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South African National Energy  
Development Institute.



# INSIGHTS 2021 | 2022

ENERGY INNOVATION FOR LIFE





# FOREWORD

By Lethabo Manamela, Interim CEO, SANEDI

The COVID-19 pandemic has shaken and changed the world. It has highlighted the deep socio-economic inequalities in society, locally and the world over. It has compounded the global context the world is already dealing with, which include a perpetually changing global environment, advancements in IT, and increased environmental sensitivity. These mega issues continue to shape today's socio-political and economic trajectory.

South Africa's own environment has long been characterised by economic challenges, rising unemployment and income inequality, and this continues to challenge SANEDI to seriously consider how this impacts our mandate of delivering energy efficiency (EE) and energy research and development (ERD). SANEDI's analysis and reflection leads to a conclusion that the existing national priorities remain key to fulfil at an accelerated pace going forward.

The energy sector is the backbone of the South African economy, and SANEDI plays a crucial role in enabling the country's socio-economic advancement. The world is embarking on a journey of recovery, striving to build resilience. SANEDI's contribution to this effort will focus on energy solutions, energy availability and promoting access to energy solutions.

SANEDI, an agency of the Department of Mineral Resources and Energy (DMRE), is mandated to direct, monitor and conduct ERD, promote applied energy research and technology innovation, as well as undertake measures to encourage the uptake of green energy and EE throughout the economy. Our mission is to develop innovative, integrated solutions that will catalyse growth and prosperity to meet our vision of sustainable living for growth and prosperity in Africa.



This publication reflects our achievements in deepening our impact in line with national priorities. SANEDI's focus is mainly developing innovative, integrated clean energy and resource-efficient solutions that aim to catalyse growth and prosperity. As technologies develop and mature, opportunities for innovative energy solutions that can make a meaningful contribution are becoming increasingly relevant for improving energy access and lowering the country's carbon footprint.

SANEDI operates in a global context shaped by several megatrends including climate change, urbanisation, demographic shifts, Fourth Industrial Revolution (4IR) and growing inequalities. We have shaped programmes of action and have adopted three themes to strengthen and drive our mandate. The themes are: Climate Change and Decarbonisation, Service Delivery within the Municipal Environment, and Information Knowledge (Data and Knowledge Management) and Technological Convergence.

The COVID-19 pandemic was an unexpected global event, that sharply highlighted the shortcomings in the universal distribution of and access to resources and the negative impacts created by the megatrends under consideration. In our assessment, COVID-19 does not replace these trends and does not invalidate the existing programmes of action and in fact, compounds the context we operate in and calls for increasing the pace of delivery of the strategic intents envisaged in the global sustainability goals, the national priorities and indeed SANEDI's own mandate.

SANEDI understands that it is uniquely positioned and is required to carefully balance the short-term needs of the country as far as energy solutions are concerned, while taking into account where

the country wants to be in decades to come, and therefore develop research-based energy solutions and innovative technology applications ahead of time.

SANEDI is building even closer collaboration and alignment with the DMRE to ensure that the key priorities of the Department, in line with national priorities, are delivered effectively. SANEDI is a key part of the country's innovation and clean energy information/ data system and can contribute to the elevation of innovation in the country. We will aim to lead and drive collaboration in the energy sector locally and internationally.

We have been focused on providing an optimal energy research, development and deployment environment, and co-operating with persons, associations and institutions undertaking related energy programmes locally and internationally, to ensure that international learnings and best practice are shared and, where relevant, adopted and applied in South Africa. Co-operation and membership of international bodies has led to significant financial support for such endeavours in South Africa. We will continue with these, as part of our being a global citizen and links to a better world and better Africa.

SANEDI's Smart Grids, Energy Efficiency and Renewable Energy (RE) programmes all contribute to energy development and innovation in this area. Successful collaboration between SANEDI and industry has allowed us to drive several research, development and pilot projects, that will contribute to the national energy and environmental objectives. In this regard, SANEDI has facilitated and supported several National and Provincial Departments to understand possible mitigation actions that would lead to more efficient and swift deployment of RE in the country.



