals.

SANEDI's mandate is derived from the authority and obligations set out in various government policies, legislation and constitutional requirements. These include, but are not limited to, the South African Constitution, the National Energy Act, Ministerial Directives, the White Paper on Energy Policy and the Industrial Policy Action Plan (IPAP).

Sustainable energy supply is a critical component in economic growth and development. However, the challenge of providing access to clean, reliable and affordable energy in support of socio-economic developmental needs, and addressing major environmental challenges including climate change, has proven to be problematic internationally. It is generally recognised that, in order to meet the intensifying climate challenge; the global (carbon intensive) energy system must undergo a fundamental transformation.

Many developed and fast-developing countries are now starting to plan for this transition to a low-carbon economy as a competitive and development priority, understanding that this will require far-reaching changes in technology, finance, policy and societal behaviour.

Amidst this global uncertainty, South Africa finds itself at a critical juncture faced with urgent and important energy related decisions that will have a significant impact on its future.

Two key building blocks of sustainable energy solutions, and a low carbon economy, relate to energy innovation and energy conservation, which also describe the essence of SANEDI's composition and focus.

SANEDI has a critical role to play in ensuring that South Africa will have the necessary information and planning support (regarding, amongst others, emerging technologies, innovative practices, alternate energy solutions, advanced infrastructure, energy data) to plan for a sustainable and secure energy future that will also satisfy the country's economic, social and environmental needs.

SANEDI also has to influence/facilitate an immediate and critical change in the country's energy culture towards more considered and sustainable energy practices.

Within the overall Government planning context, SANEDI will primarily contribute to three of the national priority outcomes, referred to as the 'Change Agenda'. SANEDI will be the principal partner of the Department of Energy (DOE), in its effort to attain the energy policy objectives with particular focus on those that relate to (1) achieving macro-

economically efficient production and rational use of energy, (2) stimulation of renewable energy sources and of innovative energy technologies and processes, and (3) related job creation and green industry development aligned with IPAP.

Through thorough analysis, three specific Strategic Outcome Orientated Goals have been identified for SANEDI. Six priority programmes have been identified for the five years from 2011/12-2016/17 towards the three goals. Each of the six programmes will in one way or the other contribute to the reduction of the carbon intensity of the economy by either reducing the energy intensity or the carbon intensity of energy supply, or both, as expressed in the following equation:

$$Energy\ Intensity\ x\ Carbon\ Intensity\ of\ Energ\quad Supply = Carbon\ Intensity\ of\ the\ Economy$$

Various strategic objectives in turn support the programmes. Each strategic objective has been structured to be measurable against a defined baseline to ensure progress tracking and timely corrective actions.

STRATEGIC OUTCOMES	PROGRAMMES	STRATEGIC OBJECTIVES
Enable well informed and high confidence energy planning, decision-making and support policy* development	Applied energy research	• Knowledge creation in support of policy direction • Intelligent energy systems infrastructure • Optimised energy research investments • Strong collaborative approach and strategic international collaboration
	Data and knowledge management	• Establishment of Technology Management Centre • Develop and maintain central data repository • Enhanced access to energy information
Accelerated transformation to a less energy and carbon intensive economy	Low energy and carbon intensity development, demonstration and commercialisation	• increased projects in demonstrations and commercialisation phase • Facilitated technology innovation
	Green industry capacity building and development	• Grow pool of competent productive researchers • Facilitate development of a 'green' workforce • Promote job creation through innovation
	Working for energy programme	• Increased employment levels within participating communities • Rural clean energy production and provision • Demonstrated energy management opportunities
Foster a culture of energy efficiency and more rational energy use	Energy efficiency programme	• Establish a national energy efficiency agency within SANEDI • Energy efficiency improvements in public facilities • Large-scale awareness of energy efficiency • Market demand for energy efficient and green technologies • Support the Income Tax Amendment Act section 12i and 12 l relating to the tax rebate for energy efficiency improvements • Management of the EEDSM hub and oversight of transition of Hub to CORD

* Please note that in this and all references to policy development, SANEDI's role is an enabling or support role. Decisions regarding policy setting do not reside with SANEDI and this plan does not intend to suggest that.

Every programme and goal has been selected based on its alignment with the SANEDI focus areas described in the Business case, the outcomes that relate to the Minister of Energy's commitments (Key Performance Indicators) and the Department of Energy priority programmes as defined in the amended 2011/12 – 2015/16 5-year Strategic Plan. The primary linkages between these programmes and commitments:

SANEDI Programme	Departmental Programmes (Approved 5 year Strategic Plan 2011/12 – 2015/16)		Ministerial KPIs (Performance Contracts 27 May 2011)		
	Programme 2: Energy Planning and Policy[1]	Programme 5: Clean Energy[2]	OUTCOME 6[3]	OUTCOME 7[4]	OUTCOME 10[5]
Programme 1: Applied Energy Research	▯	▯	▯		▯
Programme 2: Data and knowledge management	▯	▯			▯
Programme 3: Low energy and carbon intensity innovation cultivation	▯				▯
Programme 4: Green Capacity building and Development	▯	▯			▯
Programme 5: Working for Energy Programme		▯	▯	▯	▯
Programme 6: Energy Efficiency Programme		▯			▯

Because of the significant contribution of the energy sector towards South Africa's high carbon emissions, SANEDI Programmes were also considered in terms of the positive contribution it would make in reducing carbon intensity and advancing clean energy. SANEDI's priority programmes therefore also directly support the mitigation plans and approaches identified in the National Climate Change Response White Paper published October 2011.

The priority mitigation options, as identified in Section 6.3 of the Climate Change Response Plan, were defined as:

- **Option 1:** Shifting to lower carbon generation options
- **Option 2:** Significant up-scaling of energy efficiency applications
- **Option 3:** Promoting transport related interventions
- **Option 4:** Carbon capture and storage in the synthetics fuels industry
- **Option 5:** Mitigating non-energy emissions in agriculture and land use

[1] DoE Programme 2 Energy Planning and Policy: Evidence-based planning, policy setting and investment decisions in the energy sector and improved energy regulation and competition
[2] DOE Programme 5: Clean Energy: Development and implementation of clean and renewable energy and energy efficiency initiatives
[3] An efficient, competitive and responsive economic infrastructure
[4] Environmental assets and natural resources that are well protected and continually enhanced

- **Option 6**: Transitioning society and economy to more sustainable consumption and production patterns

The correlations between the SANEDI programmes and these priority mitigation actions can be shown as:

SANEDI Programme	Priority Mitigation Options (of the Mitigation Actions in the Current Draft Resource Plan)					
	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Programme 1: Applied Energy Research	▯	▯	▯	▯	▯	▯
Programme 2: Data and knowledge management	▯	▯	▯	▯		▯
Programme 3: Low energy and carbon intensity innovation cultivation	▯	▯	▯	▯	▯	▯
Programme 4: Green Capacity building and Development	▯	▯	▯	▯		▯
Programme 5: Working for Energy Programme	▯	▯				▯
Programme 6: Energy Efficiency Programme	▯	▯				▯

SANEDI furthermore plays a leading role in three of the identified near-term priority flagship programmes as defined in Section 8 of the White Paper:

- 8.1 The Climate Change Response Public Works Flagship Programme: **Working for Energy**
- 8.4 The Energy Efficiency and Energy Demand Side Management Flagship Programme: **SANEDI energy efficiency and specifically the Public Buildings Energy Efficiency Programme**
- 8.7 The Carbon Capture and Sequestration Flagship Programme: **SANEDI's Carbon Capture and Storage programme**

Delivery of the full scope will require a significant investment, but will also offer significant short and long-term economic, environmental and social benefits resulting from a transition to a lower-carbon, less energy intensive economy.

With respect to financing of the SANEDI Strategic Plan, the first three scenarios were considered and designed strategically, however scenario four has emerged by default to be the likely scenario under which SANEDI will operate:

Scenario description	Benefits	Considerations	Budget required year 1 (2012/13)	Budget required (2012/13 - 2016/17)
SCENARIO 1: Rapid transition and full operationalisation as independent entity with programme implementation in parallel	Full programme benefits and contribution achieved (as per this plan) Rapid establishment of SANEDI as independent entity	Significant financial commitment required. Continuity of operation to receive priority attention	R225 192 831	R2 794 851 532
SCENARIO 2: Rapid transition and full operationalisation as independent entity with skeleton programme only	Financial commitment for year 1 is reduced	Programme benefits as presented in this plan moves out with one year Opportunities may be lost Synchronisation with IRP and other planning processes impeded Existing and planned partnerships and initiatives may be at risk	R154 712 387	R1 578 334 991
SCENARIO 3: Focussed programme implementation with gradual transition to independence	The budget requirement for year 1 is not too onerous Full programme benefits and contribution can be achieved	Slow transition to independence	R 136 579 179	R 2 768 474 563
SCENARIO 4: SANEDI receives a baseline allocation that allows it to survive	**Keep the organisation in survival mode**	**Inadequate funding to fulfil mandate to its full potential**	**R 50 110 000**	**R 264 193 372**

Details of the cost breakdown per annum are included as Appendix D to this plan.

SANEDI is committed to delivering the goals and objectives described in this plan, subject to the availability of funding.

Part A: Strategic Overview

2. Vision

To serve as a catalyst for sustainable energy innovation, transformation and technology diffusion in support of South Africa's sustainable development that benefits our nation.

3. Mission

Advance innovation of clean energy solutions and rational energy use that effectively supports South Africa's national energy objectives and the transition towards a sustainable, low carbon energy future.

4. Values

- Innovation
- Accountability
- Transparency
- Integrity
- Professionalism
- National Interest
- Batho Pele

5. Legislative and other mandates

SANEDI's mandate is derived from the authority and obligations set out in the following policies, legislation and constitutional requirements:

5.1. Constitutional mandates

The South African Constitution (Act 108 of 1996), states that the people of South Africa have the **right to an environment that is not detrimental to human health,** and impose duty on the state to promulgate legislation and to implement policies to ensure this right is upheld. The environmental vision of the South African Government has however departed from a conservationist approach and committed itself to **sustainable development with equal emphasis on social and economic development and environmental sustainability** with this principle of **sustainable development being adopted into the South African Constitution**[5]. Section 24 states the following:

"and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

The Constitution therefore allows for **national policy** to be **developed and implemented by the state** to protect these rights and to secure ecologically sustainable development. This is interpreted as aiming to ensure that **national (including energy) resources are adequately utilised** and hence that the **production and distribution of energy resources are done sustainably**.

SANEDI's implied mandate in terms of the Constitution is to support policy development, planning and implementation of sustainable development policy objectives in the energy sector in its role as agency to Government and specifically the Department of Energy.

[5] Section 24 of the Bill of Rights of the South African Constitution (Act 108 of 1996)

5.2. Legislative mandates

The following act gave effect to SANEDI's existence and provides for its primary mandate and specific responsibilities:

Legislative Mandate	Description and Intention of Legislation	Section in Act that SANEDI mandate
National Energy Act, 2008 (Act No. 34 of 2008), Section 7 (2)	To ensure that **diverse energy resources** are available, in **sustainable quantities** and at **affordable prices**, to the **South African economy in support of economic growth and poverty alleviation**, taking into account **environmental management** requirements, international commitments and obligations and interactions amongst economic sectors; **to establish institutions to be responsible for promotion of efficient generation and consumption of energy, energy modelling and planning**, increased **generation and consumption of renewable energies, energy research**, contingency energy supply, holding of strategic energy minerals, **adequate investment in, appropriate upkeep of** and equitable access to **energy infrastructure**; to provide measures for the furnishing of certain data and information regarding energy demand, supply and generation; and to provide for matters connected therewith.	Provides for **SANEDI to direct, monitor and conduct energy research and development as well as undertake measures to promote energy efficiency throughout the economy.** Chapter 4 focuses on the establishment of SANEDI. The institute is intended to: • Promote energy efficiency in the economy. • Increase the GDP per unit of energy consumed • Ensure energy resources used in optimal manner • Promote energy research and technology innovation • Increase players in the energy field • Facilitate effective management of energy demand and its conservation

The following specific plans; directives and public announcements further reinforced and refined SANEDIs responsibilities:

Policy	Description of Policy Intervention	Specific role SANEDI currently
Department of Energy (DoE) Strategic Plan 2011/12 – 2015/16	5 Year Strategic plan for the National Department of Energy	The Strategic plan expands on the original mandate and states the SANEDI mandate as: To direct, monitor and conduct applied energy research and development, demonstration and deployment as well as undertake specific measures to promote energy efficiency throughout the Economy To establish a nationally focused energy research, development and innovation sector and undertake energy efficiency measures with a strong relevance for South Africa, aligned with DoE objectives as stated in the National Energy Act, 2008
Ministerial Directive which established SANERI	The Ministerial Directive that established SANERI allows SANERI to undertake all types of energy-related research. The Energy Act mandates SANEDI to undertake all activities of SANERI and hence empowers SANEDI to also undertake all types of energy research. However in line with Strategic Management Model of Science and Technology DOE and DST agreed to review all current programmes within SANERI in order to determine their	The Ministerial Directive, which established SANERI, allows SANERI to **undertake all types of energy-related research**. The directive also recommends that SANEDI focus only on **applied research** activities with all primary research being undertaken by DST and its agents.

Directive	Description of the focus of the policy directive	Statement on how SANEDI is responding
	best placement. Going forward the objective is for SANEDI to focus only on applied research activities with all primary research being undertaken by DST and its agents. The Minister will ensure this through annual approval of the Corporate Plan.	
Ministerial Directive which established NEEA	During February 2006 the then Minister of Minerals and Energy issued a Directive to CEF (Pty) Ltd to establish the National Energy Efficiency Agency (NEEA) as a division.	The Ministerial Directive that established NEEA, stated the objects of NEEA to include, inter alia: • The Establishment of a Governance Committee to prioritise and recommend energy efficiency and DSM projects • Funding of specific programmes related to the implementation of the National Energy Efficiency Strategy (2005) • Oversee monitoring and verification of energy efficiency • Ensure energy efficiency and DSM awareness campaigns • Oversee the implementation of the Energy Efficiency Accord • Oversee coordination of training in energy efficiency Under section 1(2) (a) (iA) of the Central Energy Fund Act, 1977 (No. 38 of 1977)
2011 National Council of Provinces (NCOP) Budget Vote speech by the Minister of Energy, Ms Dipuo Peters, MP, Old Assembly Chamber, Parliament, Cape Town	Budget Vote Speech	The Minister of Energy's budget vote speech made specific reference to SANEDI's expected role: "Last year we committed to establishing the South African National Energy Development Institution (SANEDI), and this was duly done. SANEDI will, amongst others, be the **champion for Energy Efficiency** in the country, which will not only save energy, but reduce the burden on households. In addition SANEDI will house South Africa's **Carbon Capture and Storage research and development as well as other energy research programmes.**" She further refers to the different programmes and progress made.
2011 Budget Vote Speech by the Deputy Minister of Energy, Ms. Barbara Thompson, MP E249, National Assembly, Parliament, Cape Town 26th May 2011	Budget Vote Speech	The Deputy Minister of Energy's budget vote speech made specific reference to SANEDI's expected role/contribution: "In terms of SANEDI's role, it is expected that they will become the repository of all energy efficiency programmes. **This requires them to oversee energy efficiency initiatives, in particular, to assist with the certification of energy savings achieved by those companies that seek to claim tax deductions under the Income Tax Amendment Act.** We have secured the concurrence of the Minister of Finance for energy efficiency incentives under the **Standard Offer and Energy Efficiency Tax Incentive Scheme**, which will be in place this year."

5.3. Policy mandates

Key responsibilities of SANEDI as provided for in policies:

Policy Mandate	Overall Intended Outcome of the Policy Mandate	Specific Role for SANEDI Responsibility
White Paper on Energy Policy, 1998	This White Paper has been written so as to clarify Government policy regarding the supply and consumption of energy for the next decade. The policy strengthens existing energy systems in certain areas, calls for the development of underdeveloped systems and demonstrates a resolve to bring about extensive change in a number of areas. It addresses international trade and co-operation, capacity building, and the collection of adequate information. The document is comprehensive, addressing all elements of the energy sector as practically as it can.	The White Paper highlights the importance of research funding and alludes to the intended function of SANEDI by highlighting the need for integrated research and a coordinated strategy: The White Paper states that Government will consider the development of a system to **prioritise national research funding** into the three main research categories in order to address the medium to long-term research needs in the energy sector. This will consist of **an integrated, multi-year, national, needs-driven, energy research strategy,** developed from time to time by an experienced team of experts appointed by the Minister. This strategy will identify medium and long-term priority programmes and themes.
National Energy Efficiency Strategy of the RSA, 2008	The vision of the strategy is to contribute to affordable energy for all, and to minimise the effects of energy usage on health & the environment. It is implemented through sector programmes. This Strategy allows for the immediate implementation of low-cost and no-cost interventions, as well as those higher-cost measures with short payback periods. These will be followed by medium-term and longer-term investment opportunities in energy efficiency. The Strategy acknowledges that there exists significant potential for energy efficiency improvements across all sectors of our national economy.	The **South African National Energy Research Institute** will be funded to carry out a **dedicated programme of research and development for energy efficiency**. The Strategy will support appropriate research and the possible adaptation of internationally available technologies and processes. Renewable Energy; Clean Fuels Programme, Energy Audits, Energy Management. - The National Energy Research Institute will be funded to carry out a dedicated R&D programme for energy efficiency
Energy Security Master Plan for Liquid Fuels, 2007	In the short term the master plan focuses on developing supply chain solutions to South Africa's fuel supply challenges, management of liquid fuels demand and energy response tactics. The log-term approach is broader and begins to integrate supply, demand, macroeconomics, geopolitics and climate change. It further seeks to allow for the making of well-informed choices with respect of energy supply, energy carriers, demand sector strategies, as well as energy transformation approaches, cognisant of the need to minimize negative impacts on the environment and the economy.	Amongst others, the master plan recommends that **energy efficiency** should be strongly promoted and calls for a review of present programmes in operation. The master plan also highlights the importance of having access to **relevant and adequate data** for due analysis and to inform modelling, scenario planning and decision-making. *"impossible to develop adequate energy plans without appropriate data acquisition and modelling tools"*
Energy Security Master Plan, 2007	The Master Plan is premised on achieving certain goals that have been set for the electricity sector. Due to the uncertainty over the planning horizon, some assumptions are made regarding demand projections and the economic outlook. After consideration of the Energy White Paper and the regulatory policy framework, the current electricity generation, transmission and distribution sectors are appraised, in terms of the challenges confronting these sectors.	**Focused research and development** will enable meeting technical performance and capacity expansion objectives. **Electricity/energy-based technology development and innovation is imperative to productivity and growth of the country.**

Policy/Legislation	Description of the focus areas and relevance	Implications for SANEDI
Integrated Resource Plan for Energy, 2010	Cabinet promulgated the Policy-Adjusted IRP in May 2010. It is a major step towards building local industry clusters and assists in fulfilling South Africa's commitments to mitigating climate change as expressed at the Copenhagen climate change summit. The Policy-Adjusted IRP includes the same amount of coal and nuclear new builds as the RBS, while reflecting recent developments with respect to prices for renewables. In addition to all existing and committed power plants (including 10 GW committed coal), the plan includes 9,6 GW of nuclear; 6,3 GW of coal; 17,8 GW of renewables; and 8,9 GW of other generation sources.	Section 7 of the policy adapted IRP 2010 identifies a **Research Agenda** for the subsequent IRP process that correlates closely with SANEDI's current and planned research activities. SANEDI is expected, as energy development institute, to support this list of research needs: Distributed generation, **smart grids** and off-grid generation Harnessing South Africa's **coal resource** Decommissioning and waste management Technology options * Small hydro * Regional hydro options (specifically Inga) * Biomass (including municipal solid waste and bagasse) * Storage; and *** Energy efficiency demand side management** Vision for 2050 **Uncertainty & Risk factors**
DST 10 year innovation plan	The plan identifies the grand challenge areas as: • The Farmer to Pharma value chain to strengthen the bio-economy • Space science and technology **• Energy security - the race is on for safe, clean, affordable and reliable energy supply, and South Africa must meet its medium-term energy supply requirements while innovating for the long term in clean coal technologies, nuclear energy, renewable energy and the promise of the "hydrogen economy".** **• Global-change science with a focus on climate change** • Human and social dynamics.	The plan recommends, from an R&D perspective, to position **SANERI**, Eskom, Sasol and various CEF subsidiaries to work together **to advance clean coal technologies.**
Measurement and Verification Guideline for Energy Efficiency Certificates (DRAFT)	The SA Government intends to introduce tax incentives for companies that can prove energy efficiency savings. One of the primary requirements for companies to benefit from this tax incentive is that they need to make use of independent and registered Measurement and Verification (M&V) professionals that are certified by the Council of Measurement and Verification Professionals of South Africa (CMVPSA).	This Measurement and Verification Guideline for Energy Efficiency Certificates aim to provide background with regards to the M&V requirements surrounding the energy efficiency tax incentive scheme. It also provides a high-level M&V approach that should be followed by registered M&V professionals to issue the required supporting documentation that will be used by **SANEDI to issue Energy Efficiency Certificates.**
Industrial Policy Action Plan (IPAP) 2010/11 – 2012/13, published Feb 2010	IPAP2, as it has become known, builds on the National Industrial Policy Framework (NIPF) and the 2007/08 IPAP. It represents a significant step forward in scaling up our efforts to promote long term industrialisation and industrial **diversification beyond our current reliance on traditional commodities and non-tradable services**. Its purpose is to expand production in value-added sectors with **high employment and growth multipliers** that **compete in export markets** as well as compete in the domestic market against imports. In so doing, the action plan also places emphasis on more **labour absorbing production and services** sectors, the increased	Section 13.3 of the plan makes specific reference to the green industries that offer economic opportunity and requires priority attention. Those highlighted below are best aligned with SANEDI's current and planned activities: - SWH - **Wind** - **Photovoltaic power** - **Concentrated Solar Thermal power**

Policy Vehicle	Description of Policy Document	SANEDI Role and Responsibility
	participation of historically disadvantaged people and regions in our economy and will facilitate, in the medium term, South Africa's contribution to industrial development in the African region. IPAP2 also identified **green and energy saving industries as one of a few qualitatively new areas of focus of industrial policy.**	**- Industrial Energy Efficiency** - Water efficiency - Waste Management **- Biomass and waste management** **- Energy-efficient vehicles** Similarly, several of the Key Action Programmes (listed as items 13.3.1 – 13.3.11) identified in the IPAP correspond with SANEDI's focus areas and requires SANEDI's support of the plan. 13.3.1 Roll-out of national solar-water-heating programme – manufacturing and installation capacity 13.3.2 **Solar and Wind Energy** 13.3.3 Development of an **industrial energy-efficiency** programme 13.3.4 Strengthen water-efficiency standards 13.3.5 **Demonstrate viability of Concentrated Solar Thermal (CST) power as a major renewable energy generation source** 13.3.6 Biomass Energy 13.3.7 Clean and Multi-Energy Stoves 13.3.8 **Water- and Energy-Efficient Appliances** 13.3.9 **Efficient Motors, Variable-Speed Drives, Energy Metering and Control and Electricity Storage (Batteries and Fuel Cells)** 13.3.10 Waste and Waste Water Treatment 13.3.11 Green Industries special focus: The South African Renewables Initiative (SARi)

6. Situational analysis

Energy is intrinsically weaved into the fabric of modern society and economy and the course for all growth and development. At the same time energy production and use impact on the environment, natural resources and sustainability of our planet for future generations.