## Smart Grids

SANEDI, in collaboration with the DMRE, developed and piloted the concept of Smart Grids in South Africa. The programme mainly focused on “Technology as an Enabler for Change” in the municipal environment. Municipalities are currently under huge financial pressure, largely as a result of poor revenue collection and incorrect tariff designs. The Enhanced Revenue Management project, piloted in ten municipalities, was designed to assist municipalities in collecting electricity revenues. For projects that were properly designed and implemented, results have shown that technology can be used to improve revenue collection while also enhancing the effectiveness and efficiency of the municipalities, thereby returning them to sustainability.

## Energy Efficiency

SANEDI’s co-ordination and implementation of the EE tax incentives (Section 12L and 12I), have produced phenomenal results, both in terms of energy savings and reduction in Greenhouse Gas Emissions (GGE). Over 19 TWh have been saved and the emission of 18 730 mega-tonnes CO<sub>2</sub> has been avoided. Based on the success of this activity over the last five years, the Section 12L incentive has been extended from January 2020 to January 2022. This also saw the development of various secure online tools and databases for the processing of these applications which has resulted in the establishment of a significant repository of EE data, for use in modelling impacts of these interventions.

Furthermore, the Cool Surfaces programme, which initially started as a small activity within the international Clean Energy Ministerial series of activities, has gained traction in South Africa with impressive results achieved in a Northern Cape pilot programme managed by SANEDI. This book showcases our achievements to date.

Energy derived from various forms of municipal and industrial waste is an avenue that SANEDI will be supporting municipalities in, to mitigate GGE, minimise waste to landfills, and diversify energy sources. These interventions will reduce the amount of energy required by municipalities to run Waste Management Plants.

Through the 12L and 12I programmes, SANEDI will continue to support the industry to reduce its energy and carbon intensity through the verifiable deployment of RE and EE initiatives.

## Solar Thermal Technologies

Our local and international cooperation and collaboration have grown stronger. SANEDI, through the Austrian Government supported SOLTRAIN programme, has supported several solar thermal initiatives for commercial and industrial applications and building skills to support the growing industry.

Renewable Energy and Energy Efficiency Partnerships (REEEP), supported by the United Nations Industrial Development Organisation (UNIDO), established the Energy Agriculture Platform and has also successfully completed two demonstration initiatives in the IKheis and Nelson Mandela Bay Metros. These were to improve energy and water efficiencies in municipal water and wastewater infrastructure. Besides saving energy, the solutions also helped the municipalities save water, improve water quality, improve service delivery and realise cost savings.



## Cleaner Fossil Fuels

Another major change in the organisation has been the transfer of the Pilot Carbon Dioxide Storage Pilot Project (PCSP) and the team to the Council for Geo-Science (CGS) for further implementation and custodianship. The PCSP had made a major financial gain with the signing of a World Bank grant of USD 23 million. It also saw the application of new techniques, not previously available, to analyse existing geological data in the KwaZulu-Natal (KZN) Basin, the outcome of which was the identification of two prospective injection sites.

Work was directed to the characterisation of those two sites. As part of the monitoring programme, the CO<sub>2</sub> surface monitoring protocols were developed through field trials at Bongwana natural gas releases, and these included atmospheric, soil and water concentrations.

A survey of the industry regarding the implementation requirements of the Carbon Capture and Storage (CCS) technology, revealed most significant concerns pertained to cost and regulation. Regarding the impact of the carbon tax on CCS, it has been shown that the tax at introduction would be insufficient by itself to finance CCS. An appraisal of fossil fuel and RE hybrid systems had indicated feasibility, and an analysis and assessment of global carbon capture and utilisation technologies indicated possible commercial application in South Africa.

The PCSP, the Carbon Capture Utilisation and Storage (CCUS) project, and the team have been transferred to the CGS for further implementation and custodianship. SANEDI believes that the exploration of solutions in the area of Cleaner Fossil Fuels is important and that there is scope outside of CCUS that should be



explored. Therefore, SANEDI retains the Cleaner Fossil Fuels sub-programme and is exploring other applied energy research including clean coal pilots and biofuels.

Through demonstrated clean energy initiatives, SANEDI will support the Sector Education and Training Authorities (SETAs) and Incubators to enable the development of skilled small, medium micro enterprises in the clean energy sector.