Policymakers, regulators and citizens all over the world are grappling with the challenges of providing access to clean, reliable and affordable electricity in support of socio-economic developmental needs, and addressing major environmental challenges including climate change. It is generally recognised that, in order to meet the intensifying climate challenge; the global (carbon intensive) energy system must undergo a fundamental transformation.

Amidst this global uncertainty, South Africa is confronted with having to urgently make important energy related decisions that will have a significant impact on its future. It is appreciated that the country's energy future will be different from the era of plenty (and low cost energy) we are leaving, no matter what energy choices are made. To set South Africa on a sustainable energy path at this crucial moment it is however essential that those choices are both well informed and legitimate.

In the past, South Africa has often benefited from available international experience to inform decision-making and planning. Unfortunately, at this time, South Africa cannot wait for the challenges of a changing global energy system to be resolved before making its own decisions. Planning decisions and choices will therefore be based on the best information, analysis and planning support currently accessible.

Taking a macro view is critical to manage trade-offs between environmental, social, and financial considerations, and also to identify points of convergence of these public interests. Governments, and agencies of Government, therefore have a vital role to play to lead countries and economies into sounder energy solutions.

Two key building blocks of sustainable energy solutions relate to energy innovation and energy[6] conservation/efficiency.

In line with international practice[7], the South African Government has placed responsibility for promoting, directing and developing non-conventional, renewable and alternate energy sources and technologies and taking concrete steps towards energy conservation, with a Government agency, SANEDI.

SANEDI therefore has to play a critical role to ensure that South Africa will have the necessary **information** and **planning support** (regarding, amongst others, emerging technologies, innovative practices, alternate energy solutions, advanced infrastructure, energy data) to **plan** for a sustainable and secure energy future that will also satisfy the country's economic, social and environmental needs.

[6] Note that energy and fuel are often used interchangeably throughout the document, particularly in reference to energy efficiency.

[7] Numerous examples globally include: ACRE (Australia); Austrian Energy Agency, Energy Institute (Croatia), Danish Energy Agency, Environment and Energy Management Agency (ADEME, France), Sustainable Energy Authority (Ireland), National Agency for New Technologies, Energy and Sustainable Development (Italy), Polish National Energy Conservation Agency, Swedish Energy Agency, NYSERDA (New York, USA).

SANEDI also has **to influence/facilitate** an immediate and critical change in the country's energy culture towards more considered and **sustainable energy practices**.

Recent analysis by the National Planning Commission further reinforced the importance of SANEDI's role. The Material Conditions Diagnostic pointed to the global shift towards a dematerialised economy and decarbonisation of energy sources, emphasised the risks and costs associated with remaining a carbon-based economy and the importance of resilience to impacts of climate change.

Key pointers were highlighted in the Material Conditions Diagnostic report for South Africa to make significant progress in this respect:

- **Starting early in the transition to a low-carbon economy** yields the best results, largely because it avoids too large a shock in the future.
- South Africa is unlikely to meet its targets without **innovation and adaptation of global technological advances**.
- **Changing the energy mix and improving energy efficiency** are critical to meeting targets.

SANEDI's mandate and focus is critically aligned with these key pointers, and if appropriately empowered and applied, will directly support South Africa's capacity to take advantage of the technological trends and opportunities and the country's ability to mitigate vulnerabilities.

6.1. Performance environment

A PESTLE[8] analysis framework was used as a basis for a comprehensive environmental analysis for SANEDI. A brief overview of the most pertinent considerations is highlighted here to contextualise the SANEDI Strategic plan.

As it takes its cue from Government priorities and policy direction, SANEDI is vulnerable to an ambiguous policy, legislative and regulatory environment. Several aspects of SANEDI's operation are dependent on the resolution of legislative and policy decisions. Most notably is the importance of reconciliation between energy, economic development and environmental policy and resolution with respect to the anticipated Department of Energy, Energy Technology Innovation Policy.

Low electricity prices have historically been a key inhibitor for energy efficiency and contributed to a wasteful energy culture in South Africa. Rising electricity, energy and fuel prices coupled with policy signals and disincentives should however prompt a shift towards more considered energy selection and consumption. International experience has shown that the real impact of price on consumer behaviour and choice of equipment and activities will only materialise over time. The expected delay of the impact of price elasticity should therefore be mitigated by complementary initiatives such as awareness creation, communication and education.

The global recession has negatively impacted economic activity and therefore energy related investment. Initial expectations were for full economic recovery during 2010, but the rate of recovery has been slower than anticipated with current expectations of a second slump. Delayed economic recovery is likely to curtail research and innovation investments globally. It may also increase the relative importance of short-term financial considerations in energy technology / solution selection, hence perpetuating old, carbon intensive options.

[8] Political, Economic, Socio-cultural, Technology, Legislative, Environmental

As a result of the prevailing economic environment funding sources are currently relatively scarce and expensive which also impacts national Government's ability to provide additional fiscal funding. Conversely, grant and development funding earmarked for climate change interventions have been more readily available and may continue to provide supplemental funding sources for energy research and innovation activities.

Unemployment in South Africa is high and job creation the top priority of Government. The availability of energy and electricity is a major component of economic stability and growth and therefore the economy's ability to absorb employment and preserve existing jobs. The 'green industry' offers significant opportunity to bolster the South African Government's ability to address unemployment and grow economic activity.

Independent reviews[9] revealed chronic shortages of higher skills and underinvestment in research and development in the country. South Africa has in recent years seen a marked decline in national **energy** research capacity and investment with a significant share of previously available funding being diverted to more pressing operational priorities.

But, with consideration of the link between energy research and development and global competitiveness, this situation requires due attention and correcting for South Africa to support the level of innovation and technological adaptation that is aligned with the existing, and growing, socioeconomic and sustainability challenges.

The benefits associated with research and technology innovation extend far beyond the obvious to include:

Dimension	Public benefits of research and technology innovation	
Techno-economic	• Improvement of industrial competitiveness	• National economic growth
	• Reduction of the energy intensity of the national economy	• SME development (e.g. ESCO, Certification entities, component manufacturing)
	• Technological and service exports	• Economic efficiency
Environmental	• Optimal use of renewable resources	• Biodiversity
	• Climate change	• Sustainable development
	• Air quality	•
Social	• Access to energy	• Reduce cost to consumers
	• Employment creation	• Empower consumers
	• Equity issues related to energy	•
Strategic	• System reliability, loss reduction, quality of energy	• Security of energy supply
	• Regional development	• Improve the technological services balance of trade
	• Domestic technology capacity building	• Create industrial base for energy technology
	• Diversification of energy mix	•

[9] National Advisory Council on Innovation, South African Science and Technology Indicators, 2009; The OECD's Review of South Africa's Innovation Policy, 2007; National Survey of R&D activities, undertaken by the Centre for Science, Technology and Innovation Indicators (CeSTII) of the Human Sciences Research Council (HSRC).

6.2. Organisational environment

Chapter 4 of the National Energy Act, 2008 (No 34 of 2008) provides for the establishment of the South African National Energy Development Institute (SANEDI) as a successor to the previously created South African National Energy Research Institute (Pty) Ltd (SANERI) and the National Energy Efficiency Agency (NEEA) (a division of CEF (Pty) Ltd).

SANEDI has been listed as of the 31st December 2010 as a new Schedule 3A Public Entity, and will see the merger of SANERI and NEEA. All assets, liabilities, and staff of SANERI and NEEA will be vested in SANEDI. The establishment of SANEDI therefore comprises the incorporation of two functioning bodies into one.

SANEDI was furthermore operationalised by the State President and the Minister of Energy on 18 March 2011 – effective as of 1st April 2011.

SANEDI is an implementation agency of Government, specifically the Department of Energy, created for the sole purpose of assisting the State to achieve its strategic objectives as set out in the National Energy Act, 2008 (No. 34 of 2008), i.e.:

- Ensure uninterrupted supply of energy to the Republic;
- **Promote diversity of supply of energy** and its sources;
- **Facilitate effective management of energy demand and its conservation**;
- **Promote energy research;**
- **Promote appropriate standards and specifications** for the equipment, systems and processes used for producing, supplying and consuming energy;
- **Ensure collection of data and information** relating to supply, transportation and demand;
- Provide for optimal supply, transformation, transportation, storage and demand energy that are planned, organised and implemented in accordance with a balanced consideration of security of supply, economics, consumer protection and a sustainable development;
- Provide for certain safety, health and environment matters that pertain to energy;
- Facilitate energy access for improvement of quality of life of the people the Republic;
- **Commercialise energy-related technologies**;
- **Ensure effective planning of energy supply**, transportation and consumption; and
- Contribute to sustainable development of the South African economy.

SANEDI will furthermore **support the local renewable energy and Energy Efficiency and Demand Side Management (EEDSM) industries** in South Africa in accordance with the Industrial Production Action Policy (IPAP) and, indirectly, also the climate change and mitigation, social and economic development and environmental sustainability priorities of the country.

As indicated earlier two key building blocks of sustainable energy solutions relate to energy innovation and energy conservation/efficiency. This is reflected in the high level organisational structure (Figure 1) where SANEDI Applied

Research (previously SANERI) and SANEDI Energy Efficiency (previously NEEA) will continue as two separate divisions in the SANEDI structure.

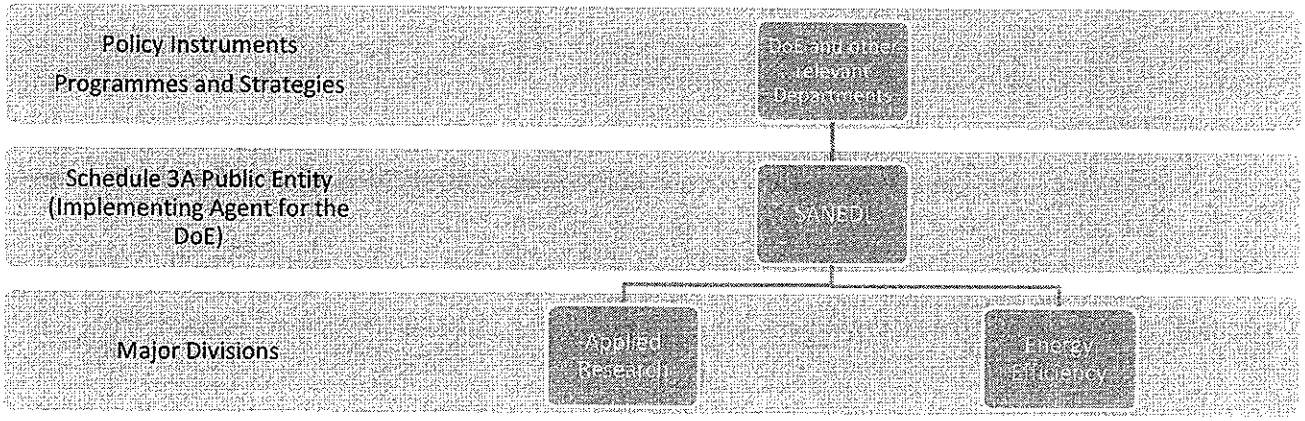
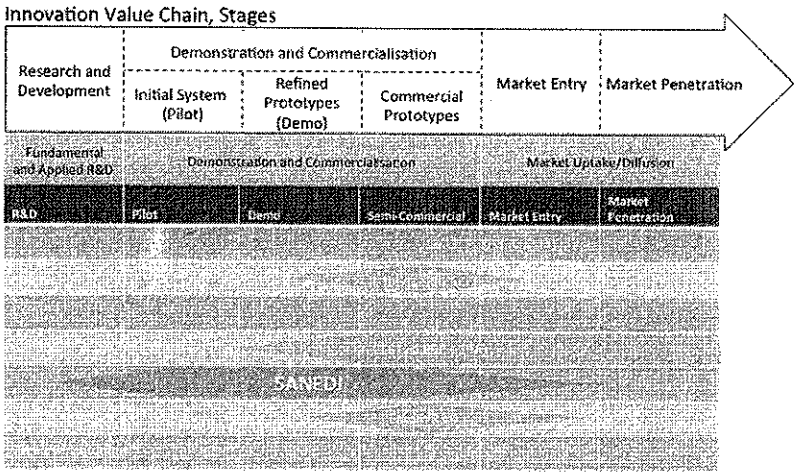


Figure 1: SANEDI Organisational structure

In South Africa's existing research and innovation context, SANEDI's focus will be primarily on applied energy research and increasingly also on the front end of energy innovation (pilots, demonstration projects and semi-commercialisation of select solutions). Select activities of SANEDI Energy Efficiency and the Working for Energy Programme will also promote technology deployment, i.e. market entry and penetration, of new clean energy and energy efficiency solutions. This spread of activity and an indication of the relation to other research entities in the South African environment are depicted in Figure 2. More detail regarding the other role-players and SANEDI's expected relation to them is provided in Appendix C of this document.



DST: Department of Science and Technology; TIA: Technology Innovation Agency; DTI: Department of Trade and Industry; CSIR: Council for Scientific and Industrial Research; EDC: Energy Development Corporation; ETA: Eta Energy; SANEDI: South African National Energy Development Institute; *Tertiary institutions: Higher Education institutes such as the ERC, UP and US Energy Hubs, etc. are funded by a combination of funds from the Department of Higher Education, DST, Industry, etc.

Figure 2: South Africa's Research, Development and Demonstration context

SANEDI Applied Research

Research and innovation will reside primarily with SANEDI Applied Research (previously SANERI). As an immediate focus SANEDI Applied Research has identified areas of development that relates closely to the expected transformation of the country's energy landscape in the short- to medium-term, aimed at contributing to dramatic reductions in greenhouse gas emissions whilst maintaining secure access to competitive sources of energy that can support the targeted economic growth for the country.

The identified priority areas align closely with the national policy direction, as reinforced by the Integrated Resource Plan, 2010 which was promulgated in May 2011 for the electricity environment (Table 2).

Further focus areas have been prioritised to ensure knowledge management and industry infrastructure can adequately support the evolving electricity and energy landscape and the complexities associated with un-firm supply options.

Table 1: IRP 2010 Revised Balanced Scenario (total of 56,539 MW additional capacity by 2030)

Energy Source/Technology	Additional capacity by 2030 (MW)	Percentage of new capacity	Corresponding SANEDI Thematic Area
Coal	16,383 MW	28.98%	Advanced Fossil Fuel
Renewables	21,534 MW	38.09%	Clean Energy Solutions
Solar	8,400 MW		Clean Energy Solutions
Wind	9,200 MW		Clean Energy Solutions
Imported hydro	2,609 MW		Not in SANEDI scope
Landfill, small hydro	125 MW		Clean Energy Solutions
Nuclear	9,600 MW	16.98%	Not in SANEDI scope
Energy Efficiency Demand Side Management (has been assumed in plan)	3,422 MW	N.A.	NEEA and WFE

In addition to the research and innovation component, SANEDI will undertake national energy efficiency measures aligned with national objectives of achieving sustainable utilisation of energy resources while promoting economic development and improving the quality of life for all.

As national research institute, SANEDI Applied Research has a two-pronged focus i.e. (1) technology management and design and (2) technology development. The first aspect, technology management, refers to the articulation of a research and innovation strategy / vision, provision of leadership and coordination that aligns the research and innovation agenda to national, 'mission driven' priorities (as opposed to the private sector focus which is typically market driven). The management and design function, with internal capacity, is being grown within SANEDI Applied Research.

Technology development refers to technology innovation and the development of emerging technologies, inventions, and discoveries. SANEDI Applied Research's role will be to advance and accelerate technology development with cognisance of the strategic direction i.e. 'research with the end in mind'. Technology development activities will be outsourced to

relevant tertiary institutions, laboratories, innovation hubs or private researchers, as relevant and most appropriate, for expedited incubation. In the case where no technical capability or laboratory exists, SANEDI will undertake to develop these within SANEDI.

SANEDI Energy Efficiency (previously NEEA)

SANEDI Energy Efficiency has been established to champion energy efficiency in the country and to promote the prioritisation and implementation of efficiency improvements in South Africa. SANEDI Energy Efficiency's focus extends beyond the historic focus of electricity efficiency to include areas such as the transport sector and efficient application of all energy carriers, including gas, liquid fuels and electricity. In line with international trends, energy efficiency will increasingly incorporate rational/considered use of energy i.e. selecting optimal energy sources (including small-scale renewable energy solutions/technologies) to displaced carbon intensive energy sources for specific end use applications.

SANEDI management model

The former structures of SANERI and NEEA have been fully incorporated as divisions under SANEDI into a cohesive entity with a revised operational structure to ensure full and optimal utilisation of scarce skills and resources.

A **matrix structure** is targeted for this purpose as it offers a dynamic structure that provides benefits specific to SANEDIs requirements, including:

- greater flexibility that allows employee movement across current functional / departmental boundaries,
- improved access to a diverse range of skills and perspectives,
- improved communication, coordination and information sharing across functional boundaries,
- allows for broader experience and hence offers improved opportunities for professional development and career progression to employees.

The matrix structure concept as it applies to SANEDI is illustrated below:

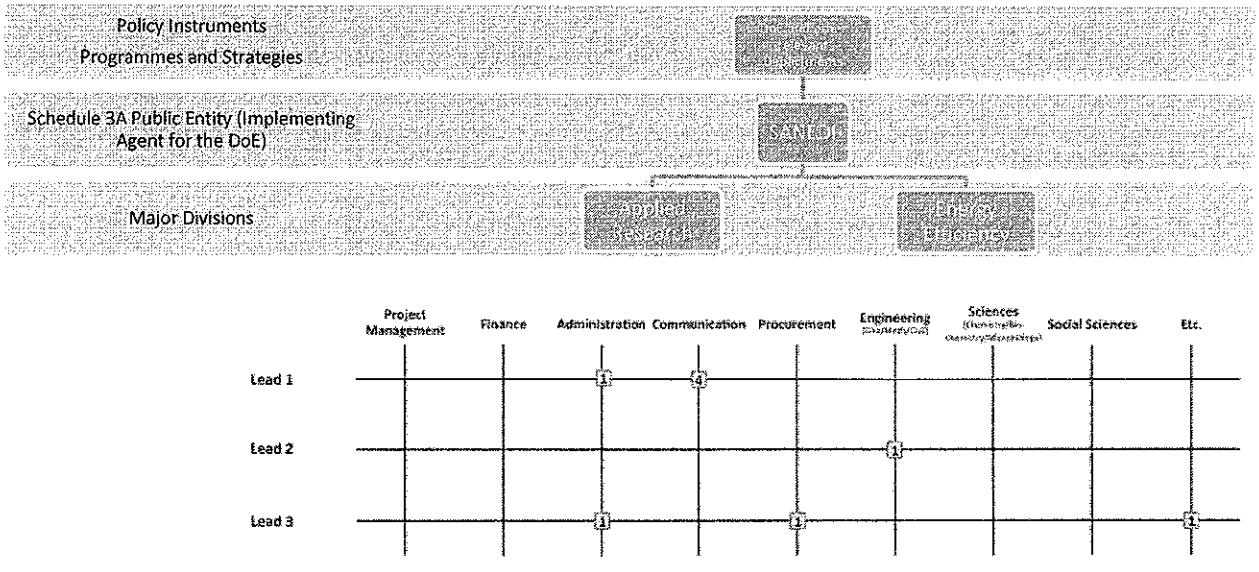


Figure 3: An illustration of SANEDI's matrix management model

Effectively this structure establishes a pool of people that can be utilised across the different focus (rows) and functional areas (columns) to optimise the limited capacity and the available skills set and to allow for greater development opportunities. The complete view of all relevant areas and the matrix management model as it applies to SANEDI is attached as Appendix D.

SANEDI acknowledges that the structure introduces a higher level of internal complexity and additional management challenges, but these are considered manageable with the small permanent staff complement. As the number of employees increase, this model may be reconsidered and adjusted to suit the changing environment.

6.3. Description of the strategic planning process

The listing of SANEDI as a Schedule 3A entity on 31 December 2010 and the operationalisation of SANEDI as of 1 April 2011 signified two important milestones in SANEDI's existence. This also marked the initiation of the strategic planning process for SANEDI as a single, integrated entity.

An initial version of the Strategic Plan was developed during the first quarter of 2011. This draft plan served as platform for the subsequent, collaborative planning process.

In June 2011 SANEDI hosted a strategic planning session with attendance and input from the Department of Energy (DoE), Department of Science and Technology (DST), CEF's Energy Development Corporation (EDC), Eskom Integrated Demand Management (IDM) and Eskom Energy Research, Testing and Development (R,T&D). This first session was aimed at affirming the SANEDI mandate with these key stakeholders and to provide an overview of the anticipated strategic direction and initiatives of SANEDI.

The inputs and discussions of this session informed the development of a revised and restructured plan during July. During this process the plan was also restructured in accordance with the Framework for Strategic Plans provided by National Treasury. This second version of the SANEDI Strategic Plan was tabled at the August ExCo for consideration by the SANEDI management team.

As part of the strategic planning process, this version will remain a working document whilst it is being circulated for comment and input to industry, academia and the relevant Government stakeholders. In accordance with National Government requirements, comments and inputs will be considered and incorporated before the plan is finalised for the 2012/13 planning period.

7. Strategic outcome oriented goals of the institution

As described by the Department of Energy's, 2011/12 Strategic Plan, the Department will **primarily** contribute to three of the twelve national priority outcomes referred to as the 'Change Agenda', namely 'Decent employment through inclusive growth' (Outcome 4), 'An efficient, competitive and responsive economic infrastructure network' (Outcome 6) and 'Environmental assets that are protected and continually enhanced' (Outcome 10). The Department however, expects to also contribute, albeit to a lesser extent, to the remaining nine Outcomes.

As the only state-owned, energy development agency in South Africa, SANEDI is the **principal partner of Government** through the DOE in its effort to attain the energy policy objectives with particular focus on those that relate to achieving **macro-economically efficient production** and a **rational use of energy**, and **stimulation of renewable energy sources and of innovative energy technologies and processes**.

SANEDI's focus and activities therefore will **directly contribute to the stated energy-related Outcomes**, but as a result of identified capacity building, skills development and training initiatives and the research focus, will also contribute significantly to Outcome 5: 'A skilled and capable workforce to support an inclusive growth path.'

SANEDI's three specific Strategic Outcome Orientated Goals have been identified for realising SANEDI's stated vision and defined as summarised below and described in subsequent paragraphs:

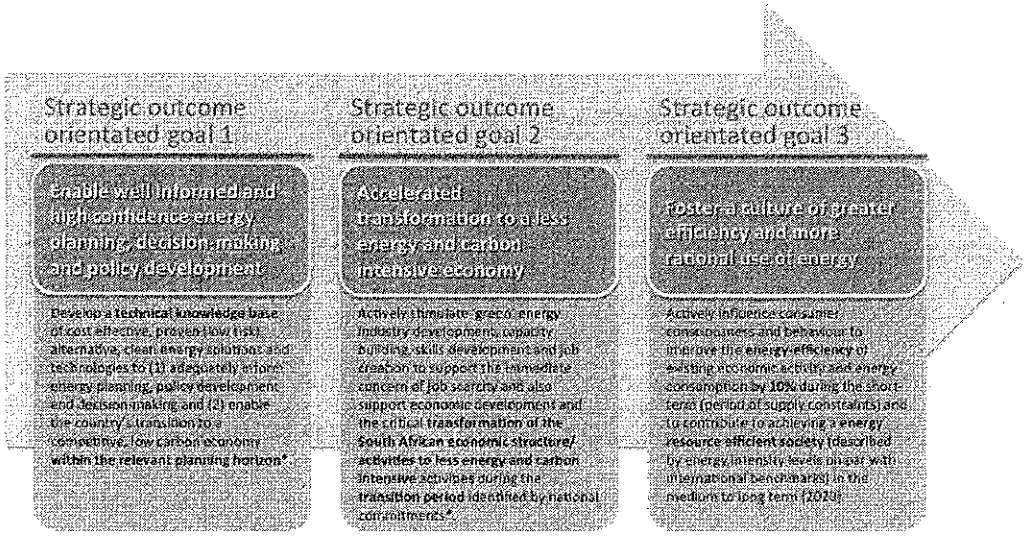


Figure 4: Overview of the SANEDI strategic orientated goals towards realising the stated vision

Strategic Outcome Oriented Goal 1	**Enable* well informed and high confidence energy planning, decision-making and policy development.**
Goal Statement	Develop a **technical knowledge base** of cost effective, proven (low risk) alternative, clean energy solutions and technologies to (1) adequately inform clear and coherent energy planning, policy development and decision-making and (2) enable the country's transition to a competitive, low carbon economy within the relevant planning horizon in support of the Department of Energy and the energy sector/industry activities.

* Please note that SANEDI's role is to develop and collate the necessary information that can be used by government for planning and decision-making.

SANEDI contributes to the achievement of this strategic outcome by:

- Providing an optimal energy research environment.
- Directing and conducting energy research, development and innovation on priority energy-related technologies and solutions.
- Co-operating with persons, associations and institutions undertaking related energy programmes in other countries, to ensure that international learning's and 'best practices' are shared and, where relevant, adopted and applied in South Africa.
- Creating local and international partnership to leverage funding, research facilities and share knowledge to accelerate technology development and innovation in the respective thematic areas.
- Reduce technology cost and risk and facilitate learning (learning by doing, learning by using and learning by interacting) on strategically chosen technologies.

The South African Government has made several international commitments[10] to cap and reduce its absolute carbon emission levels. Achieving these commitments are important because of the environmental implications, but also because of the possible economic consequences associated with non-compliance. Concerns exist over trade barriers based on emission intensity of imports, further supporting the need for South Africa to manage its emissions and energy intensive economy.

South Africa's energy sector is closely linked to South Africa's climate change commitments. The recently promulgated Integrated Resource Plan (IRP) 2010 has effectively accepted 'ownership' for 50% of the emissions reduction targets defined by the Long-term Mitigation Scenarios (LTMS). This however implies that a further 50% of the targeted emission reductions must be forthcoming from other industries and economic activities.

In terms of these required emission reductions and South Africa's goals for energy security and sustainability it will be critical for South Africa's current energy and carbon intensive economic structure/focus to be diversified and a transition to be made to a low carbon economy.

Strategic Outcome Oriented Goal 2	**Accelerated transformation to a less energy and carbon intensive economy**
Goal Statement	Actively stimulate 'green' energy industry development, capacity building, **skills development** and **job creation** in response to the immediate concern of job scarcity and also support economic development and the critical **transformation of the South African economic structure/activities to less energy and carbon intensive** activities during the **transition period** identified by national commitments. (new growth path, climate change commitments)

The required economic shift may have short-term implications associated with the transition, but is ultimately expected to result in a competitive economy, with increased investment (avoided trade barriers linked to high carbon intensity), create new enterprises and open up new job opportunities.

SANEDI will directly support the economic transition by:

[10] Notably African National Congress' 2007 Polokwane Resolution on Climate Change, 2008 Cabinet Vision, Strategic Direction and Framework for Climate Policy and the International Pledge under the Copenhagen Accord.

- Accelerating, where relevant, applied research projects getting to market, ultimately resulting in commercial rollout.
- Stimulate a market demand (pull) for innovative, clean energy technologies through, amongst others, awareness, education, demonstrated and communicated successes and also by facilitation of the tax incentives.
- Facilitating, coordinating and enabling industry capacity building and skills development efforts.
- Supporting the local renewable energy and Energy Efficiency and Demand Side Management (EEDSM) industries in South Africa in accordance with the Industrial Production Action Policy (IPAP).

Improving resource efficiency is among the top priorities in today's world, as Governments, businesses and civil society are increasingly concerned about natural resource use, environmental impacts, material prices and supply security.

Strategic Outcome Oriented Goal 3	**Foster a culture of greater efficiency and more rational use of energy**
Goal Statement	Actively influence consumer consciousness and behaviour to improve the energy-efficiency of existing economic activity and energy consumption by 10% during the short-term (period of supply constraints) and to contribute to achieving a energy resource efficient (described by energy intensity levels on par with international benchmarks) society in the medium to long term (2020).

SANEDI will expedite a culture change inter alia by:

- Leading the way by implementing energy efficiency improvements in Public Facilities as example and business case of what can be achieved, as well as proof of Government's commitment to this matter;
- Creating large scale awareness programs to increase the general level of cognisance of the advantages and benefits of using energy more rationally;
- Supporting industry with measurement and verification measures in order to qualify for tax incentives linked to energy efficiency.

These outcomes describe what SANEDI envisages would constitute a successful contribution to South Africa's changing energy landscape, as illustrated in Figure 5 below.

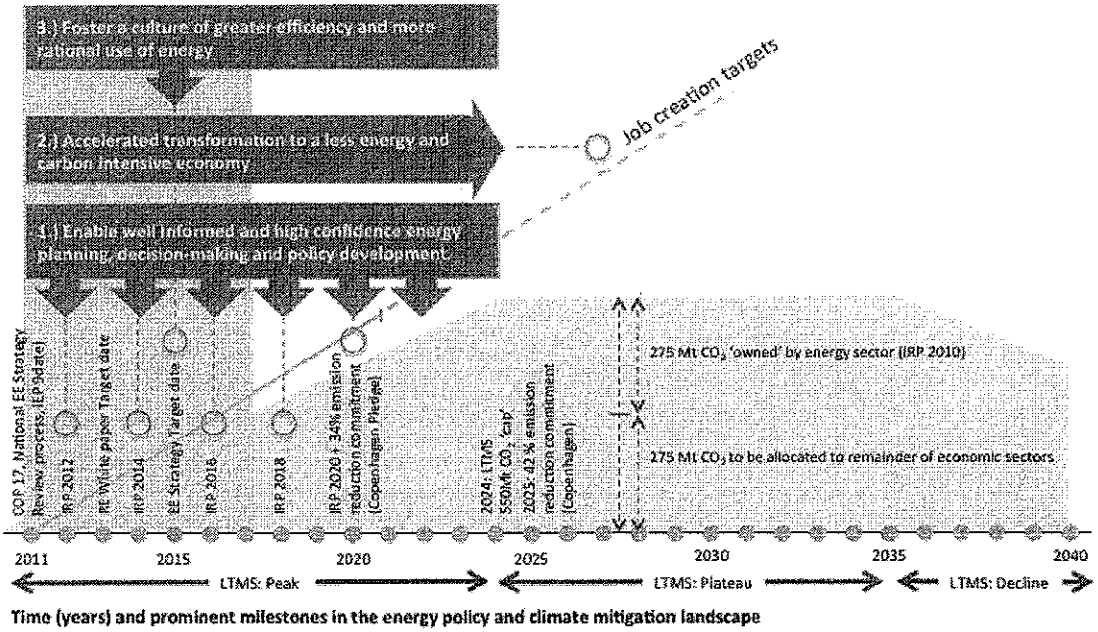


Figure 5: Intended focus and contribution of SANEDI's strategic outcomes

Six priority programmes were defined in support of these outcomes:

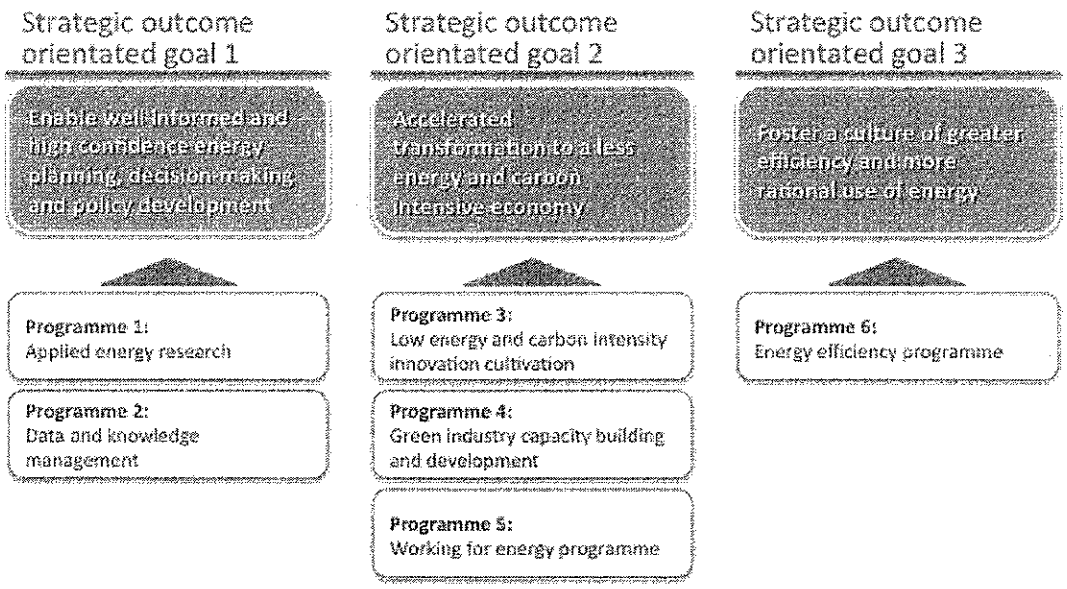


Figure 6: Overview of SANEDI's priority programmes

Each programme also corresponds with at least one the two main focus areas identified in the Business Case for the Establishment of the South African National Energy Development Institute (SANEDI) (approved 23/08/2010) and one or

more of the Department of Energy's priority focus areas as defined by the Minister's KPIs and the amended Strategic Plan for the Fiscal Years 2011/12 – 2015/16:

Table 2: Programme linkages to the SANEDI Business Case and Department of Energy priorities

SANEDI Programmes	Business Case: Energy Research and Development	Business Case: Energy Efficiency	Change Agenda: Priority Outcome 5[11]	Change Agenda: Priority Outcome 10	Change Agenda: Priority Outcome 4	Change Agenda: Priority Outcome 6	DoE: Strategic Plan: Programme 2[12]	DoE: Strategic Plan: Programme 5
Programme 1: Applied Energy Research	▯		▯	▯			▯	▯
Programme 2: Data and Knowledge Management	▯	▯		▯			▯	▯
Programme 3: Low Energy and Carbon Intensity Cultivation	▯	▯		▯	▯	▯	▯	
Programme 4: Green Industry Capacity Building and Development	▯	▯		▯	▯	▯	▯	▯
Programme 5: Working for Energy Programme	▯	▯	▯	▯	▯	▯		▯
Programme 6: Energy Efficiency		▯		▯			▯	▯

Programme 2 (Energy Planning and Policy), as described in the amended Strategic Plan, incorporates objectives relating to improved energy data and information, integrated energy planning, improved energy sector monitoring and impact assessment of related policies, greenhouse gas mitigation and promotion of clean energy in the country.

Programme 5 (Clean Energy) describes the departmental objectives and priorities in terms of, amongst others, renewable energy development, climate change (mitigation and adaptation), environmental compliance, development of the carbon capture and storage mechanism and energy efficiency.

These objectives are underlying to, have shaped and will directly dictate the focus of all six of the defined SANEDI's programmes.

The department's 5-year strategic plan furthermore acknowledges the close interconnection between energy and climate change and the significant responsibility that the Department of Energy, and the energy sector as a whole, carry in terms of the national climate change and environmental sustainability objectives. As such, several of the defined departmental

[11] Outcomes 4, 6 and 10 of the twelve national priority outcomes referred to as the 'Change Agenda', namely 'Decent employment through inclusive growth' (Outcome 4), 'An efficient, competitive and responsive economic infrastructure network' (Outcome 6) and 'Environmental assets that are protected and continually enhanced' (Outcome 10). SANEDI's Programme should also contribute significantly to 'A skilled and capable workforce to support an inclusive growth path' (Outcome 5).

[12] Programmes 2 and 5 as described by the Department of Energy's Amended Strategic Plan for the Fiscal Years 2011/12 – 2015/16. Programme 2: (Energy Planning and Policy): ensure evidence-based planning, policy setting and investment decisions in the energy sector and improve energy regulation and competition. Programme 5 (Clean Energy): Manage and facilitate the development and implementation of clean and renewable energy and energy efficiency initiatives.

programmes, its technological and energy focus and current and planned policy instruments align directly with these objectives.

SANEDI's programmes aim to make a meaningful contribution to, and support the department and sector's mitigation activities. A significant focus of SANEDI's energy development imperative will therefore be on technological opportunities in energy efficiency, renewable energy and carbon capture and storage while also investigating possible mitigation means and measures of relevance to the energy industry. In this respect, SANEDI's programmes also correlate well with the National Climate Change Response White Paper, published in October 2011.

The priority mitigation options, as identified in Section 6.3 of the Climate Change Response Plan, were defined as:

- **Option 1:** Shifting to lower carbon generation options
- **Option 2:** Significant upscaling of energy efficiency applications
- **Option 3:** Promoting transport related interventions
- **Option 4:** Carbon capture and storage in the synthetics fuels industry
- **Option 5**: Mitigating non-energy emissions in agriculture and land use
- **Option 6**: Transitioning society and economy to more sustainable consumption and production patterns

The correlations between the SANEDI programmes and these priority mitigation actions can be shown as:

Table 3: Programme linkages to the National Climate Change Response White Paper, October 2011

SANEDI Programme	Priority Mitigation Options identified in the White Paper, October 2011 (Section 6.3 of the Climate Change Response Plan)					
	Option 1	**Option 2**	**Option 3**	**Option 4**	**Option 5**	**Option 6**
Programme 1: Applied Energy Research	▯	▯	▯	▯	▯	▯
Programme 2: Data and knowledge management	▯	▯	▯	▯		▯
Programme 3: Low energy and carbon intensity innovation cultivation	▯	▯	▯	▯	▯	▯
Programme 4: Green Capacity building and Development	▯	▯	▯	▯		▯
Programme 5: Working for Energy Programme	▯	▯				▯
Programme 6: Energy Efficiency Programme	▯	▯				▯

▯ indicates that the option is **directly** supported by the SANEDI Strategic Plan
▯* indicates that the option is **indirectly** supported by the SANEDI Strategic Plan

SANEDI furthermore plays a leading role in three of the identified near-term priority flagship programmes as defined in Section 8 of the White Paper:

- 8.1 The Climate Change Response Public Works Flagship Programme: **Working for Energy**
- 8.4 The Energy Efficiency and Energy Demand Side Management Flagship Programme: **SANEDI energy efficiency**

and specifically the Public Buildings Energy Efficiency Programme

- 8.7 The Carbon Capture and Sequestration Flagship Programme: **SANEDI's Carbon Capture and Storage programme**

Sections 9 – 10 of this plan describe the respective programmes in greater detail.

8. Critical Success Factors

8.1. Funding

Availability of funding is a critical enabler of the full SANEDI scope and therefore effective and optimal utilisation of available funding and active development of alternate funding sources are immediate priorities to support delivery requirements. A second priority is securing a longer-term view on scheduled/committed funding to enable capacity building, ramping up of activities with longer durations and the ability to offer career opportunities that will attract more high calibre talent (also a critical success factor).

The operationalisation of SANEDI in April 2011 coincided with the first fiscal budget allocation to SANEDI. This initial funding is adequate for a small complement of core staff members and limited operational expenses, but does not currently provide for any significant project/research costs, technology innovation, capacity building initiatives, establishment of facilities, etc. The current mechanism also does not allow for any long-term commitments that will enable skills retention.

An appropriate mechanism for the allocation of public funding is under investigation and until resolved it is proposed to use the energy vote through the Appropriation Act to fund SANEDI.

Based on a preliminary assessment of options and best practice, it is recommended that:

A. The DoE develop an Energy Technology Innovation Policy that is supported at an inter-ministerial level

B. It is proposed that a National Energy Fund, through a monies bill, be created which will be used to support all aspects of the energy innovation cycle. This fund can be used to undertake:

- Basic energy research
- Application research and demonstration as a portfolio of technology options
- Energy Technology diffusion which supports national socio-economic upliftment goals through the creation of sustainable job opportunities, supports diversification of our energy supply and promotes a shift to lower-carbon technologies

The public component of SANEDI's funding would then be an appropriate allocation from the proposed National Energy Fund. But, as shown in Figure 7, investments from non-Government sources are important and increasingly so towards the back-end of the innovation value chain.

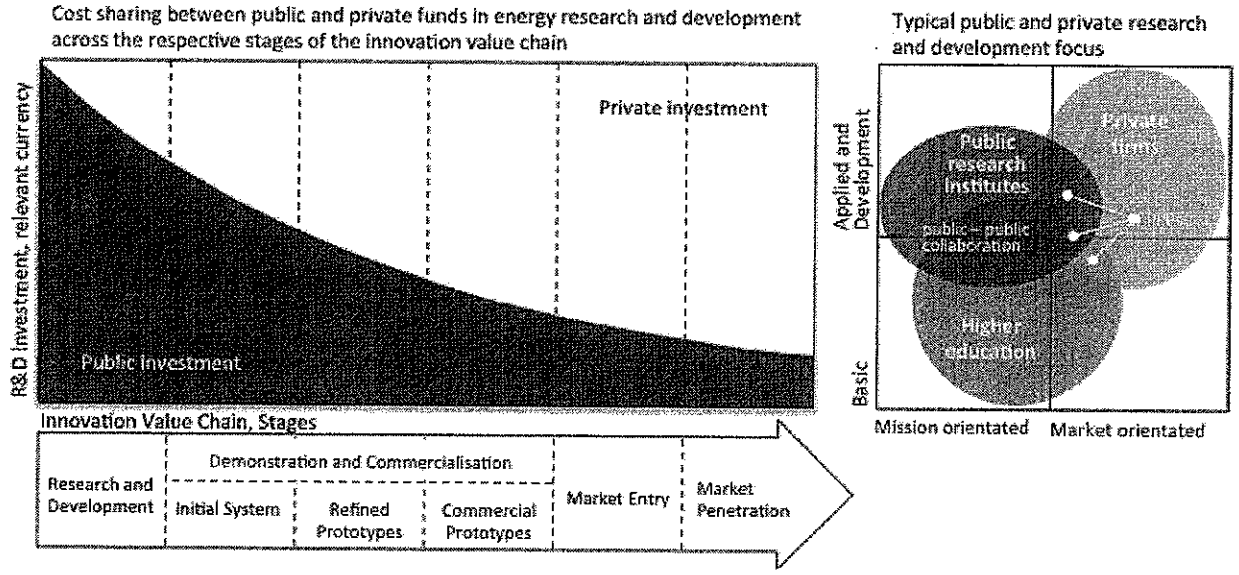


Figure 7: Public and Private contributions to R&D, OECD Innovation Policy Reviews (2010)

It is further proposed that the fiscal budget allocation, through the medium term expenditure framework (MTEF) for the **next financial year, remains relatively modest**, but be aligned to the critical needs and current and growing capacity of SANEDI. It will be important however, that a **commitment for an exponential increase of funding is obtained for the immediate future**, to facilitate a ramping up of the pipeline of initiatives with development of corresponding talent and capacity that can support effective delivery on the stated strategic outcomes.