## Wind Energy

The Wind Atlas for South Africa (WASA) Programme has completed the countrywide wind mapping and launched the WASA Book. WASA maintains the national wind database. We also identified scope to enhance growth in this sector and focus on training and capacity building, as we grow the wind sector.

Based on the success of the earlier Wind Programme, SANEDI will continue to enable the development of wind energy in South Africa through mapping and creation of demonstration of small wind projects for complementary energy applications, through the Wind Atlas of South Africa (WASA 3) and SAWEP Programmes.

## Cleaner Mobility

SANEDI's Cleaner Mobility programme, with support from UNIDO, has been actively engaging with the Department of Transport (DoT) as well as various cities to explore and introduce cleaner mobility options. SANEDI has been instrumental in doing applied research and demonstration regarding the use of electric vehicles and charging batteries using solar PV with success. Going forward, the Cleaner Mobility sub-programme will continue solving key challenges including energy security, EE in transportation, urban air pollution, traffic congestions, local industry development and climate change.

## Data and Knowledge Management

SANEDI plans to be a data repository for clean energy data in South Africa. SANEDI is in the process of establishing a data centre that will house reliable, accurate and up-to-date clean energy datasets that will be made available to stakeholders.

SANEDI at present is responsible for maintaining the following datasets that are annually maintained and available at no cost to stakeholders: WASA database, ESCO register, 12L Tax Incentives database, Big EE database, Transport database and Residential database.

SANEDI will continue to maintain the above datasets and create and maintain these to the following datasets: Commercial database, Industrial database, Agricultural database, Standards & Labelling database and Public Infrastructure database (Public Buildings & Wastewater Treatment Plants).

## The Energy Secretariat

SANEDI is proud to have been awarded the right by the DSI to run on its behalf, the DSI Energy Secretariat Programme. The Secretariat is an administrative office that carries out the substantive and administrative work as directed by the Chief Director Hydrogen Energy.

The objective of establishing the Energy Secretariat is to support the successful commercialisation, and upscaling of knowledge outputs from the broader energy RDI portfolio and ensuring systemic impact in the NSI.

## Scaling, Commercialisation and Partnerships

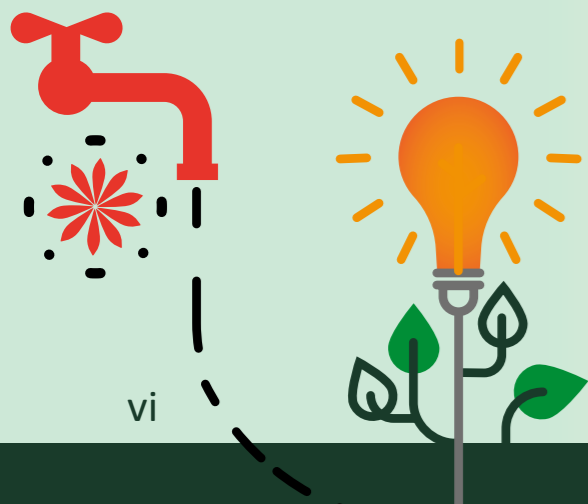
SANEDI is focusing more on the self-sustainability of projects by supplementing our funding with funding from strategic partners. We will focus on facilitating the transformation of our research output into wider scale adoption and roll-out, by supporting the entrepreneurial spirit of youth, women and PwDs. This effort will be supported by deeper partnerships and strategic relationships.

The commercialisation of innovation will be a key area for SANEDI. The means to facilitate more commercialisation of energy solutions will be explored in this financial year. Strategic partnerships will be deepened, and the resulting impact would include increased adoption of our innovative solutions and job creation, as well as the stimulation of youth entrepreneurship in the energy sector.

This publication showcases the remarkable success which SANEDI has attained in one of the toughest years in the history of the country. While we face new challenges, we have renewed commitment to our mandate as we strive to improve the South African energy landscape. Such improvements are instrumental in social and economic development, and for our nation's recovery.