8.2. Skills and capacity

Having access to appropriate skills and human capital is critical to SANEDI's successful contribution to energy development in South Africa. Insufficient delivery capacity to coordinate and implement the comprehensive portfolio of programmes may hamper the delivery of the SANEDI outcomes. Being able to recruit and maintain suitable talent in sufficient numbers will be a critical success factor (tied closely to available funding).

8.3. Execution capacity

A critical and immediate priority for SANEDI will be to strengthen the necessary execution capacity i.e. organisational structures, operating models and processes that can support and coordinate the rapidly expanding, diverse portfolio of SANEDI activities.

8.4. Policy environment and governance structures

As policy direction will serve as the primary guideline to focus SANEDI's research and efforts, an unambiguous policy environment is critical to ensure on-going alignment with national priorities. A conducive policy environment, such as specific provisions under an Energy Technology Innovation Policy as example, will further serve to optimise the benefits to the energy sector and national economy and environment.

Part B: Strategic Objectives

This section describes SANEDI's six priority programmes for the five years from 2011/12-2016/17 to achieve the set goals described in the preceding section.

The carbon intensity of the economy can largely be decomposed into two basic elements: (1) energy intensity, defined as the amount of energy consumed per dollar of economic activity; and (2) carbon intensity of energy supply, defined as the amount of carbon emitted per unit of energy. The formula below represents a simplified version of the Kaya Identity[13].

$$Energy\ Intensity\ x\ Carbon\ Intensity\ of\ Energy\ Supply = Carbon\ Intensity\ of\ the\ Economy$$[14]

or, algebraically,

$$\frac{Energy}{GDP}\ x\ \frac{CO_2}{Energy} = \frac{CO_2}{GDP} \quad \longrightarrow \text{equation A}$$

The multiplication of the two elements produces a composite indicator of South Africa's carbon intensity, defined as the amount of carbon dioxide emitted per Rand of economic activity.

SANEDI's strategic outcomes, described in the preceding section, and programmes, described in the subsequent paragraphs, are targeted at reducing energy intensity (improved energy efficiency, optimal application of energy, green industry stimulus and capacity development) i.e. achieving a reduction in term 1;

$$\frac{Energy}{GDP} \quad \longrightarrow \text{term 1}$$

reducing the carbon intensity of energy supply (term 2) (promotion and development of clean energy solutions, mitigation of CO_2 from existing energy sources, development of green fuels and optimal supply infrastructure);

$$\frac{CO_2}{Energy} \quad \longrightarrow \text{term 2}$$

the combination of which should have a resultant reduction in the carbon intensity of the economy (term 3).

$$\frac{CO_2}{GDP} \quad \longrightarrow \text{term 3}$$

Strategic objectives for the respective programmes will aim to tangibly contribute to or support the reduction of one or more of the above terms.

[13] The Kaya Identity, developed by Japanese energy economist Yoichi Kaya and used by the IPCC for scenario planning, expresses CO_2 emissions from fossil fuel as a product of population, GDP per capita (income level), energy per unit GDP (energy intensity) and CO_2 per unit energy (fuel mix). Our assumption is that SANEDI's mandate does not extend to curbing population growth, hence the stated reduction of the formula.

[14] Equation from "Navigating the numbers: Greenhouse Gas Data and International Climate Policy – Part I", published by the World Resources Institute (WRI), December 2005.

It should be noted that some of the sub-programmes are currently under review by the SANEDI Board, but have not yet been approved. Where relevant, these programmes are indicated as **'Proposed'** in this plan.

9. Programme 1: Applied Energy Research Programme

During the coming decades, there are likely to be major changes in energy systems throughout the world as efforts are made to meet the growing demand for affordable energy and reconcile energy demand with the need to effectively address climate change. South Africa is faced with finding suitable solutions to supply a rapidly growing population with energy and to support essential economic development in ways that are economically, environmentally and socially acceptable.

Fostering research in the energy sector will undoubtedly be an important step towards developing suitable solutions for our country.

The **purpose** of the applied research programme is effectively **knowledge creation** (Note knowledge creation includes: technology adaption through localisation, learning, technology cost reduction and technology risk reduction secondary issues relate to beneficiation of raw materials, job creation and creation of secondary support industries) that can support and inform energy-related planning and decision-making by all stakeholders. The applied research programme is therefore primarily focussed on developing a portfolio of confirmed **viable** (cost effective and low risk) and **sustainable** energy solutions - aligned with Government goals of energy security, energy sector transformation and diversification, economic development and environmental protection - that can confidently be incorporated into national plans and policy processes.

This programme contributes directly to SANEDI's Strategic Outcome Goal 1: Enable well informed and high confidence energy planning, decision-making and policy development.

With consideration to limited resources, SANEDI Applied Research's research programme has been structured to correspond with **four priority thematic areas/divisional portfolios** for energy research and development as informed by national policy direction:

Table 4: Direct SANEDI Applied Research thematic area correlation with national policy direction

SANEDI Applied Research Thematic Areas	IRP 2010	IPP 2	NEMP 2013	SAWEF 2008	RE Vision	Energy 2007	Draft EE Plan	Energy 2008	Energy Vision	Energy 2007
Advanced Fossil Fuels	☐	☐		☐			☐	☐		
Clean Energy Solutions	☐	☐	☐		☐		☐			☐
End User Interface (including smart grids, energy storage, distributed generation, EV smart grids and fleet infrastructure)	☐	☐	☐	☐	☐			☐		☐
Green Transport		☐		☐			☐			

The respective **divisional portfolios/thematic** areas **correspond with the** applied research programme (and sub-programmes) as follows:

Applied Research Programme and Sub-programmes	Advanced Fossil Fuels	Clean Energy Solutions	End User Interface	Green Transport
Carbon Capture and Storage	▯ (CCS)			
Clean Coal Technology Research	▯ (CCT)			
Clean Energy Solutions		▯		
Clean Oil and Gas Research**	▯ (COG)			
Energy Efficiency Research Centre*			▯	
Energy systems infrastructure research programme**		▯ (Energy Storage)	▯ (Smart Grids)	▯ (EV Smart grids + Fleet infrastructure)
Green transport research programme				▯
International Cooperation Programme	▯	▯	▯	▯

COG: Clean Oil and Gas; CCS: Carbon Capture and Storage; CCT: Clean Coal Technology; EE: Energy Efficiency; EV: Electric Vehicles

The relevance of the listed legislative and policy instruments to SANEDI are detailed in Appendix B to this plan, but the brief overview below emphasises the significance of energy research as identified in a few of the relevant publications and/or the motivation for the selection of the four priority thematic areas.

Table 5: Research priorities as Policy

Policy	Description of relevance
Integrated Resource Plan (IRP) 2010	The IRP 2010 **identified a specific research agenda** for the next IRP which included distributed generation, smart grids, off-grid generation, harnessing of South Africa's coal resource as well as technology options that relate to energy efficiency demand side management, biomass and energy storage. **These agenda items correspond directly with the priority research areas within SANEDI.**
Long-Term Mitigation Scenarios (LTMS), 2008	The LTMS strongly emphasises, technology development along-side investment and policy interventions, as key to an appropriate response strategy. The LTMS indicates the need for wider deployment of existing climate-friendly technology, together with commercialisation of emerging technologies and **spending at scale on research and development of new technology.**
White Paper on Renewable Energy, 2003	The white paper calls for the **promotion of appropriate research and development** and local manufacturing **to strengthen renewable energy technology and optimise its implementation.** It further more emphasises the importance of monitoring on-going research and development programmes and identifying additional investigations and demonstration projects that would assist in the development and optimisation of renewable energy systems. Specifically research and development of cost effective energy storage systems utilising renewable energy are to be encouraged.
DST 10 year innovation plan	The 10-year innovation plan identifies both energy security and climate change as grand challenge areas. The plan most notably states: "the race is on for safe, clean, affordable and reliable energy supply, and South Africa must meet its medium-term energy supply requirements while innovating for the long term in clean coal technologies, nuclear energy, renewable energy and the promise of the "hydrogen economy"." These identified priorities correspond closely with the advanced fossil fuels, biomass, clean energy solutions and green transport research areas.
National Energy Efficiency Strategy, 2008	The vision of the strategy is to contribute to affordable energy for all, and to minimise the effects of energy usage on health & the environment. Besides energy efficiency, it also includes reference to renewable energy and the clean fuels

Policy	Description of relevance
(revision 1)	programme. The strategy identifies SANEDI Applied Research (previously SANERI) to carry out a dedicated R&D programme in support of national energy efficiency targets.
White Paper on Energy Policy, 1998	Identifies the need for an integrated, multi-year, national, needs-driven, energy research strategy.
Energy Security Master Plan for Electricity, 2007	The Master Plan identifies **focused research and development** as a **key enabler** for meeting technical performance and capacity expansion objectives and states that electricity/energy-based technology development and innovation is **imperative to productivity and growth of the country**.

A second focus of the applied research programme is on establishing and maintaining **strategic partnerships and cooperative arrangements** in the energy sphere with other research institutions and Government agencies both in South Africa and abroad to promote energy research, demonstration and implementation of technologies.

In view of the global nature of the challenges at hand and global developmental and climate change commitments, international organisations have significant interest in energy developments within developing countries. For this reason, international knowledge sharing and assistance, both financial and advisory, is readily on offer.

But collaboration also extends to national partnerships and sharing of responsibilities between the private and public sector.

The research cooperation/collaboration sub-programme is therefore focussed on creating local and international partnerships to leverage funding, research facilities and share knowledge to accelerate technology development and innovation in the respective thematic areas.

To optimise collaboration and all available resources, a Centre of Research and Development (CORD) structure has been selected. This interface with industry and stakeholders will provide capability for common ground research in an industry partnership arrangement. It is expected that most research activities (programmes and initiatives) will be transitioned into the CORDs within the next two years. The likely exception will be ring fenced programmes, which are those programmes 100% externally funded, but overseen by SANEDI.

Initially, research will be undertaken in partnership with universities under the auspices of the Centres of Research and Development. However, in areas where no capacity exists at universities, SANEDI will establish and undertake in-house research.

9.1. Strategic objectives

Unless proven to be cost-competitive, safe and effective, the adoption of innovative, cleaner energy technologies and systems will either be limited or driven by policy. Research and demonstration is thus needed to reduce costs, risks and learning curves associated with uncertainty and to encourage adoption.

Significant opportunity exists for adaptation of internationally available technology. In this context, applied research would focus on appropriate technology transfer and localisation for South African conditions and application. A critical

aspect of effectively absorbing 'foreign' technology and developing local technological capacity is learning and development of local scientific and technological knowledge. An appropriately structured applied energy programme presents an invaluable opportunity for learning by doing, using and interacting with the technologies of interest, and ultimately job creation in the green energy sector.

The programme objective is therefore to focus public funded research and development on reducing technology risk, reducing technology cost and increasing societal value by increasing the deployment of clean technology options, quantified as follows:

Strategic Objective 1.1	**Knowledge creation in the energy sector in support of policy direction**
Objective statement	Develop a portfolio of demonstrable, cost-effective, sustainable energy options with an emissions intensity of less than 40 gCO_2/MJ that have the potential to increase the low carbon content of the South African energy mix by 5% (225 million GJ/a) by 2020 (refer equation A, term 2, Section 8 of this plan))
Baseline	South Africa's GHG inventory is under review and hence recent emissions data, as reported by the Department of Environmental Affairs (DEA), is sourced from the UN with 2008 data the most recent. Similarly now recent Total Primary Energy Supply (TPES) data is available for South Africa. The reference data for the current energy mix has therefore been based on TPES and Carbon Emissions reported by the International Energy Agency and UN statistics respectively for 2008 as base year. Carbon intensity has remained roughly consistent since 1997 with carbon-based energy closely following economic growth; hence any error is likely to be marginal. The 2008 figures indicated a **current carbon intensity of 77 gCO_2/MJ**, mainly ascribed to the high reliance on coal as primary energy source. SANEDI's portfolio of solutions will **however be measured relative to the portfolio itself**.

The identified Research and Development portfolios (sub-programmes) relating to Clean Energy Solutions (renewable and alternative energy), Carbon Capture and Storage[15], Clean Coal Technology and Clean Oil and Gas have the potential to contribute significantly to reducing the carbon intensity of the country's energy mix. Renewable energy typically has Life-Cycle Assessment (LCA) emission factors that are below 30 g CO_2/MJ and Carbon Capture and Storage reportedly has the potential to reduce emissions from fossil fuel-based energy sources by 60%. Performance indicators for each of the sub-programmes towards the stated objective are currently being developed.

Advanced, responsive and 'intelligent' **energy systems infrastructure** has been identified as a key addition to the applied research programme. The transition to a Smart Grid will be critical for the successful implementation and management of a diversified, low carbon energy mix that incorporates intermittent supply from renewable energy sources, distributed generation and energy storage. An intelligent energy delivery system is further essential to support new innovations (products and services), new infrastructure requirements (e.g. electric vehicles), the growing digital economy, improved energy management and effective and efficient energy usage.

Smart Grids have the potential to contribute to and enable reduced peak demand, improved operational and system efficiency, higher grid reliability and resilience, lower carbon emissions and higher economic productivity from integration of more distributed and renewable generation. As such, an intelligent energy systems infrastructure is a **vital enabler** of a low carbon economy.

[15] 60%+ reduction in CO2 emissions demonstrated in the UK

Strategic Objective 1.2	**Intelligent energy systems infrastructure**
Objective statement	Finalise an accepted, comprehensive National Smart Grid 2030 vision with tangible system benefits[16], and define SANEDI's role and mandate towards realising this vision by 2012.
Baseline	Baseline relative to zero. Tangible system benefits to be defined relative to appropriate baselines.

SANEDI's role with respect to developing a Smart Grid vision and accelerating the deployment thereof in South Africa requires consideration. Industry activities are currently fragmented across 174 municipal distributors and Eskom and driven by legal obligations and market imperatives. As an independent Energy Development Institute, SANEDI is well positioned to play a lead role, providing macro structure and direction to a comprehensive, coordinated national initiative. Alternatively, SANEDI's role may be limited to providing critical research support services to the industry with direction setting and strategy developed elsewhere (currently largely absent).

Increased expenditure on R&D in relation to GDP is a good indication of the competitiveness of a country's economy. The third objective therefore relates to **optimised** research investment in the energy sector:

Strategic Objective 1.3	**Optimised energy research investments**
Objective statement	Consolidate energy related public spend for research and innovation and pursue increased overall energy research investments (nationally and internationally) to correspond with the goal of 1,5% of GDP (R5.6bn/annum for the energy sector) by 2014[17] of which 30% (R1 864 800 000/annum) (i.e. 0.5% of GDP for the energy sector) to be invested from public funds.
Baseline	The most recent full National Survey of Research & Experimental Development report (produced by the Human Science Research Council) available is for 2007/08. The report shows that total R&D spend in the energy sector (resources and supply) amounted to R1 074 767 000. Of this, the Government (including science councils) contribution in this sector was reported as R53 143 000.

A relevant and critical research portfolio that delivers tangible benefits and conclusive outputs will be an important justification for increased research investment. Optimisation will further depend on effective leveraging of international funding and private partnerships.

Besides optimisation of research investments, a strong co-operative approach and strategic international collaboration will also contribute to the optimal use of other scarce resources such as expertise and facilities. SANEDI already facilitates several established partnerships, bi-lateral or multi-lateral agreements (e.g. IEA and REEEP) and regional multi-technology frameworks (e.g. EU Framework Programme). But, this service to the energy sector can be significantly enhanced with the development of a national strategy for collaboration and broadening of co-ordinated research, joint projects, information exchange, modelling databases and capacity building.

[16] Suggested contributions may be structured as: a 20% reduction in South Africa's electricity peak demand, 100% system availability for critical loads, 40% improvement in system efficiency and asset utilization (to achieve a load factor of 70%) and incorporate 9% electricity capacity from distributed and renewable energy sources.

[17] South African Science and Technology Minister Naledi Pandor said President Jacob Zuma wanted spending on research and development to reach 1.5% of GDP by 2014 http://www.southafrica.info/about/science/research-090910.htm.
Energy Sector contributes about 15 percent of GDP ($357.3 billion (2010 est.) (CIA Factbook official exchange rate)) and employs about 250,000 people according to http://www.nationsencyclopedia.com/economies/Africa/South-Africa.html and http://www.southafrica.info/business/economy/infrastructure/energy.htm.

As with technology adaptation, international co-operation also presents an invaluable opportunity for learning and capacity and skills development from sharing facilities and expertise.

The fourth objective is therefore to establish and implement a comprehensive and practical strategy for effective international and national collaboration:

Strategic Objective 1.4	**Strong collaborative approach and strategic international collaboration**
Objective statement	Develop, in consultation with key stakeholders, a strategy for international and national collaboration by 2013 that aligns with national priorities and sets clearly defined objectives and milestones. Develop tactical plan and implement to achieve objectives and milestones as defined in strategy.
Baseline	Baselines measured from zero i.e. no existing strategy.

The strategy should furthermore set clear measures of success and criteria for evaluation, both at a strategic level and to guide the structuring of co-operation and partnerships.

9.2. Resource considerations

The table below details the number of projects, maximum number of staff, the budget required to fulfil its mandate and the budget allocated under scenario 4. The table highlights the resources required for the realisation of this programme and the related strategic objectives:

Applied Research Programme	Number of Projects	SANEDI team members	Budget Required (2012/13 - 2016/17)*	Budget allocated under scenario 4 (2012/13 - 2016/17)*
Carbon Capture and Storage	3	5	R213 980 338	R15 300 000
Clean Coal Technology Research	4	6	R139 230 553	R3 000 000
Clean Energy Solutions	8	4	R163 025 670	R10 000 000
Clean Oil and Gas Research**	4**	5**	R46 953 717	R0
Energy systems Infrastructure research programme**	10**	75**	R1 210 186 055	R15 000 000
Green transport research programme	4	3	R56 398 606	R10 400 000
International Cooperation Programme	3	1	R7 753 477	R 10 000 000
Total	**38**	**99**	**R 1 862 465 618**	**R63 700 000**

* Although partly approved, the expansion of the EE Hub into a complete Centre of Research and Development is currently under consideration

** Proposed programmes currently under consideration.

Only internal budget requirements are shown. Further firm contributions to the value of R 22.5 million have already been identified from external sources, but hinge on the availability of the above commitments.

The above represents a significant financial investment into applied research over the five-year planning horizon. Combined with the investment requirements across SANEDI's six programmes, the **total research investment requirement approaches R6,2 billion for the planning period.** Although substantial, this still falls short of the targeted 1.5% of GDP per annum and more importantly, it is still almost R3 billion short of the R1,8 billion per year public investment target (even with consideration of other publically funded energy expenditure as reported by the Human Science Research Council).

Several people are currently seconded or appointed on short-term contracts to SANEDI. An opportunity therefore exists to secure/retain their skills and experience if greater certainty with regards to committed future funding can be provided (refer risks below).

It should further be noted that the 75 people indicated for the Energy Systems Infrastructure Research programme are almost all already deployed in the industry and does not require massive capacity building. The intention is rather to transfer or second the necessary people as and when needed and to consolidate and direct their efforts from a national perspective. It should also be noted that this full complement corresponds with a scenario in which SANEDI plays an industry lead role.

The energy research environment has in the past been dominated by research and innovation effort and investments into synthetic fuels and nuclear. More recently a shift has occurred towards clean energy and specifically renewable energy sources and related technologies.

As a result of these obvious priorities and resource limitations, research and innovation investment in **clean coal, oil and gas has been neglected.** An important priority for the 5-year planning horizon is to identify the requirements and priorities for these portfolios and to tailor make a research programme to support advancement also around these energy sources.

SANEDI's Strategic Plan will therefore be broadened to encompass these fuel sources with completion of the anticipated Integrated Energy Plan and Master Plan for Liquid Fuels.

9.3. Risk management

The **five** key risks that may affect realisation of the stated strategic objectives of the applied research programme:

Risk	Risk Description and Proposed Mitigation
Incoherent and unfocussed research activities	Policy Direction will be used as the primary guideline to focus research. Development of a national Roadmap in collaboration with Government, key stakeholders and industry to guide priority focus areas and research needs.
Ineffective research efforts and spend	It is important to formulate the relevant research strategy (followers, leaders or 'Wait & See') for each area. Being a follower often carry less risk and may be a suitable default approach for most of the portfolios to mitigate the risk. Establishing however with certainty that a specific solution, concept or technology is not viable and eliminating it, is in itself valuable. Having a process in place that will enable a conclusive decision and limit the associated investment is therefore important. For this purpose stage gates have been well defined and will be strictly applied.
Limited funding	Although a national R&D investment target of 1.5% of GDP has been communicated, the corresponding private and public funding still has to be made. This may prove particularly challenging with the anticipated 'double-dip' recession. Where possible SANEDI will focus on leveraging international funding to supplement any and all local funding. SANEDI will also focus on effective processes to optimise the benefits associated with a given investment. Prioritisation criteria are to be developed to select and initiate initiatives that best correspond with available funding.
Intellectual Property	A mechanism of ensuring that effective technological transfer of previous and current energy research takes place should be established and as far as possible intellectual property should be retained for national benefit (refer Programme 3 for a more specific mitigation strategy)
Knowledge and skills loss	SANEDI's inability to offer long term employment security and the resulting failure to attract and retain the necessary (and best) skills in the industry has a severe impact in terms of loss of institutional memory/corporate learning, risks of rework and delay in or ineffective delivery and potentially reputational impacts. Longer-term contracts or permanent employment combined with competitive remuneration packages should go a long way towards mitigating this risk.

10. Programme 2: Data and Knowledge Management Programme

Inadequate energy data and energy statistics compromise the country's ability to make critical, clear and coherent energy planning and policy decisions. Energy statistics is also increasingly important from a socio-economic and environmental perspective, particularly with the growing requirement for emission inventories. Policy makers and planners, including the Department of Energy and the National Planning Commission, have in recent months reiterated the challenges associated with not having accurate and updated data available for planning purposes.

Important quality aspects with respect to energy statistics include timelines (duration of data collected, whether data is current), coverage (the extent of data collected), reliability and transparency. Data quality is a measure of the reliability and effectiveness of data, especially in the context of decision-making. High quality data has to be accurate, comparable, timely (current), useable and relevant.

Towards improving the availability and quality of energy data in South Africa, the Department of Energy has initiated the development of a centralised data repository hosted by the department. A data and knowledge management Joint Energy Statistics Task Team (JESTT) has furthermore been established to align efforts, avoid duplication and coordinate data standardisation and quality amongst different entities (DOE, STATSSA, etc.) that are responsible for or own energy data in the country. SANEDI is a key data producer, collector and data processor in the country.

To support the DOE objectives for high quality and increasingly complete energy data, SANEDI's goal is to ensure that technical data collected and produced with SANEDI's sphere of influence is appropriately managed and consolidated, and where appropriate, fed into the DOE centralised database. SANEDI has the capacity and is ideally positioned to assist with data sourcing and development, research, modelling, analysis in support of specific energy related questions that arise. SANEDI is furthermore ideally positioned to disseminate information about the data components within their scope (e.g. renewable energy, meteorological data, energy efficiency technologies, etc.) to support and attract investments, industry growth and a move towards an energy efficient society.

The purpose of this programme is therefore collation, development, processing and disseminating of credible, objective and high quality technical data and information relating to the areas of SANEDI's responsibility. The primary aim is to support national policy commitments (tax incentives, carbon taxes) and planning (IEP, IRP, etc.), but also to inform local developmental planning, investment decisions and to facilitate international reporting requirements.

This programme contributes directly to SANEDI's Strategic Outcome Goal 1: **Enable** well informed and high confidence energy planning, decision-making and policy development.

A Centre for Energy Systems Analysis and Research (CESAR), has been established in South Africa under the auspices of SANEDI on a shared basis between the Energy Research Centre (ERC) at the University of Cape Town (UCT) and the University of Pretoria (UP). This centre was primarily established to develop human capacity with the technical know-how on the mechanics and skills of modelling and planning, using data either available through the centre or supplied by various stakeholders in the energy sector. The skills developed at the centre will be available to support and mentor the various stakeholders in the energy sector on modelling and planning.

In terms of data and knowledge management, SANEDI will play a management, integration, co-ordination quality control and dissemination role. CESAR will be contracted for the operational component, responsible for collecting and maintaining a database of research data for use by various stakeholders and to provide support to Government initiatives relating to energy data collection, energy modelling and planning.

The centre will also collaborate with various international bodies such as the IEA, regarding research on energy data, energy modelling and support on planning and policy development initiatives.

Whilst this current function of CESAR will be on-going, the vision is to evolve this function into a comprehensive Technology Management Centre (TMC) that fully supports the relevant energy data needs of South Africa.

The TMC will incorporate an Energy Data Management Function, a Climate Technology Research Centre, an Energy Economics Unit and an Energy Modelling Unit. The TMC will also incorporate Knowledge Management and Human Capital Development as cross cutting functions.

10.1. Strategic objectives

The objectives of the Energy Data and Knowledge Management programme are to support the Department and industry and to provide a complementary service to any existing data and knowledge management initiatives and as such are defined as:

Strategic Objective 2.1	**Establishment of a Technology Information Management Centre (TIMC) in support of the Department of Energy and industry activities**
Objective statement	Establish a highly competent, independent technology information management centre by 2017 that can adequately support energy related analysis and tracking of progress indicators towards a low carbon economy (refer equation A, Section 8 of this plan)
Baseline	Baseline relative to zero.

The TIMC function will, amongst others, integrate technology data developed and collected and researched across universities, CORDs and also within any of the SANEDI functions or areas into a coordinated whole.

A priority focus of the data and information collection and development function is on the local parameters of these technologies.

A second focus is on building capacity to do energy related economic modelling and specifically macro-economic impacts.

Strategic Objective 2.2	**Develop and maintain a comprehensive, technical data repository with high quality data relating to the areas of SANEDIs focus to feed into the DOE central database**
Objective statement	Compilation and maintenance of a credible and current energy dataset to the adopted IRES standard at an adequate level of disaggregation for the areas and indicators directly under SANEDIs influence (Energy Efficiency, Renewable Energy, Clean Carbon Technology and Clean Oil and Gas, Carbon Capture and Storage, Smart grids, Working for Energy, Tax incentives) by 2013 and thereafter maintain as current and continue to develop in response to national requirements that will feed into the DOE database and meet specific DOE information requirements.
Baseline	Available energy data is fragmented, mostly out-dated and no standard format applied in the past. The baseline will be measured from zero.

Strategic Objective 2.3	**Enhanced access to relevant energy information and knowledge**
Objective statement	Provide appropriate (in a suitably controlled manner to protect confidentiality commitments) access and disseminate available energy data to a broad range of users as soon as possible and sustained over the planning horizon for information relevant to SANEDI's area of focus. (support industry activity, development and investment by making available appropriate information related to SANEDI programmes and areas of focus
Baseline	Requires the consolidated dataset (refer above) to be established and performance indicators to be defined.

The initial focus for objectives 2.2 and 2.3 will comprise of three components:

- Define a comprehensive data collection, tracking and monitoring framework for the relevant areas in South Africa. Establish a repository that is independently owned, objective and credible and designed to the adopted IRES standards and which can feed into the DOE central database where relevant.
- Collate and track energy data related to the defined framework with a high level of completeness and high level of integrity/confidence.
- Have global datasets and reports (specific to SANEDI's areas of activity) available at a central portal for access by all South Africans and potential investors, developers and international organisations. It is anticipates that this information will include solar radiation and wind resource data, industry role-players, energy efficiency opportunities, knowledge management components, job creation opportunities created and current research activity in specified areas.

10.2. Resource considerations

The table below shows the number of projects, maximum number of staff, the budget required to fulfil its mandate and the budget allocated under scenario 4. Critical resources that have been identified for the delivery of the Energy Data and Knowledge Management function during the five-year planning horizon include:

Energy Data Management Programme	Number of Projects	SANEDI Core Employees	Budget required (2012/13 – 2016/17)	Budget allocated under scenario 4 (2012/13 – 2016/17)
CESAR and TMC (with central data repository)	2	23	R103 390 500	R6,723,360
Information Dissemination Programme	1	1	R 5 128 284	R0
Total	**5**	**24**	**R 108 518 784**	**R6,723,360**

10.3. Risk management

The **five** key risks that may affect realisation of the stated strategic objectives of the applied research programme:

Conflict between transparency objectives and confidentiality commitments.	All granular (source specific) data to be protected under a non-disclosure agreement where required. Data managed and shared as a global dataset with access management and security to protect confidentiality.
Data maintenance resource requirements	To maintain a dataset is often as time-consuming and resource intensive as the initial establishment. But, unless the data repository is kept up to date, it will have limited value to the country. SANEDI will have to make us of automation where possible and will have to dedicate resources and infrastructure for

Risk	Risk Description and Proposed Mitigation
	maintenance and on-going development.
Data integrity	Appropriate design, standardisation and quality control measures must be developed and put in place.
Completeness of dataset	Targets for data integrity and completeness must be defined and tracked.
Limited information available (historically a problem)	The status of current available data must first be determined and specific solutions developed for each area of concern.
Non-standardised data formats	An IEA format has been selected as preferred for South Africa and all energy data will be standardised to this format.

11. Programme 3: Low energy and carbon intensity technology development, demonstration and commercialisation programme

Innovation is widely touted as the key to long-term economic prosperity. Energy innovation offers opportunity to accelerate economic and net job growth, but also opportunity to improve energy security while significantly reducing greenhouse gas emissions. The purpose of this programme is to promote the development and ultimate commercialisation of viable, low energy and carbon intensity products and technologies through the innovation process and hence realise the associated benefits for South Africa.

This programme contributes to SANEDI's Strategic Outcome Goal 2: Accelerated transformation to a less energy and carbon intensive economy to be achieved through **innovation**.

By actively advancing relevant technologies and initiatives (i.e. those with the potentially greatest return for business opportunities and economic growth, from research through demonstration to final deployment), SANEDI can contribute to the required transformation. SANEDI therefore has a critical role in identifying and accelerating the development (through a scientifically rigorous process) of technologies that can and will contribute positively to Government's goals in terms of job creation, local manufacturing, environmental benefit and social upliftment.

The existing SANEDI structures will apply, but with greater emphasis on progressing relevant research initiatives into later phases of the innovation value chain (i.e. through demonstration to technology diffusion) combined with improved integration with entities focussed on commercialisation and market entry such as the Technology Innovation Agency (TIA), Energy Development Corporation (EDC), ETA Energy or similar.

11.1. Strategic objectives

The aim is to accelerate suitable, sustainable energy technologies and products getting to market, ultimately resulting in commercial rollout and improved economic diversity. SANEDI's role relates to driving ideas through the process to either confirm elimination as early as possible or, if viable, to a demonstrated, verified commercial concept. This requires a progression or continuation of projects with confirmed potential:

Strategic Objective 3.1	**Increase the share of demonstration and commercialisation phase projects in SANEDI's portfolio**
Objective statement	Increase the focus on innovation and demonstration by increasing the share of projects in the portfolio that are in the Demonstration and Commercialisation phase to 40% (currently 32% of the portfolio by number of projects and spend) by 2017.
Baseline	The current portfolio consists of 56 projects of which 38 are in the applied research phase and 18 are in demonstration and commercialisation phases.

It should be noted that although SANEDI supports market entry and penetration of renewable energy and innovative energy efficiency projects, these have not to date come through the SANEDI innovation process. SANEDI's focus will also not be on business incubation and commercialisation, but rather on fostering strategic collaborations with industry role-players and proactively seeking appropriate partners to whom to transfer appropriate technologies for commercialisation. The second objective is therefore:

Strategic Objective 3.2	**Facilitate technology innovation progress to commercialisation**
Objective statement	Transfer one fully-fledged, commercially viable concept for every R500 million spent on Research and Development to TIA or EDC or similar for active business incubation and deployment.
Baseline	Baseline will be measured from zero.

This objective will be achieved by:

- Identifying commercialisation opportunities that have the potential to develop and attract economic activity and investment in South Africa.
- Facilitating the realisation of such energy innovation opportunities by formalising continuation agreements with organisations that offer effective technology commercialisation processes.

11.2. Resource considerations

The table below shows the number of projects, maximum number of staff, the budget required to fulfil its mandate and the budget allocated under scenario 4. The table highlights the resources required for the realisation of this programme and the related strategic objectives:

Key Energy Research Commercialisation Programme	Number of Projects	Staff Complement	Budget Required (2012/13 – 2016/17)	Budget allocated under Scenario 4 (2012/13 – 2016/17)
Facilitated progress to commercialisation programme (pilot and demonstration projects)	18	24	R 865 047 460	R0
Total	**18**	**24**	**R 865 047 460**	**R0**

Again only internal budget requirements are shown. External contributions to the value of R 136.96 million have already been offered and further contributions are being investigated, but are contingent on the demonstrated financial commitment from SANEDI.

11.3. Risk management

The **three** key risks that may affect realisation of the stated strategic objectives:

Risk Description	Proposed Mitigation
Resource (time, money and talent) allocation to non-viable initiatives	Develop a sound understanding of commercially realistic ventures. Recognise the value of eliminating an idea or technology after due, but limited consideration.
Intellectual Property	A mechanism of ensuring effective transfer of energy innovation takes place is to be established through interfaces with TIA, EDC and other similar organisations. Collaborate with the NRF and other stakeholders to put the necessary measures in place that will ensure,

Risk	Risk Description and Proposed Mitigation
	as far as possible intellectual property should be retained for national benefit. The proposed approach will be to register as a listed entity and be gazetted as an IP holding institution under the IRP Act by the Minister of Science and Technology.
Inadequate investment	A certain amount of investment is required to distil out actual opportunities and to progress development to a point where the concept materialises the associated innovation benefits. Continuation of research potential and investment in pilots and demonstration must therefore be prioritised.

12. Programme 4: Green industry capacity building and development programme

The increased focus in diversifying energy supply, transformation, and demand from traditional sources has led to an increased need to learn new skills and develop or adapt to new technologies.

Green industries, and specifically the renewable energy sector tend to be a more labour-intensive energy source than the still-dominant/traditional fossil fuels[18], which rely heavily on expensive pieces of production equipment. A transition toward green industries and renewables thus promises job gains, but also requires an up skilling or reskilling of existing competencies.

Independent reviews[19] revealed chronic shortages of higher skills and underinvestment in research and development. Both of which would need correcting for South Africa to support the level of innovation and technological adaptation that is aligned with the existing and growing socioeconomic and sustainability challenges.

The purpose of this programme is to facilitate capacity development in the country to support the required and anticipated shift in economic activities and to take full advantage of the advertised associated employment opportunities.

This programme contributes to SANEDI's Strategic Outcome Goal 2: Accelerated transformation to a less energy and carbon intensive economy to be achieved through **capacity development**.

12.1. Strategic objectives

Researchers and academically qualified people who perform, manage and guide the process of undertaking research that leads to new knowledge and novel research findings are critical to a successful energy related research programme in South Africa. South Africa has a low base[20] and increasing capacity contributes both to the development of high skills and job creation, therefore an important objective is:

Strategic Objective 4.1	**Growing the pool of active and productive researchers, technicians and support staff**
Objective statement	Actively contribute to strengthening research leadership and capacity and contribute to job creation and skills development by creating 100 additional research positions (i.e. ~25% increase for the sector) (including research chairs, assistant research chairs, fellowships as well as internal research positions) by 2017.
Baseline	The national average has consistently been around 1.4 – 1.5 Full-Time Employed (FTE) researchers per 1 000 employees in a sector according to the latest national survey of R&D activities, undertaken by the Centre for Science, Technology and Innovation Indicators (CeSTII) of the Human Sciences Research Council (HSRC). This is well below the OECD average of 8 per 1,000. Applying the average suggests that the energy sector currently supports ~350 research positions and an additional 100 will increase the sector activity by ~29%. The baseline will however be measured from zero.

[18] In the United States, coal output rose by almost one third during the past two decades, yet employment has been cut in half.

[19] National Advisory Council on Innovation, South African Science and Technology Indicators, 2009; The OECD's Review of South Africa's Innovation Policy, 2007; National Survey of R&D activities, undertaken by the Centre for Science, Technology and Innovation Indicators (CeSTII) of the Human Sciences Research Council (HSRC).

[20] Compared to the OECD average of 8 researchers per 1,000 employees in a sector (OECD's Reviews of Innovation Policy (2007))

The current portfolio of approved programmes as included this plan, is expected to generate 88 new research related positions within, and directly associated to, SANEDI's research and development activities. Achieving the stated objective and making the contribution to the Department of Science and Technology objective is highly likely with this proposed plan.

While research and development jobs are frequently highly specialised and technical, new industries and technologies can have a wide reaching impact requiring a broad range of skills. The second objective therefore relates to mobilising a broader, green workforce. A recent baseline assessment of the current status of and skills requirements for renewable energy and energy efficiency in South Africa has shown that the current education structure and qualifications occupational framework are generally adequate to support the required development of skills. The study furthermore confirmed the likely increase in demand for green skills/jobs corresponding with the shift in the energy sector and economic activity. The recommended approach is therefore to optimally apply the available structures and processes in support of the emerging industry skills shift by playing a mobilisation, acceleration, coordination and industry collaboration role.

Strategic Objective 4.2	**Facilitate the development of a skilled workforce that meets the needs of the changing economy**
Objective statement	Mobilise and coordinate an industry-wide skills development initiative (which should include, amongst others, establishment of a reference and support group for green jobs and skills and a key occupations review process) for energy efficiency and renewable energies that leverages and complements existing frameworks and structures and resolve identified gaps (in support of equation A, Section 8 of this plan).
Baseline	Baseline will be measured from zero.

A third objective will be to proactively pursue the cultivation of permanent employment opportunities as a result of SANEDI's technology development activities:

Strategic Objective 4.3	**Promote job creation through innovation**
Objective statement	Deliver at least 1 permanent employment position for every R1,5 million spent on technology innovation (demonstration and commercialisation innovation stages) until 2017.
Baseline	Baseline will be measured from zero.

12.2. Resource considerations

The table below shows the number of projects, maximum number of staff, the budget required to fulfil its mandate and the budget allocated under scenario 4. The table highlights the resources required for the realisation of this programme and the related strategic objectives:

Programme/Capacity building/Training	Number of Projects	SANEDI Complement	Budget required (2012/13 - 2016/17)	Budget allocated (2012/13 - 2016/17)
Training and skills development Programme (cross cutting)	6	5	R61 162 519	R12,400,000
Total	**6**	**5**	**R61 162 519**	**R12,400,000**

External contributions to the value of R 7.5 million have been committed to this programme pending a demonstrated financial commitment from SANEDI.

12.3. Risk management

The primary risks that may affect realisation of the strategic objectives stated for the capacity building programme:

Risk	Description and proposed Mitigation
Industry demand for 'green' skills	The current demand for green skills has caused competition for scarce skills and raises concerns regarding poaching of newly developed talent. This could possibly be addressed by contractual commitments.
Funding	Although the funding requirement for this programme is comparatively small compared to SANEDI's other programmes, it will be competing against the other programmes for available funds. With funding in short supply, prioritisation and hence a limited allocation presents a risk. This programme has the opportunity, with a limited budget, to serve as industry catalysts, with far-reaching benefits. An external contribution of more than 10% of the public investment has been identified. It is proposed that the contribution of supplemental finding is proactively pursued.

13. Programme 5: Working for Energy Programme

The highest density of low-income households[21] are found in rural areas in South Africa where limited access to infrastructure and hence energy security and affordability are challenging issues. By developing and demonstrating the rural application of labour-intensive energy efficiency and renewable energy technologies, clean energy solutions are deployed coupled with benefits of energy-poverty eradication, green job creation and local economic empowerment.

The purpose of this programme is therefore to stimulate economic vitality, green job creation and an enhanced quality of life in South Africa's deep rural areas.

The Working for Energy Programme is implemented in partnership with the Department of Energy with SANEDI appointed as the Implementing Agent in terms of a Memorandum of Understanding (MOU) with the DOE.

This programme contributes significantly to SANEDI's Strategic Outcome Goal 2: Accelerated transformation to a less energy and carbon intensive economy to be achieved through **job creation**.

13.1. Strategic objectives

Three objectives have been defined for the Working for Energy Programme commensurate with the valuable, pragmatic contributions of this programme:

Strategic Objective 5.1	**Demonstrated increase in employment levels within participating communities.**
Objective statement	Create 400 new full time employment opportunities and 120 000 person days of temporary employment during the five years until 2017 and hence contribute 0.01% (equivalent to 500 new jobs) towards the 5 million new jobs by 2020 targeted by the new growth path.
Baseline	To be measured relative to zero.

Strategic Objective 5.2	**Demonstrated Rural clean energy production and provision**
Objective statement	Establish clean energy and electricity production/generation and supply facilities equivalent to 5MWp and 25 GWh/annum (non-grid solutions) within (rural) communities by 2017 with all associated economic, social and sustainability benefits (refer equation A, term 2, Section 8 of this plan)).
Baseline	To be measured relative to zero.

Strategic Objective 5.3	**Demonstrated Energy Management opportunities**
Objective statement	Develop and demonstrate the rural application of energy efficiency technologies (non-grid and non-conventional solutions) to deliver energy savings of 0.5 MW and 1.5 GWh/annum by 2017 with all associated economic and environmental benefits (refer equation A, term 1, Section 8 of this plan).
Baseline	To be measured relative to zero.

[21] Described as levels D and C in terms of 'Lifestyle Levels' i.e. LSMs 1 – 3 (currently comprises 20% of South African households, but only 4% of income and expenditure)

13.2. Resource considerations

The Working for Energy Programme has already benefited from public, private and international investments to support the active contribution the programme is making to promote green energy, job creation and improvement of quality of life for rural South Africans. Additional resource requirements for the programme for the next five years:

Working for Energy Programme	Number of Projects	Length of programme	Budget Required (2012/13 - 2016/17)	Budget allocated (2012/13 - 2016/17)
Working for Energy Programme (Total)	20	5	R2 266 692 187	R25,000,000
Total	**20**	**5**	**R2 266 692 187**	**R25,000,000**

The Working for Energy Programme has unlocked external investments in excess of R50 million and discussion with interested international donors is continuing. An accrual of funds from the 2011/12 year, based on the lateness of allocation of the funds to SANEDI, results in an internal budget of R20 million for the 2012/13 year. Projects approved under the public tender process undertaken by SANEDI in 2011/12 are to be implemented during the 2012/13 year. This has prompted the request for an accrual of the 2011/12 allocation. The R20 million will also be used to leverage additional funding from local and international donors and/or financiers.