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# ENERGY EFFICIENCY

## ENERGY EFFICIENCY

### in light of loadshedding

SANEDI predicts that since Eskom is unable to consistently meet South Africa's demand for electricity, load shedding is likely to be a regular feature. The Council for Scientific and Industrial Research (CSIR) has reported an economic loss of R338 billion over the past ten years due to load shedding, with 2019 being the worst year on record for blackouts. Continued outages are something South Africans can ill-afford amid a global pandemic; as such, SANEDI believes energy efficiency is vital for improved electricity provision and economic recovery.

The International Energy Agency (IEA) has reported that in 2020, the Covid-19 pandemic transformed the energy landscape and the priorities of governments around the world. Like many other countries, South Africa's efforts have been focused on disaster management, but energy efficiency is a key tool that governments can use to respond to the severe economic, environmental, and social development consequences of the crisis. Ambitious energy efficiency action can be mobilised quickly to create jobs, stimulate local economic activity, and improve energy affordability, thus helping South Africa to accelerate the achievement of our recovery goals.



Energy affects everyone and therefore strong collaboration between all role-players in society can help scale up the market and create demand for energy efficient solutions. For this to be successful, all sectors of society should be engaged, from businesses to local government and everyone in between.

The importance of prioritising energy efficiency is clear. The IAE estimates that without the energy efficiency improvements that have been made since 2000, the world would be using 13% more energy today, and energy-related carbon emissions would be 14% higher. Efficiency progress is also enhancing energy security and access to affordable, reliable energy in other countries – something much-needed in South Africa.

#### Everyone has a role to play

There are steps that every electricity user can and should take to decrease electricity demand and thereby reduce the risk of load shedding. In an electricity system, generating capacity and load must be balanced. If the load (i.e., the demand for electricity) becomes too high, generating equipment becomes overloaded and could break down. Load shedding prevents the overloading of equipment by removing, or shedding, some of the load.



Nonetheless, load shedding causes many problems. Businesses lose production time and materials get spoiled when the machines stop in the middle of a run; people who rely on essential medical equipment such as oxygen machines are put at serious risk when the power goes off. An important additional factor is the critical need to maintain the cold-chain in the storage and distribution of COVID-19 vaccines, which require a stable energy supply.

SANEDI promotes that everyone must play their part in lowering the amount of electricity they use. Commerce and industry consume vast amounts of electricity. Although many businesses have taken steps to reduce their energy demand, their buildings are often not as efficient as they could be. A Government Gazette, which was published on 8 December 2020, makes Energy Performance Certificates mandatory for large business and government buildings. These certificates will be issued, following a professional energy efficiency assessment and will help businesses to understand the true status of their buildings from an energy-efficiency perspective, so that the necessary changes can be made to improve their ratings.

Every electricity user can help to decrease the load on Eskom's power stations by simply switching off equipment and lights when not in use. Switch lights off when exiting a room; open windows to cool a room rather than switching an air conditioner or fan on. Make sure that windows and doors seal properly to keep the heat in during winter so that heaters can be more effective. Don't heat or cool unoccupied rooms.

Besides these behavioural changes, some technical interventions could be implemented. These include adding insulation in the roof, replacing an electric water heater with a solar water heater, or at least installing a timer on the electric geyser. Significant savings can also be achieved by replacing old incandescent, and compact fluorescent lightbulbs with LED light bulbs.

SANEDI will continue to encourage every person, business and government entity to use electricity wisely.



# SAVING MONEY

## BY SAVING ELECTRICITY

*Energy efficiency offers immediate and direct financial gains for the poor*

Energy efficiency practices have far-reaching financial benefits for the underprivileged as these provide daily cost savings, especially at a time when the global economy is under pressure. SANEDI believes people must be fully informed to understand the importance of sustainable energy practices, in order to benefit from the associated savings.

Since 2003, the South African Government has made Free Basic Electricity (FBE) services available to the country's poorest households. This means that each household receives 50kWh per month, providing enough power for basic lighting and a small TV and radio.

Homes that have pre-paid electricity meters can monitor their usage and top up when the free electricity is used, while those with conventional meters will be charged at the end of the month for the extra used. SANEDI believes this is where energy efficiency and its financial benefits come into play. This will stretch the allocated FBE services and translate into approximate financial savings of up to as much as 30% of the normal monthly electricity bill.