13.3. Risk management

The four key risks that may affect realisation of the strategic objectives stated for the capacity building programme:

Risk	Description and Proposed Mitigation
Funding	As for other programmes, the availability of funding is the most significant risk to the realisation of all programme objectives.
Project Management Capacity	The coordination of the Working for Energy programme is mostly dependent on project management capacity to implement the portfolio of activities and to effect the social benefits.
Technology uncertainty	The Working for Energy programme promotes the introduction/demonstration of new technologies in new technical and often also 'commercial' configurations. There are numerous risks associated with this uncertainty, but these are mostly mitigated by the collaborative approach taken by the programme and communicated status as 'test' or demonstration environment.
DOE direction and programme positioning	Urgent resolution of the preferred position is required.

14. Programme 6: Energy efficiency programme

Low electricity prices have historically been a key inhibitor for energy efficiency and contributed to a wasteful energy culture in South Africa. Unfortunately, these energy habits threaten the sustainability of the environment, natural resources and our planet for future generations. It also means that South Africa's energy productivity is comparatively low. Resource saving and greater utilisation efficiency is therefore of utmost importance.

Globally communities will have to prioritise the conservation of energy, water, materials and land, the comprehensive utilisation of resources and the development of a recycling economy, establishing energy-efficient modes of production, consumption and of urban and rural construction. Energy is intrinsically linked to and interweaved into this list.

The purpose of SANEDI's Energy Efficiency programme is to accelerate a move towards a resource and particularly, an energy (including gas, liquid fuels, electricity and water) efficient society.

This programme contributes to SANEDI's Strategic Outcome Goal 3: Foster a culture of greater efficiency and more rational use of energy.

14.1. Strategic objectives

For SANEDI to play an independent and authoritative role as envisaged by the Department of Energy and to provide full support to the Department with regards energy efficiency in South Africa, a strategic shift in the energy efficiency environment will be necessary.

SANEDI's strategic objectives for the energy efficiency programme therefore include:

Strategic Objective 6.1	**Establish** SANEDI Energy Efficiency **as National Champion**[22] **for Energy Efficiency**
Objective statement	Define SANEDI Energy Efficiency's role to play a central role and for an optimal impact on South Africa's energy culture; develop and implement a plan for SANEDI Energy Efficiency to transition into fulfilling this role comprehensively by 2017.
Baseline	SANEDI Energy Efficiency 's current focus is on complementing and contributing to existing energy efficiency initiatives (which are mainly electricity focused given the current system constraints) in South Africa with its available resources.

Note that the above role definition and plan should also include the **broadening of scope to cover all energy carriers** and not primarily electricity efficiency, as has been the case in the past.

In the **interim, pending the finalisation of the above,** four priority objectives have been defined to effect an immediate change in South Africa's use of energy as follows:

National Government has stated its intent to lead energy efficiency change in South Africa in support of its overall national objectives for the energy sector. Energy efficiency improvements in public facilities present an opportunity to alleviate

[22] 2011 National Council of Provinces (NCOP) Budget Vote speech by the Minister of Energy, Ms Dipuo Peters, MP, Old Assembly Chamber, Parliament, Cape Town

ever-tightening Government budgets, save energy and money, reduce the Government's carbon footprint and demonstrate environmental leadership.

Strategic Objective 6.2	**Energy Efficiency improvements in Public Facilities**
Objective statement	Target an annual reduction in energy consumption by 250 GWh and GHG emissions by 250 tCO_2e in public facilities by 2017 (refer equation A, term 1, Section 8 of this plan).
Baseline	Baseline consumption data will be determined as part of the Measurement and Verification process, but based on initial estimates these savings should correspond to 20% efficiency improvement for the sector as targeted by the National Energy Efficiency Strategy, 2008.

High frequency communication, repeat messaging through all available channels and public education is essential to achieve a change in the energy culture towards greater conservation and more rational use of energy.

Strategic Objective 6.3	**Create large-scale awareness of energy efficiency and market demand for energy efficient and green technologies**
Objective statement	Improve general awareness levels** across all sectors by 5% by 2015 relative to 2012 (in support of equation A, term 1, Section 8 of this plan). **define awareness scope i.e. recognition of the need to save energy, how to save energy, etc.
Baseline	Baseline survey of awareness levels to be completed during 2012

Priority programmes identified by Government such as appliance standards and labelling will form part of this continual reinforcement of messaging and education towards more efficient purchases and practices.

Strategic Objective 6.4	**Create market demand for energy efficient and green technologies**
Objective statement	Achieve a 10% real increase (over and above existing trends) in sales of energy efficient and green technologies by 2017 (in support of equation A, term 1, Section 8 of this plan)
Baseline	Baseline survey of sales for indicator technologies (indicator technologies to be defined)

Although this service is considered an intrinsic part of ANEDI Energy Efficiency's intended role as Government energy efficiency implementation agency in South Africa, the expedited establishment of the support function to this progressive Act is therefore listed as a specific objective:

Strategic Objective 6.5	Support the Income Tax Amendment Act section 12i and 12 l relating to the tax rebate for energy efficiency improvements
Objective statement	Establish the capacity to support the certification of energy savings for tax reduction claims
Baseline	Baseline consumption data will be determined as part of the Measurement and Verification process.

Delivery of this function will contribute significantly to developing a credible, national dataset and hence integration with Programme 2 will be important.

A sixth objective is defined for the continuation of the Energy Efficiency Hub which is an existing commitment that rolled over from SANERI and to which SANEDI is contractually bound. **There is no budget for this programme under the current allocation and R 2 000 000 per annum for 2012/13 and 2013/14 that will be forthcoming from the Department of Science and Technology (DST) is the only funding source expected. The shortfall is R 6 243 600 that SANEDI is under agreement to provide.** The proposed approach will be to enforce significant cost cutting across all current programmes for the 2011/12 financial year to enable a reallocation of funding for this function.

When the current contract for the management of the EEDSM Hub expires, SANEDI intends introducing an EECORD, in line with its CORD programme. The current EEDSM Hub at the University of Pretoria has started to introduce elements of a CORD, through interventions such as construction of additional research laboratories, introducing a broad range of training programmes, support to industry on testing and development and cutting edge research programmes. A revised budget for the EECORD will be developed once the EEDSM hub migrates into the CORD. For now, SANEDI remains committed to supporting the EEDSM Hub and funds received from DST over the next two years will be used to enhance outputs of the Hub and leverage additional funds to accelerate the migration into a fully-fledged CORD.

The performance and outcomes of this function will therefore also be tracked and reported on.

Strategic Objective 6.6	**EEDSM Hub (Research centre)**
Objective statement	Continue the Energy Efficiency Hub initiative to strengthen energy related researches, human capacity development, and market transformation and enterprise development initiatives that will be tracked against a comprehensive existing set of KPIs with the following targets by 2014/15: Number of journal publications: 16; Number of conference papers: 26; Number of registered students: 105; Number of Graduates: 27; Number of modules/short courses offered: 45; Number of externally funded projects: 40; External funding: R3.1m; Female student ratio: 21%; PDI ratio: 55%.
Baseline	Comprehensive set of KPIs with baseline performance for 2012 as follows: Number of journal publications: 13; Number of conference papers: 20; Number of registered students: 90; Number of Graduates: 21; Number of modules/short courses offered: 45; Number of externally funded projects: 30; External funding: R2m; Female student ratio: 18%; PDI ratio: 40%.

14.2. Resource considerations

The table below shows the number of projects, maximum number of staff, the budget required to fulfil its mandate and the budget allocated under scenario 4. The table highlights the resources required for the realisation of this programme and the related strategic objectives:

Energy Efficiency Programme	Number of Projects	SANEDI team members	Budget required (2012/13 – 2016/17)	Budget allocated (under scenario 4 2012/13 – 2016/17)
Establishment of SANEDI Energy Efficiency as National Energy Efficiency Champion	1	3	R5 000 000	R0
Efficiency Improvements in priority sectors	3	4	R18 000 000	R6,768,744
Energy Efficiency Advocacy Programme (excluding campaign)	3	8	R16 000 000	R2 000 000
Communication Campaign **	Media portfolio	1	R915 765 000	R0
Energy efficiency research centre	2*	1*	R24 937 200	R16 016 256***
Total	**8**	**16**	**R960 165 000**	**R24,785,000**

*Although partly approved, the expansion of the EE hub into a complete Centre of Research and Development is currently under consideration

** The proposal for a comprehensive media campaign is currently under review by the SANEDI Board

*** R3.1 million generated from saving in the 2011/12 year will be paid to the hub

Only internal budget requirements are shown. Further contributions to the value of R 225 million from external sources have already been earmarked with a promise of further contributions, but all depending on the availability of 'match funding' from SANEDI.

14.3. Risk management

The **five** key risks that may affect realisation of the stated strategic objectives of the applied research programme:

Risk	Risk Mitigation Plan
Insufficient funding	Operationalisation of ANEDI Energy Efficiency, implementation of extensive energy efficiency interventions and especially high impact, high frequency communication and awareness activities requires substantial funding. Activities and the resultant impact will be adjusted commensurate with available funding. Partnerships and available resources (material, expertise and co-funding) will be leveraged for optimal reach and impact towards achieving the desired culture change in South Africa.
Stakeholder collaboration	Energy efficiency communication and implementation efforts are intensifying, but are currently fragmented. While increased involvement contributes to the momentum required to effect change, it also increases the risk of conflicting messaging and sub-optimal application of available resources. It would therefore be important to facilitate collaboration and where possible, to coordinate and consolidate efforts to achieve a coherent effort in the country.
Role clarity and mandate	In order for ANEDI Energy Efficiency to play For SANEDI to play the leading, independent and authoritative role envisaged by the Department of Energy and to provide full support to the Department with regards energy efficiency in South Africa, a strategic shift in the environment will be necessary.
Skills shortage	A shortage of suitable skills and resources may negatively impact delivery on objectives. With the increased focus on energy efficiency in the country, the competition for competent and experienced

Risk	Risk Description and Possible Mitigation
	people is strong. Capacity building within ANEDI Energy Efficiency will require specific attention i.e. recruitment and development of appropriate knowledge, skills and experience coupled with appropriate compensation structures. It may be necessary to investigate outsourcing strategies where relevant. Alternatively it may be possible to provide support to Energy Services Companies (ESCO's) for development of their internal capacity and capabilities.
Measurement and Verification	Having adequate and standardised feedback mechanisms to monitor progress will add to costs (up to 10% of project implementation costs), but are essential to track performance. M&V will be

Part C: Links to other plans

15. Links to the long-term infrastructure and other capital plans

The Department of Energy is not directly responsible for energy sector infrastructure development and as such SANEDI does not link into a long-term infrastructure plan.

16. Public-private partnerships and donor funding

SANEDI is not currently part of any formal Public Private Partnerships[23] as defined by South African law. SANEDI does, however, intend pursuing the establishment of such partnerships, particularly with metropolitan councils and municipalities involvement. In such a case, a Public Public Partnership model will be explored to allow the local government institution to provide a concession to SANEDI to develop key projects in their jurisdiction. Working for Energy projects are good examples of projects involving possible Public Public Partnerships. In the case where a private management company is required to operate a facility allocated to SANEDI on a concessional basis, SANEDI intends establishing a Public Private Partnership to manage such a relationship. SANEDI will also pursue the leveraging of funds from local and international partners and donors to implement key projects. SANEDI currently manages the following strategic partnerships with private entities and global organisations:

Partnering entity	Description of partnership	Value of partner contribution	Status	Commitment Period
Swiss Development Agency *	Energy Efficiency M&I partnership	R13 950 000 over period	Active	2010/11 – 2014/15
REEEP*	Hosting of Regional contact centre on behalf of REEEP programme	R700 000/annum	Active	Under review
Industry Partners for SACCCS **	Financial and other support / collaboration from Sasol, Eskom, Alstom, Anglo Coal, PetroSA, Total, Xstrata, UK, Norway and AFD, amongst others.	R5 700 000/annum	Active	2009/10 – 2013/14 (ending during this 5-year period)
AFD Technical Advisory Facility*	Partnership with AFD to provide a technical advisory facility to support an AFD-funded Green Loan initiative for South African Banks	€ 700 000 over three years	Pending	2012/13 – 2015/16 (ending during this 5-year period)
Several communities via the Working for Energy Programme	Partnerships are tailored for each project	Varies	Active and pending	On-going

* donor funded

** mixed funding (donor and PPP)

[23] http://www.ppp.gov.za/

17. Appendix A: Technical Indicator Descriptions for Strategic Outcomes

Table 6: Technical indicator description for Strategic outcomes

Indicator Title	.Identifies the title of the strategic outcome oriented goal, objective or programme performance indicator
Short Definition	Provides a brief explanation of what the indicator is, with enough detail to give a general understanding of the indicator
Purpose/importance	Explains what the indicator is intended to show and why it is important
Source/collection of data	Describes where the information comes from and how it is collected
Method of calculation	.Describes clearly and specifically how the indicator is calculated.
Data limitations	Identifies any limitation with the indicator data, including factors that might be beyond the department's control
Type of indicator	Identifies whether the indicator is measuring inputs, activities, outputs, outcomes or impact, or some other dimension of performance such as efficiency, economy or equity
Calculation type	Identifies whether the reported performance is cumulative, or non-cumulative
Reporting cycle	Identifies if an indicator is reported quarterly, annually or at longer time intervals
New indicator	Identifies whether the indicator is new, has significantly changed, or continues without change from the previous year
Desired performance	Identifies whether actual performance that is higher or lower than targeted performance is desirable
Indicator Responsibility	Identifies who is responsible for managing and reporting the indicator

17.1. Applied Research Programme: Technical Indicator Descriptions

Indicator Title	**1.1 Knowledge creation in support of policy direction**
Short Definition	Development of a portfolio of demonstrable, cost-competitive, sustainable energy options with an average emissions intensity below 40g CO_2/MJ that has the potential to increase the low carbon content of the South African energy mix by 5% (225 million GJ/a) by 2020.

Purpose/importance	The programme objective is to focus public funded research and development on reducing technology risk, reducing technology cost and increasing societal value by increasing the deployment of clean technology options. The indicator is intended to demonstrate that viable alternate energy options are available with the potential to reduce the carbon intensity of energy supply in the country.
Source/collection of data	Baseline relative to zero. Tangible system benefits to be defined relative to appropriate baselines.
Method of calculation	• For renewable and alternate/clean energy sources: A LCA emissions factor x annual energy potential for the technology/solution. • For carbon mitigation solutions: A relevant, demonstrated emissions reduction x the scope of mitigation impact.
Data limitations	Indicative emissions factors are published by the IEA, but limited information exists regarding local emission intensities. Emission intensities and potential may also be an output of the research and hence challenging to predict the actual contribution potential and to manage the delivery of the targets.
Type of indicator	Measures the emissions intensity of energy supply for the specific portfolio and the potential impact on the overall energy mix. .
Calculation type	Cumulative.
Reporting cycle	Annually.
New indicator	New Indicator. Benchmarking of the targeted emissions intensity was done against 2008 CO_2 emissions and TPES data. South Africa's GHG inventory is under review and hence recent emissions data, as reported by the Department of Environmental Affairs (DEA), is sourced from the UN with 2008 data the most recent. Similarly now recent Total Primary Energy Supply (TPES) data is available for South Africa. The reference data for the current energy mix has therefore been based on TPES and Carbon Emissions reported by the International Energy Agency and UN statistics respectively for 2008 as base year. Carbon intensity has remained roughly consistent since 1997 with carbon-based energy closely following economic growth; hence any error is likely to be marginal. The 2008 figures indicated a **current carbon intensity of 77 gCO_2/MJ**, mainly ascribed to the high reliance on coal as primary energy source. SANEDI's portfolio of solutions will therefore be measured relative to the portfolio itself.
Desired performance	A portfolio with a lower emissions intensity, but potential to contribute more than 5% to the existing energy mix would be desirable.
Indicator Responsibility	Accountability resides with CEO of SANEDI (sub-programme responsibility resides with the respective senior managers)

Indicator Title	**1.2 Intelligent Energy System Infrastructure**

Short Definition	Finalise an accepted, comprehensive National Smart Grid 2030 vision with tangible system benefits[24], and define SANEDI's role and mandate towards realising this vision by 2012.
Purpose/importance	A transition and modernisation of the South African energy systems infrastructure is critical to support the envisaged low carbon economy. 'Smart grids' offer tangible benefits that can be measured against quantifiable metrics that can form the basis of later definitions of objectives. But, prior to the definition of strategic objectives that relate to the demonstrated performance of smart grids, SANEDI needs to clarify the overall direction and the role for which it takes responsibility in order to measure performance against that. Hence the first step to formulate and clarify this.
Source/collection of data	The indicator is currently a Boolean value, either true or false measured against whether a National Vision has been formulated and finalised by the stated target date and whether SANEDI's expected contribution has been defined.
Method of calculation	• Confirmation of a formally signed off national vision/roadmap, yes or no. • Clearly defined mandate/role in place, yes or no.
Data limitations	The environment and technology is rapidly changing to the point
Type of indicator	Measures outputs.
Calculation type	Non-cumulative
Reporting cycle	Annually.
New indicator	New Indicator.
Desired performance	It will be preferred if a national vision and SANEDI's role can be finalised before the stated timeline.
Indicator Responsibility	Accountability resides with SANEDI's CEO (sub-programme responsibility resides with the relevant senior manager)

Indicator Title	**1.3 Optimised energy research investments**
Short Definition	Consolidate energy related public spend for research and innovation and pursue increased overall energy research investments (nationally and internationally) to correspond with the goal of 1,5% of GDP (R5.6bn/annum) by 2014[25] of which 30% (R1 864 800 000/annum) (~0.075% of total GDP) to be invested from public funds.

[24] Suggested contributions may be structured as: a 20% reduction in South Africa's electricity peak demand, 100% system availability for critical loads, 40% improvement in system efficiency and asset utilization (to achieve a load factor of 70%) and incorporate 9% electricity capacity from distributed and renewable energy sources.

[25] South African Science and Technology Minister Naledi Pandor said President Jacob Zuma wanted spending on research and development to reach 1.5% of GDP by 2014 http://www.southafrica.info/about/science/research-090910.htm.

Purpose/importance	The indicator is intended to demonstrate progress towards the targeted annual research and development investment. R&D investment and activity in a country or sector is a key global indicator of innovation and hence economic competitiveness.
Source/collection of data	GDP as Published by Stats SA of which 15% is attributed to the energy sector. R&D spend for the energy sector as published by the DST (HSRC survey publication) or alternatively, budget information for the relevant research bodies collated by SANEDI for this purpose. A breakdown of the total energy R&D spend into public funded, private sector funded and international funding contributions is required.
Method of calculation	• The total annual energy research and development spend expressed as a percentage of energy sector contribution to GDP, • Public funded energy research and development spend expressed as a percentage of energy sector contribution to GDP, and • Foreign funded energy research and development spend expressed as a percentage of energy sector contribution to GDP (additional metric)
Data limitations	The frequency of the published National Survey of Research & Experimental Development report (produced by the Human Science Research Council) has been reduced recently and the latest full report available is for 2007/08. If this survey data is not available, it may be necessary for SANEDI to collect the data themselves. It is anticipated that a large component of the sector's R&D spend will be consolidated under SANEDI so a good view of the budget information for the sector should be readily available.
Type of indicator	Activity measure
Calculation type	Non-cumulative
Reporting cycle	Annual
New indicator	New indicator
Desired performance	A percentage higher than 1.5% of GDP and greater than 30% contribution from public sources will be desirable. A contribution from foreign sources greater than 10% will also be desirable (10% has been the country and international average for foreign investment in R&D across all sectors)
Indicator Responsibility	Accountability resides with SANEDI CEO (sub-programme responsibility resides with the relevant senior manager and industry-wide data should ideally be reported by the DST and STATSSA respectively) to report this indicator.

Energy Sector contributes about 15 percent of GDP ($357.3 billion (2010 est.) (CIA Factbook official exchange rate)) and employs about 250,000 people according to http://www.nationsencyclopedia.com/economies/Africa/South-Africa.html and http://www.southafrica.info/business/economy/infrastructure/energy.htm.

Indicator Title	**1.4 Strong collaborative approach and strategic international collaboration**
Short Definition	Develop, in consultation with key stakeholders, a strategy for international and national collaboration by 2015 that aligns with national priorities and sets clearly defined objectives and milestones. Develop tactical plan and implement to achieve objectives and milestones as defined in strategy.
Purpose/importance	Strategic cooperation/collaboration through local and international partnerships are critical for the leveraging and sharing of resources, research facilities, expertise and for sharing knowledge to accelerate technology development and innovation.
Source/collection of data	The indicator is currently a Boolean value, either true or false measured against whether the strategy has been developed, a tactical plan is in place and clear measures of success and criteria for evaluation have been defined against the strategy and plan. Subsequent progress will be tracked against these defined measures and criteria.
Method of calculation	Established and operational, yes or no, Tactical plan for implementation defined and agreed, yes or no, Measures and evaluation criteria defined, yes or no
Data limitations	None anticipated
Type of indicator	Measures activity towards a final output.
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	Strategy and tactical plan developed and operationalisation before the target date is desirable.
Indicator Responsibility	Accountability for reporting on this indicator resides with the CEO of SANEDI

17.2. Data and Knowledge Management Programme: Technical Indicator Descriptions

Indicator Title	**2.1 Establishment of a Technology Management Centre**
Short Definition	Establish a highly competent, independent technology management centre by 2017 that can adequately support energy related analysis and tracking of progress indicators towards a low carbon economy.
Purpose/importance	As indicated even within these indicator descriptions, the availability of credible data remains a major challenge. The purpose of this indicator is to measure the progress towards

	establishing an energy data and knowledge management centre with the specified units and functions.
Source/collection of data	The indicator is currently a Boolean value, either true or false measured against whether the TMC has been established and is operational by the target date.
Method of calculation	Established and operational, yes or no, with interim progress measured against a project plan.
Data limitations	The implementation of the centre will be directly related to the availability of resources. The project plan and target date for delivery will therefore be adjusted annually to reflect realistic delivery capacity.
Type of indicator	Measures activity towards a final output.
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	Establishment and operationalization before the target date is desirable.
Indicator Responsibility	Accountability for reporting on this indicator resides with the CEO of SANEDI

Indicator Title	**2.2 Develop and maintain a comprehensive, central data repository with high quality data relating to the areas of SANEDIs focus**
Short Definition	Compilation and maintenance of a credible and current energy dataset to the adopted IEA standard at an adequate level of disaggregation for the areas and indicators directly under SANEDIs influence (Energy Efficiency, Renewable Energy, Clean Carbon Technology and Clean Oil and Gas, Carbon Capture and Storage, Smart grids, Working for Energy, Tax incentives) by 2013 and thereafter maintain as current and continue to develop in response to national requirements.
Purpose/importance	Available energy data is fragmented mostly out-dated and no standard format applied in the past. A comprehensive, relevant and current energy data dataset to inform planning and policy setting have been recognised as critical. This indicator is intended to measure progress towards establishing such a central data repository.
Source/collection of data	CESAR progress
Method of calculation	Will report on CESAR's progress against a framework description of the target dataset
Data limitations	It is anticipated that populating the dataset may present a challenge as information in this sector is notoriously difficult to obtain and historic data most likely does not exist. The extent of the requirements and challenges will only be defined once the dataset framework has

	been designed and the exact data requirements are clear.
Type of indicator	Progress towards a final output.
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	Delivery of a usable dataset prior to the target date will be desirable.
Indicator Responsibility	Accountability for reporting on this indicator resides with the CEO of SANEDI (responsibility for progress reporting will reside with the relevant senior manager and CESAR)

Indicator Title	**2.3 Enhanced access to energy information and knowledge.**
Short Definition	Provide appropriate (in a suitably controlled manner to protect confidentiality commitments) access and disseminate available energy data to a broad range of users as soon as possible and sustained over the planning horizon.
Purpose/importance	Energy and related data are key indicators of global performance and country status. It also serves as key input in national planning and reporting. The intent is to measure how readily accessible important energy related data is to respective end users. An appropriate indicator will however depend on the structure and location of the central repository and an information sharing / dissemination strategy. If this is an online repository, the indicator may be defined in terms of the percentage of time that the website is online, number of visitors or visitors may be requested to complete a short survey to indicate their satisfaction with the service, etc. Alternatively, the indicator may be structured as the number of people that are aware and make use of the dataset.
Source/collection of data	Pending
Method of calculation	Pending
Data limitations	Pending
Type of indicator	Likely to measure activity
Calculation type	Non-cumulative
Reporting cycle	Quarterly
New indicator	Pending
Desired performance	Pending
Indicator Responsibility	Accountability for reporting on this indicator resides with the CEO of SANEDI (responsibility

	will reside with the relevant senior manager)

17.3. Innovation Cultivation Programme: Technical Indicator Descriptions

Indicator Title	**3.1 Increase the share of demonstration and commercialisation phase projects in SANEDI's portfolio**
Short Definition	Increase the focus on innovation and demonstration by increasing the share of projects in the portfolio that are in the Demonstration and Commercialisation phase to 40% (currently 32% of the portfolio by number of projects and spend) by 2017.
Purpose/importance	Innovation is globally seen as an indicator of economic competitiveness – often measured as the number of patents per GDP, etc. In support of innovation in the energy sector in South Africa, SANEDI has taken a strategic decision to stimulate and cultivate innovation by proactively progressing viable initiatives/technologies/solution through the innovation progress and ultimately into the market. The indicator is intended to track the shift in focus / activity from applied R&D towards the front end of the Demonstration and Commercialisation as an indicator of SANEDI's delivery on this objective.
Source/collection of data	Data will be collected from SANEDI's project database.
Method of calculation	Number of active projects in the demonstration and commercialisation stages of the innovation value chain relative to the total number of active projects in the pre-diffusion phases, expressed as a percentage.
Data limitations	An alternative approach would be to assess the progress in terms of spend, but typically demonstration projects are more costly than research projects and is therefore likely to present a skew indication of relative importance/effort.
Type of indicator	Measures activities.
Calculation type	Non-cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	A portfolio share of greater than 40% will be desirable, but only up to approximately 50% as the R&D projects are typically the pipeline /source for future innovation.
Indicator Responsibility	Accountability for reporting on this indicator resides with the CEO of SANEDI (responsibility for progress reporting per portfolio / thematic area will reside with the relevant senior managers)

Indicator Title	**3.2 Facilitate technology innovation progress to commercialisation**
Short Definition	Transfer one fully-fledged, commercially viable concept for every R500 million spent on Research and Development to TIA or EDC or similar for active business incubation and deployment.
Purpose/importance	A further measure to track SANEDI's contribution to encourage energy innovation in the country, while also ensuring continuation of potentially viable commercial ideas by formally transferring them to a relevant entity for further development.
Source/collection of data	Data will be collected from SANEDI's project database, project spend (also from the database) and a record of projects transferred to partnering entities (supported by signed handover certificates)
Method of calculation	Count of projects formally handed over relative to SANEDI's project expenditure to date.
Data limitations	None expected
Type of indicator	Measures outputs.
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	A greater number of projects transferred per comparative spend is desirable.
Indicator Responsibility	Accountability for reporting on this indicator resides with the CEO of SANEDI (responsibility for progress reporting per portfolio / thematic area will reside with the relevant senior managers)

17.4. Green Industry Programme: Technical Indicator Descriptions

Indicator Title	**4.1 Growing the pool of active and productive researchers, technicians and support staff**
Short Definition	Actively contribute to strengthening research leadership and capacity and contribute to job creation and skills development by creating 100 additional research positions by 2017.
Purpose/importance	South Africa's average has hovered around 1.4 – 1.5 full time employed (FTE) researchers for every 1,000 employees in a sector in recent years. The OECD average is around 8 FTE researchers per 1,000 employees in a sector. Improving this ratio has therefore been

	identified as an objective for the country. The intent is to measure the contribution that SANEDI's research and development programme makes towards improving this ratio. A target of 100 new positions has been set, which will represent a 25% increase to the current estimated researcher complement for the sector.
Source/collection of data	Number of additional research related positions within SANEDI and in partnering research entities including research chairs, assistant research chairs and fellowships.
Method of calculation	An audited count of additional internal and associated research related positions.
Data limitations	None expected
Type of indicator	Measures impact.
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	More than 100 new positions would be desirable.
Indicator Responsibility	Accountability for reporting on this indicator resides with the CEO of SANEDI (responsibility for input per CORD will reside with the relevant senior managers)

Indicator Title	**4.2 Facilitate the development of a skilled workforce that meets the needs of the changing economy**
Short Definition	Mobilise and coordinate an industry-wide skills development initiative for energy efficiency and renewable energies that leverages and complements existing frameworks and structures and resolve identified gaps.
Purpose/importance	Current indications are of a natural shift towards green jobs and skills. South Africa furthermore has a well-defined education and skills development structure. It is proposed that the greatest contribution SANEDI can make at this time is to accelerate this natural trend, further stimulate the demand for green skills and to facilitate optimal utilisation of existing structures to achieve the desired level of skills and capacity. This indicator is intended to firstly measure as a Boolean the establishment of an industry-wide skills development initiative with specific tasks.
Source/collection of data	The indicator is currently a Boolean value, either true or false measured against whether the initiative is in place and the specified tasks achieved.
Method of calculation	Established and operational, yes or no.

	Specified tasks delivered, yes or no.
Data limitations	The implementation of the initiative will be directly related to the availability of resources.
Type of indicator	Measures activity towards a final output.
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	Earlier delivery will be desirable
Indicator Responsibility	Accountability for reporting on this indicator resides with the CEO of SANEDI

Indicator Title	**4.3 Promote job creation through innovation**
Short Definition	Deliver at least 1 permanent employment position for every R1,5 million spent on technology innovation (demonstration and commercialisation innovation stages) until 2017.
Purpose/importance	Job scarcity is a major concern for South Africa. The green industry and technology innovation are both theoretically associated with higher employment rates. The intent of this indicator is to ensure that the cultivation of permanent employment opportunities is proactively pursued wherever an opportunity arises.
Source/collection of data	Audited number of jobs and project spend as reported by SANEDI.
Method of calculation	Count of permanent positions created. Reported expenditure (combined spend including funding from external sources) on projects in the commercialisation and demonstration phases.
Data limitations	The target has been set based on the current project database and the projections for new positions associated with pilot and demonstration projects. As actual data becomes available it may be necessary to refine the target.
Type of indicator	Measures impact.
Calculation type	Non-Cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	A greater number of jobs for the same expenditure are desirable.
Indicator Responsibility	Accountability for this indicator resides with the CEO of SANEDI

17.5. Working for Energy Programme: Technical Indicator Descriptions

Indicator Title	**5.1 Demonstrated increase in employment levels within participating communities.**
Short Definition	Create 400 new full time employment opportunities and 120 000 person days of temporary employment during the five years until 2017 and hence contribute 0.01% (equivalent to 500 new jobs) towards the 5 million new jobs by 2020 as targeted by the new growth path.
Purpose/importance	The indicator is intended to show the contribution of the Working for Energy Programme to job creation.
Source/collection of data	Audited number of jobs and person days linked to the programme.
Method of calculation	• Count of permanent positions created • Nuber of person days (permanent and temporary jobs) per year and over the project life cycle.
Data limitations	None expected
Type of indicator	Measures impact
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	A larger number of new jobs over the period is desirable
Indicator Responsibility	Accountability for this indicator resides with the CEO of SANEDI

Indicator Title	**5.1 Demonstrated increase in employment levels within participating communities.**
Short Definition	Create 400 new full time employment opportunities and 120 000 person days of temporary employment during the five years until 2017 and hence contribute 0.01% (equivalent to 500 new jobs) towards the 5 million new jobs by 2020 as targeted by the new growth path.
Purpose/importance	The indicator is intended to show the contribution of the Working for Energy Programme to job creation.
Source/collection of data	Audited number of jobs and person days linked to the programme.
Method of calculation	• Count of permanent positions created • Nuber of person days (permanent and temporary jobs) per year and over the project life cycle.
Data limitations	None expected
Type of indicator	Measures impact

Calculation type	Cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	A larger number of new jobs over the period is desirable
Indicator Responsibility	Accountability for this indicator resides with the CEO of SANEDI

Indicator Title	**5.2 Rural clean energy production and provision**
Short Definition	Establish clean energy and electricity production and supply facilities equivalent to 5MWp and 25 GWh/annum within (rural) communities by 2017 with all associated economic, social and sustainability benefits.
Purpose/importance	The indicator is intended to show the contribution of the Working for Energy Programme to clean energy production and supply.
Source/collection of data	Measured and verified project capacity and energy production data.
Method of calculation	• MWp (or equivalent) capacity installed • GWh (or equivalent) produced • The above will enable CO_2-eq emission reductions to be quantified and reported
Data limitations	None expected
Type of indicator	Measures impact
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	More clean energy capacity and generated energy over the period is desirable
Indicator Responsibility	Accountability for this indicator resides with the CEO of SANEDI

Indicator Title	**5.3 Demonstrated Energy Management opportunities**
Short Definition	Develop and demonstrate the rural application of energy efficiency technologies to deliver energy savings of 0.5 MW and 1.5 GWh/annum by 2017 with all associated economic and environmental benefits (refer equation A, term 1, Section 8 of this plan).
Purpose/importance	The indicator is intended to show the contribution of the Working for Energy Programme to energy efficiency.
Source/collection of data	Measured and verified capacity and energy savings

Method of calculation	• MWp (or equivalent) capacity reduced • GWh (or equivalent) saved • The above will enable CO_2-eq emission reductions to be quantified and reported
Data limitations	None expected
Type of indicator	Measures impact
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	More clean energy capacity and generated energy over the period is desirable
Indicator Responsibility	Accountability for this indicator resides with the CEO of SANEDI

17.6. Energy Efficiency Programme: Technical Indicator Descriptions

Indicator Title	**6.1 Establish** SANEDI Energy Efficiency **as National Champion[26] for Energy Efficiency**
Short Definition	Define SANEDI Energy Efficiency role to play a central role and for an optimal impact on South Africa's energy culture; develop and implement a plan for SANEDI Energy Efficiency to transition into fulfilling this role comprehensively by 2017.
Purpose/importance	The need for energy efficiency in South Africa is so great that a major risk is for SANEDI Energy Efficiency to be involved in too many activities, activities that are too operational or activities that can be better implemented by other role players and as a result that SANEDI Energy Efficiency does not provide the industry lead role that was intended and is essential in the market. The intent of this indicator is to ensure that the operationalisation of SANEDI Energy Efficiency is prioritised and takes a structured approach with appropriate stakeholder buy-in that will ensure SANEDI Energy Efficiency can be effective and make an optimal contribution to the industry.
Source/collection of data	The indicator is currently a Boolean value, either true or false measured against whether NEE SANEDI Energy Efficiency's role and mandate has been defined, a plan is in place for the transition into this role and progress against the plan.
Method of calculation	Established and operational, yes or no, Project Plan for transition defined and agreed, yes or no, Progress against the project plan, i.e. progress on track, yes or no
Data limitations	None anticipated

[26] 2011 National Council of Provinces (NCOP) Budget Vote speech by the Minister of Energy, Ms Dipuo Peters, MP, Old Assembly Chamber, Parliament, Cape Town

Type of indicator	Measures activity towards a final output.
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	Establishment and operationalisation/transition before the target date is desirable.
Indicator Responsibility	Accountability for reporting on this indicator resides with the CEO of SANEDI

Indicator Title	**6.2 Energy Efficiency improvements in Public Facilities**
Short Definition	Target an annual reduction in energy consumption by 250 GWh and GHG emissions by 250 tCO_2e in public facilities by 2017
Purpose/importance	Efficiency improvement for the public sector is a National priority and commitment from Government with targets for efficiency performance set by the National Energy Efficiency Strategy. This programme presents numerous opportunities to demonstrate/show case the benefits and opportunities associated with energy efficiency. As Government Energy Efficiency Agency, SANEDI has been proposed as Programme Manager for the programme. The intent of this indicator is to track progress of the programme towards the stated energy efficiency targets for public facilities.
Source/collection of data	Independently measured and verified project performance data.
Method of calculation	Independently measured and verified project performance data relative to a official baseline established prior to implementation.
Data limitations	None expected, but the programme start date will severely impact the actual delivery towards the national targets (already enormously delayed)
Type of indicator	Measures impact
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	Efficiency improvements greater than the targets would be desirable.
Indicator Responsibility	Accountability for this indicator resides with the CEO of SANEDI

Indicator Title	**6.3 Create large-scale awareness of energy efficiency and market demand for energy efficient and green technologies**
Short Definition	Improve general awareness levels** across all sectors by 5% by 2015 relative to 2012

	**The scope of awareness' still requires an adequate definition i.e. whether it refers to recognition of the need to save energy, understanding of how to save energy, etc. '
Purpose/importance	The intent is to measure the impact of education and communication activities on the awareness levels and behaviour (where possible to link) in the market with the aim of raising awareness and changing behaviour and to improve communication that is ineffective.
Source/collection of data	Independent survey of awareness levels.
Method of calculation	To be defined depending on the scope to be measured.
Data limitations	The quantification of awareness and specifically the impact on actual behaviour and market transformation presents a challenge. The efficacy with which this will be measured will be directly related to the structure of the survey and measurement exercise. Specialists will be consulted for this purpose. The extent of the measurement approach will however depend greatly on the extent of the communication and education efforts. **The finalisation of this metric is therefore pending an approval of the communication campaign and budget.**
Type of indicator	Measures impact
Calculation type	Non-Cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	Awareness levels greater than 5% within the stated timeframe would be desirable.
Indicator Responsibility	Accountability for this indicator resides with the CEO of SANEDI

Indicator Title	**6.4 Create market demand for energy efficient and green technologies**
Short Definition	Achieve a 10% real increase (over and above existing trends) in sales of energy efficient and green technologies by 2017
Purpose/importance	Innovation in a market is as much related to the market demand for products and services as it is related to the ability to come up with new ideas. The intent is to stimulate the demand for green products in the market through all SANEDI Energy Efficiency's activities. This indicator is intended to measure the impact on the market demand for green technologies.
Source/collection of data	Independently completed product sales data survey
Method of calculation	Independently completed product sales data survey of a pre-defined list of indicator products reported relative to existing sales trends (baseline) to be completed by an independent measurement and verification body in line with international measurement and verification protocols.

Data limitations	Product sales data are expensive and has confidentiality issues associated. Baseline development remains a challenge for 'forecasted' values such as energy usage and sales data.
Type of indicator	Measures impact
Calculation type	Cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	A market impact greater than the target would be desirable.
Indicator Responsibility	Accountability for this indicator resides with the CEO of SANEDI

Indicator Title	**6.5 Support the Income Tax Amendment Act section 12i and 12 l relating to the tax rebate for energy efficiency improvements**
Short Definition	Establish the capacity to support the certification of energy savings for tax reduction claims
Purpose/importance	SANEDI Energy Efficiency has been identified to provide support to the Department of Energy and the Department of Finance with respect to the new Energy Efficiency Tax Incentive Scheme. SANEDI Energy Efficiency's expected contribution is to assist with the certification of energy savings achieved by those companies that seek to claim tax deductions under the Income Tax Amendment Act. The intention of this metric is to check whether this function is being fulfilled to expectation.
Source/collection of data	'Customer satisfaction' survey of the relevant National Government Departments
Method of calculation	Boolean statement of compliance or achievement.
Data limitations	It will be critical to define the service delivery requirements in consultation with the recipients of this service and to assess performance against that definition.
Type of indicator	Measures output
Calculation type	Non-cumulative
Reporting cycle	Annually
New indicator	New
Desired performance	Service delivery that exceeds expectations is desirable.
Indicator Responsibility	Accountability for this indicator resides with the CEO of SANEDI

Indicator Title	**6.6 EEDSM HUB**
Short Definition	Continue the Energy Efficiency Hub initiative to strengthen energy related researches, human capacity development, and market transformation and enterprise development initiatives that will be tracked against a comprehensive existing set of KPIs with the following targets by 2014/15: Number of journal publications: 16; Number of conference papers: 26; Number of registered students: 105; Number of Graduates: 27; Number of modules/short courses offered: 45; Number of externally funded projects: 40; External funding: R3.1m; Female student ratio: 21%; PDI ratio: 55%.
Purpose/importance	Intended to demonstrate the tertiary technical skills development and capacity building achievement that result from this specific arrangement. Oversee transition to EECORD over this 5-year period
Source/collection of data	Performance data will be sourced from EEDSM HUB Annual performance reporting
Method of calculation	Tracking of annual performance against targets
Data limitations	None foreseen
Type of indicator	Measures outcomes
Calculation type	Non-cumulative
Reporting cycle	Annually reported
New indicator	New
Desired performance	Performance that exceeds the targeted values are desirable
Indicator Responsibility	Accountability resides with SANEDI CEO, management resides with the relevant Senior Manager

18. Appendix B: Policy Context

A comprehensive list of relevant legislation and policy that shapes the context for SANEDI's activities and focus is listed below - alphabetically and not order of importance.

Policy	Description	Role of/for SANEDI
2011 Budget Vote Speech by the Deputy Minister of Energy, Ms. Barbara Thompson, MP E249, National Assembly, Parliament, Cape Town 26th May 2011	Budget Vote Speech	In terms of SANEDI's role, it is expected that they will become the repository of all energy efficiency programmes. **This requires them to oversee energy efficiency initiatives, in particular, to assist with the certification of energy savings achieved by those companies that seek to claim tax deductions under the Income Tax Amendment Act.** We have secured the concurrence of the Minister of Finance for energy efficiency incentives under the **Standard Offer and Energy Efficiency Tax Incentive Scheme,** which will be in place this year.
2011 National Council of Provinces (NCOP) Budget Vote speech by the Minister of Energy, Ms Dipuo Peters, MP, Old Assembly Chamber, Parliament, Cape Town	Budget Vote Speech	Last year we committed to establishing the South African National Energy Development Institution (SANEDI), and this was duly done. SANEDI will, amongst others, be the champion for Energy Efficiency in the country, which will not only save energy but reduce the burden on households. In addition SANEDI will house South Africa's carbon Capture and Storage research and development as well as other energy research programmes. He refers to the different programmes and progress made
Biofuels Industrial Strategy 2007	A significant change to the draft Strategy is to adopt a short term focus (5 year pilot) to achieve a 2% penetration level of biofuels in the national liquid fuel supply, or 400 million litres pa. The target has been revised down from the 4.5% target that was initially proposed in the draft Strategy document. The following crops are proposed for the production of biofuels in the country: for Bioethanol, sugar cane and sugar beet and for Biodiesel sunflower, canola and soya beans. The exclusion of other crops and plants such as maize and Jatropha is based on the food security concerns. Further research is still needed to test usability of these in the country.	R&D platform will allow for the strengthening of local capacity and also leverage on international R&D work. The DST together with relevant stakeholders within the National Systems of Innovation (NSI) will facilitate the development and coordination of this work through a biofuels R&D plan that will focus on the total value chain. The research focus areas will include the investigation of alternative feedstock, development of energy crops (i.e. drought tolerance, high yield per ha, energy efficiency etc.) and improvement of known technologies whilst further developing, supporting and piloting the second generation technologies.
DME Universal Access Plan, 2004		
DOE strategic plan	The Department's strategic plan seeks to deliver results along eight strategic objectives that include promoting energy security through reliable, clean,	– Centre for Carbon Capture and Storage under SANERI1

Sub-Programme	Policy Priorities	Areas of Research Investment
	and affordable sources; universal access to energy sources, transformation of the energy sector, and strengthening the operations and management of the Department.	– Clean Coal Technologies1
DST 10 year innovation plan	The grand challenge areas are: • The Farmer to Pharma value chain to strengthen the bio-economy • Space science and technology • Energy security - the race is on for safe, clean, affordable and reliable energy supply, and South Africa must meet its medium-term energy supply requirements while innovating for the long term in clean coal technologies, nuclear energy, renewable energy and the promise of the "hydrogen economy". • Global-change science with a focus on climate change • Human and social dynamics.	From an R&D perspective, it makes sense to position Sanerі, Eskom, Sasol and various CEF subsidiaries to work together to advance clean coal technologies. For the long term, South Africa needs to strengthen the innovation chain in nuclear energy science. R&D to support conventional reactors in materials, safety, waste, reactor physics and so on must be planned and coordinated.
Energy Efficiency Policy & Strategy, DME 2004	The vision of the strategy is to contribute to affordable energy for all, and to minimise the effects of energy usage on health & the environment. It is implemented through sector programmes	Renewable Energy; Clean Fuels Programme, Energy Audits, Energy Management - The National Energy Research Institute will be funded to carry out a dedicated R&D programme for energy efficiency
National Energy Efficiency Strategy of the RSA	This Strategy allows for the immediate implementation of low-cost and no-cost interventions, as well as those higher-cost measures with short payback periods. These will be followed by medium-term and longer-term investment opportunities in energy efficiency. The Strategy acknowledges that there exists significant potential for energy efficiency improvements across all sectors of our national economy.	The South African National Energy Research Institute will be funded to carry out a dedicated programme of research and development for energy efficiency. The Strategy will support appropriate research and the possible adaptation of internationally available technologies and processes.
Energy Security Master Plan, DME	The Master Plan is premised on achieving certain goals that have been set for the electricity sector. Due to the uncertainty over the planning horizon, some assumptions are made regarding demand projections and the economic outlook. After consideration of the Energy White Paper and the regulatory policy framework, the current electricity generation, transmission and distribution sectors are appraised, in terms of the challenges confronting these sectors.	Focused research and development will enable meeting technical performance and capacity expansion objectives. Electricity/energy-based technology development and innovation is imperative to productivity and growth of the country.
Gauteng Integrated Energy Strategy	It aims to improve Gauteng's environment, reduce its contribution to climate change and tackle energy poverty, whilst promoting economic development.	
Green Paper on Climate Change Response Strategy	climate change response objective of – * making a fair contribution to the global effort to achieve the stabilisation of greenhouse gas concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system; and * effectively adapt to and manage unavoidable and potential damaging climate change impacts through interventions that build and sustain South Africa's social, economic and environmental resilience and emergency response capacity.	– Carbon capture and storage (research, development and demonstration programmes)

Policy/Plan	Brief description	Relevance to Wave Energy Industry
Industrial Policy Action Plan (IPAP) 2010/11 – 2012/13, published Feb 2010		13.3 Green industries - SWH - Wind - Photovoltaic power - Concentrated Solar Thermal power - Industrial Energy Efficiency - Water efficiency - Waste Management - Biomass and waste management - Energy-efficient vehicles
Integrated Resource Plan for Energy, 2010	This Policy-Adjusted IRP is recommended for adoption by Cabinet and for subsequent promulgation as the final IRP. This proposal is a confirmation of the RBS in that it ensures security of supply. It is a major step towards building local industry clusters and assists in fulfilling South Africa's commitments to mitigating climate change as expressed at the Copenhagen climate change summit. The Policy-Adjusted IRP includes the same amount of coal and nuclear new builds as the RBS, while reflecting recent developments with respect to prices for renewables. In addition to all existing and committed power plants (including 10 GW committed coal), the plan includes 9,6 GW of nuclear; 6,3 GW of coal; 17,8 GW of renewables; and 8,9 GW of other generation sources.	Section 7 - Research Agenda for Next IRP Distributed generation, smart grids and off-grid generation Harnessing South Africa's coal resource Decommissioning and waste management Technology options * Small hydro * Regional hydro options (specifically Inga) * Biomass (including municipal solid waste and bagasse) * Storage; and * Energy efficiency demand side management Vision for 2050 Uncertainty & Risk factors
Integrated Energy Plan, 2003	The Integrated Energy Plan outlines the direction and steps to be taken by South Africa to meet energy needs. The plan declares South Africa's continued reliance on coal, but also uses modelling to forecast which energy sources can be used most effectively to meet demand under four different scenarios. The plan advocates diversification of energy sources, including renewables, as well as fuel switching to improve energy efficiency.	
Long-Term Mitigation Scenarios, DEAT, October 2007	Develops scenarios to mitigate greenhouse gas emission and forms the basis of South Africa's national mitigation policy direction.	The LTMS recognizes the importance of a low carbon future and provides an indication of the effort that has to be extended into changing the energy mix and economic activity of South Africa to achieve the required reduction in carbon.
Measurement and Verification Guideline for Energy Efficiency Certificates (DRAFT)	The SA Government intends to introduce tax incentives for companies that can prove energy efficiency savings. One of the primary requirements for companies to benefit from this tax incentive is that they need to make use of independent and registered Measurement and Verification (M&V) professionals that are certified by the Council of Measurement and Verification Professionals of South Africa (CMVPSA).	This Measurement and Verification Guideline for Energy Efficiency Certificates aim to provide background with regards to the M&V requirements surrounding the energy efficiency tax incentive scheme. It also provides a high-level M&V approach that should be followed by registered M&V professionals to issue the required supporting documentation that will be used by SANEDI to issue Energy Efficiency Certificates.
National Energy Act, 2008	To ensure that diverse energy resources are available, in sustainable	Chapter 4 focuses on the establishment of SANEDI. The institute is

	quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, taking into account environmental management requirements, international commitments and obligations and interactions amongst economic sectors; to establish institutions to be responsible for promotion of efficient generation and consumption of energy, energy modelling and planning, increased generation and consumption of renewable energies, energy research, contingency energy supply, holding of strategic energy minerals, adequate investment in, appropriate upkeep of and equitable access to energy infrastructure; to provide measures for the furnishing of certain data and information regarding energy demand, supply and generation; and to provide for matters connected therewith.	intended to: • Promote energy efficiency in the economy. • Increase the gdp per unit of energy consumed • Ensure energy resources used in optimal manner • Promote energy research and technology innovation • Increase players in the energy field • Facilitate effective management of energy demand and its conservation
National Research & Development Strategy - Aug 2002	The objective of this strategy is to address these weaknesses in a profound but practical way. In particular, the approach is to apply internationally well-tested principles and systems that are adjusted to local realities and requirements. The strategy must be able to give expression to our national goals of economic development and improvement of quality of life for all citizens.	
National Energy Research, Development and Innovation Strategy (developed by DME, DST and stakeholders)		Medium- to long-term energy-related research themes that would guide the management of Saneri to appropriately position the company in terms of national priorities: - Energy infrastructure optimisation; - Energy efficiency and demand-side management; - The impact of energy use on the environment; - The use of energy to stimulate socio-economic development; - Cleaner fossil fuel use, including clean coal; - Renewable energy; - Alternative energy sources, including fuel cells and hydrogen; - Energy planning and modelling; and - Energy policy research
NERSA Consultation Paper - Revision of Regulatory Rules for Energy Efficiency Demand Side Management (EEDSM) including Standard Offer Programme (SOP) June 2010	Policy to support the Energy Efficiency and Demand Side Management Program for the Electricity Sector through the Standard Offer Incentive Scheme Energy Efficiency & Demand-Side Rules incl Standard Offer Program	no specific reference in the document
White paper on energy policy	This White Paper has been written so as to clarify Government policy regarding the supply and consumption of energy for the next decade. The policy strengthens existing energy systems in certain areas, calls for the development of underdeveloped systems and demonstrates a resolve to bring about extensive change in a number of areas. It addresses international trade and co-operation, capacity building, and the collection of adequate information. The document is comprehensive, addressing all elements of the	Government will consider the development of a system to prioritise national research funding into the three main research categories in order to address the medium to long-term research needs in the energy sector. This will consist of an integrated, multi-year, national, needs-driven, energy research strategy, developed from time to time by an experienced team of experts appointed by the Minister. This strategy will identify medium and long-term priority programmes and

Policy/Strategy	Purpose/Objectives	Relevance to Biomass
	energy sector as practically as it can.	themes.
White Paper on Renewable Energy Policy, Aug 2002	Formerly known as the White Paper on the Promotion of Renewable Energy and Clean Energy Development, this paper aims at informing the public and the international community of the Government's goals and objectives for the optimal use of renewable energy. Recognizing the importance of reducing the damage done to the environment by South Africa's reliance on electricity from coal and the need for diversification ofenergy resources, it commits the Government to a number of actions to ensure that renewable energy becomes a significant part of South Africa's energy portfolio over the next ten years. These measures include fiscal mechanisms, regulatory instruments, and standards to promote R&D and investment in renewables and educational programs to raise public awareness.	
White Paper on Renewable Energy, November 2003	The main aim of this White Paper is to create the conditions for the development and commercial implementation of renewable technologies. Government will use a phased, managed and partnership approach to renewable energy projects that are well conceived and show the potential to provide acceptable social, environmental and financial returns for all investors and stakeholders. This will lessen the strain on fiscal resources and hold greater potential for successful implementation. The focus will be on delivery. An appropriate enabling environment towards full commerciality will nurture the technologies that are proven to best meet Government's policy objectives. Through this policy document Government is venturing into an entirely new area.	Mechanisms will be investigated to extend the operational support available from the Central Energy Fund to renewable energy programmes.
Electricity Regulation Act (412006): Electricity Regulations for Compulsory norms and Standards for Reticulation Services	To establish a national regulatory framework for the electricity supply industry; to make the National Energy Regulator the custodian and enforcer of the national electricity regulatory framework; to provide for licences and registration as the manner in which generation, transmission, distribution, trading and the import and export of electricity are regulated, and to provide for matters connected therewith.	

19. Appendix C: An overview of the current energy research environment

19.1. Role of Department of Science and Technology (DST)

The DST strives toward introducing measures that put science and technology to work to make an impact on growth and development in a sustainable manner in areas that matter to all the people of South Africa. This includes focused interventions, networking and acting as a catalyst for change in terms of both productive components of our economy, making it competitive in a globally competitive liberalised environment, and in respect of the huge development backlog existing among the poorest components of our society. The goal of realising this vision is underpinned by development and resourcing strategies for the formation of science, engineering and technology, human capital, democratisation of state and society, promotion of an information society and ensuring environmental sustainability in development programmes. The department has, and should continue to provide strategic insight into technological advances likely to impact upon the programmes implemented by SANEDI in line with its policy that specialised research entities should be close to their line function departments.

In line with the strategic management model on science and technology which was approved by Cabinet which is currently being implemented by the Department of Science and Technology, **cross-cutting primary research activities will fall within the mandate of the DST and will be implemented by relevant agencies under the ambit of the DST. Applied research specifically within the energy sector will be conducted by SANEDI.** Current programmes within SANEDI Applied Research have been reviewed and separated in line with the model. While there has been a separation of current SANEDI Applied Research programmes, continual engagement will be required between SANEDI and the DST to ensure alignment of activities.

The representation of DST on the SANEDI Board will ensure that the DST continues to be involved and provides guidance and oversight into the strategic direction of SANEDI and that potential areas of overlap and misalignment of programmes are identified and addressed.

19.2. Role of Technology Innovation Agency (TIA)

As an agency established by Government to stimulate innovation in the country, TIA should support the basic research requirements of SANEDI, in keeping with the Strategic Management Framework for Research as approved by Cabinet. **TIA has also been given the responsibility of protecting and assisting in the commercialisation of intellectual property emanating from local inventors and developers. SANEDI will therefore need to collaborate with TIA in the commercialisation of intellectual property, relating to SANEDI focal areas.**

19.3. Role of National Research Foundation (NRF)

The objective of the National Research Foundation is to support and promote research through funding, human resource development and the provision of the necessary research facilities, in order to facilitate the creation of knowledge, innovation and development in all fields of the natural and social sciences, humanities and technology. In so doing, it contributes to the improvement of the quality of life of all the people of the country. The organisation was established in 1999 in accordance with the NRF Act.

As the Government's national agency responsible for promoting and supporting basic and applied research as well as innovation, the NRF upholds excellence in its investments in knowledge, people, products and infrastructure. The NRF provides services and grants to support research and postgraduate research training, vital to the development of South Africa. It is the NRF's vision to be a key instrument in the creation of an innovative, knowledge-driven society where all citizens are empowered to contribute to a globally competitive and prosperous country. Funding from the NRF is largely directed towards academic research, developing high-level human resources, and supporting the nation's national research facilities. **The NRF's task is to advance research in all fields of the humanities, social and natural sciences, engineering, and technology; including indigenous knowledge.** By forging strategic partnerships locally and internationally, it extends the resources that researchers need to foster and expand South Africa's research capabilities and, ultimately, to improve the quality of life for all. **Other areas of its core business are to promote research capacity development (RCD), to unlock the full creative potential of the research community and to establish equity and redress.** The NRF fosters strategic partnerships and knowledge networks to make South Africa globally relevant and competitive. It provides research information and strategic advice.

It is anticipated that the NRF will support SANEDI in the funding of human capital development programmes that support SANEDI CORDs, while also providing grant funding through the Innovation Fund for projects that display evidence of intellectual property rights development.

19.4. Role of Universities in undertaking Energy Research

The energy research undertaken at the Universities played an important part in establishing and developing a vibrant energy sector research programme that served the sector in developing capable technical, scientific and engineering skills for the energy sector in South Africa. The recent transformation of tertiary education institutes has seen a rise in the number of experienced academics leaving South Africa and a subsequent depletion of technical research capability. Therefore, the level of advanced research at universities has declined and in turn had a negative impact on the research capability of the country. Moreover, the NRF's Technology and Human Resources Industry Programme (THRIP) is presently guided by a broad national research strategy which does not necessarily have a direct focus on energy. As a result focused and advanced energy research at universities that contributes to the development of the energy sector in any meaningful way has been limited.

19.5. Role of Eskom Research

The Eskom Research and Innovation Department (ERID), as part of the Resources and Strategy Division of Eskom, is responsible for the planning and implementation of the Eskom technical research programme against the annually

allocated research budget. In 2006, Eskom realigned the Eskom Research programme to focus more on electricity operations research rather than longer-term energy research, as was the case in previous years. This resulted in the closure of critical laboratories that had relevance to the broader electricity sector and a high-specialised staff attrition within Eskom research.

In summary Eskom no longer played the role of Eskom housing an energy research facility of national importance.

19.6. CSIR

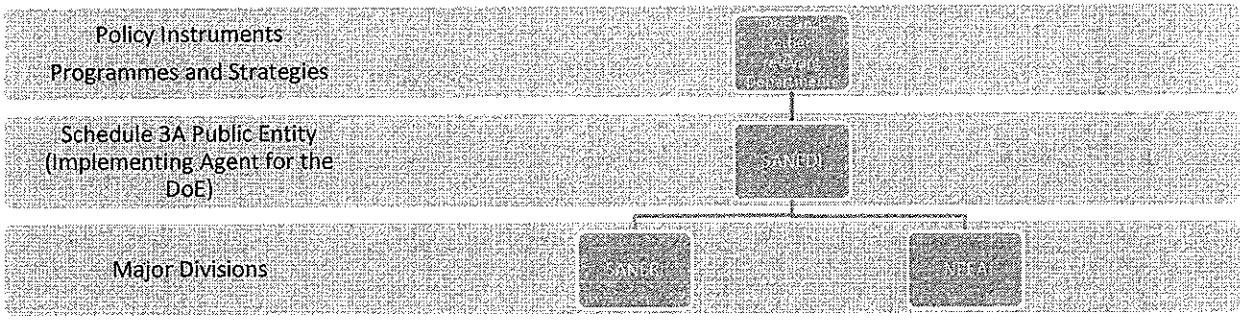
An Act of Parliament constituted the CSIR in 1945 as national science council. The CSIR undertakes directed and multidisciplinary research, technological innovation as well as industrial and scientific development to improve the quality of life of the country's people.

The CSIR is committed to supporting innovation in South Africa to improve national competitiveness in the global economy. Science and technology services and solutions are provided in support of various stakeholders, and opportunities are identified where new technologies can be further developed and exploited in the private and public sectors for commercial and social benefit.

The CSIR's shareholder is the South African Parliament, held in proxy by the Minister of Science and Technology.

21. Appendix E: SANEDI Matrix Structure (populated)

SANEDI's proposed matrix management model describes the activity areas and the interrelationship between the Senior Managers with respect to responsibilities associated with the various portfolios:



Programme/Activity leader	Energy Efficiency	Green Transport	Energy Data	Carbon Capture and Storage	Finance	Clean Energy	Working for Energy	Corporate Services	COP17 Projects
Dr M Bipath	Research requirements	Smart Grid integration	Smart Grid and local industry data provision	IEP integration aspects		Smart Grid integration	Smart Grid integration	TBC	TBC
B Bredenkamp	NEEA implementation; Custodian of EE Centre and EE Hub	EE programme implementation	Energy Efficiency database custodian	TBC		Synergistic programme development	Energy efficiency programme development	TBC	EE Projects
D Batte	Transport Energy Efficiency (research and needs analysis)	Custodian of GT Centre, supported by Green Transport Centre Manager	Transport data provision	TBC		Uptake of cleaner fuels	Transport related programme development	TBC	Green Transport & WfE Projects
Dr T Mali	TBC	Alternative fuels – clean energy	Clean Energy data provision	TBC		Custodian of RECORD, REEEP and other progs	Clean Energy programme development	TBC	Renewable Energy Projects
D Govender	Corporate Service support	Corporate Service support	Corporate Service support	Corporate Service support		Corporate Service support	Corporate Service support	Head of Corporate Services	Admin Support for COP17
AN Other	Activity Leader								
Dr AD Surridge	TBC	TBC	CCS, Coal, Gas data provision	Custodian of CCS Centre		TBC	TBC	TBC	Activity Leader
AN Other	Hosting of Energy efficiency data	Hosting of Transport related data (fuels, emissions, costs, etc)	Custodian of Energy Database, RIMS and KM systems	Hosting of CCS data		Hosting of Clean energy Data	Hosting of WfE data	TBC	TBC
D Mahuma	Integration into WfE programme	TBC	WfE data provision	TBC		Integration into WfE programmes	Custodian of WfE programme	TBC	WfE Project support

The model also describes the human capital 'pool' and the anticipated reporting structures aimed at full and optimal utilisation of scarce skills and resources:

Table 7: Matrix structure for sharing of resources as proposed (10 of the 29 roles shown are currently filled as at end October 2011)

Activity Leader	Project Management	Finance	Administration	Marketing and Communication	Electrical/Mechanical/Civil Engineering	Chemistry / Biochemistry / Microbiology	Social Sciences	Procurement	Specialist Consulting	Energy data / IT Infrastructure	Statistics / Mathematics Modelling	Physics / Geology / Materials Engineering	Strategic Planning	Human Capital	Information and operating systems
Senior Manager Marketing and Communications and Energy Efficiency			1	4											
Senior Manager Smartgrids					1								1		1
Office Administrator			1					1		1					
Project Management Office	3		1						1						
Senior Manager Advanced Fossil Fuels		1	1						2			1			
Senior Manager Renewable energy						1			2						
Finance Manager		2													
Senior Manager (Data and Knowledge Management)											1				
Senior Manager Working for Energy							1								
Human Capital Manager														1	
CEO			1												

Where the listed functions within SANEDI will encompass the following:

Project Management: Oversight and/or delivery of the SANEDI project portfolio
Finance: Planning, organising, directing and controlling SANEDi's financial activities
Administration: Office administration and management function
Marketing and Communication: Stakeholder liaison, stakeholder communication and advocacy
Electrical/Mechanical/Civil Engineering: Engineering service functions relating to core engineering processes and activities for the listed disciplines
Chemistry / Biochemistry / Microbiology: Provision of advisory and analytical services relating to the listed natural sciences
Social Sciences: Consumer behavior, Community liaison
Procurement: Contracting and purchasing of skills, infrastructure, supplies, systems, resources, as required.
Specialist Consulting: Provision of expert advisory services
Energy Data IT infrastructure: Infrastructure to host and adequately support the data and knowledge management function
Statistics / Mathematics / Modelling: Provision of statistical analysis and mathematical, engineering and economic modeling services to the organization, the DOE and other relevant industry stakeholders.
Physics / Geology / Materials Engineering: Advisory, analysis and design services relating to engineering behavior of earth materials, material properties and physics
Strategic Planning: Formulation of goals and objectives, direction setting, long term planning and implementation of a measurement and feedback system in consultation with the DOE and respective SANEDI thematic areas
Human Capital: Management of people within SANEDI including human capital planning, recruitment, election, placement, transfers, skills and career development
Information and operating systems: Information system requirements for SANEDI's internal processes and functions