Households that are reliant on monthly grants and FBE will immediately start benefiting from cost savings associated with the implementation of energy efficiency interventions, for example, coating roofs with Cool Surface paint; insulating leaky windows and doors; and purchasing the correct, more energy efficient appliances. It will free up money for other pressing expenses, ultimately contributing to the quality of their daily lives.

### Energy efficiency research

SANEDI, together with the University of Cape Town (UCT), has conducted an in-depth study that aims to collate household-level energy data relating specifically to energy consumption and appliance usage patterns. This is important for reviewing the

country's energy efficiency goals and setting new targets.

Previously, it has been difficult to obtain accurate energy consumption data from the SA residential sector. Importantly, this study builds on previous work conducted by the Department of Mineral Resources and Energy (DMRE) under the umbrella of the Standards & Labelling Programme, to enhance the understanding of household energy consumption and appliance ownership and choices.

The study looks at households' understanding of where electricity is used and how it can be reduced. It also investigates whether appliance energy efficiency is a purchasing consideration.

### The access to energy challenge

Access to energy remains a major global challenge with approximately one in seven individuals impacted and almost three billion using polluting fuels like paraffin and wood for basic heating and cooking purposes, according to the World Bank. Critically, access to energy has a direct impact on the underprivileged, which are more likely to remain poor if they stay unconnected, not to mention the negative health impacts associated with indoor air quality, as a result of burning these fuel sources.

In those countries where access to energy is gaining momentum, renewable energy is not growing at the same rate. While SANEDI is encouraged to see an upward trend, many are still lagging when it comes to educating users on the benefits of energy efficiency or implementing renewable energy sources.

The reality is that energy efficiency and sustainable energy go hand in hand with financial savings; it's a relationship that has the potential to make a significant impact on the energy-hungry world we live in.





## inefficient electrical appliances, one label at a time

Household appliances are responsible for a significant percentage of residential power usage, and as South Africa is still heavily reliant on coal-fired power stations, this usage results in increased greenhouse gas (GHG) emissions. In a bid to combat this, the Energy Efficiency Standards and Labelling Programme places energy labels on appliances that provide consumers with accurate and comparable information on their energy efficiency performance.

The Department of Mineral Resources and Energy (DMRE) has mandated SANEDI, as an agency of the DMRE, through a formal Memorandum of Understanding, to continue with the implementation, monitoring and evaluation of this programme. However, the DMRE continues to play an oversight and policy role in expanding this programme, as it is a priority initiative to save electricity, improve lives, and reduce harmful GHG emissions.

Having first been initiated in 2010, this programme is an important cornerstone of SANEDI's national energy efficiency and climate change mitigation programme. As the largest producer of GHG emissions on the continent, South Africa's efforts in reducing our carbon footprint must be prioritised. Until the end of 2020, the programme was under the direction of Dr Theo Covary, who

was funded by the United Nations Development Programme (UNDP) at the DMRE. Dr Covary has handed over his role – and knowledge base – to SANEDI's Ashanti Mogosetsi.

It has been estimated that by improving the efficiency of appliances, a reduction of 6 million tons of CO<sub>2</sub> emissions can be achieved for the country by 2030. Through the Energy Efficiency Appliance Standards and Labelling Programme, government hopes to remove inefficient electrical appliances and equipment from the South African market and encourage the adoption of energy



efficient technologies through the implementation of interventions, strategies and Minimum Energy Performance Standards (MEPS).

MEPS is a specification, containing several performance requirements for an energy-consuming device, that effectively limits the maximum amount of energy that may be consumed by a product in performing a specified task. In South Africa, MEPS are made mandatory by the DTIC and are enforced by the National Regulator for Compulsory Standards, (NRCS). The South African Bureau of Standards (SABS) is responsible for setting and publishing the standards which manufacturers must meet, by law. All these entities are key partners in this exciting initiative.

The programme was originally jointly funded by the DMRE and the Global Environmental Facility (GEF) and the first developmental phase of the project was implemented by

the DMRE, in collaboration with the United Nations Development Programme, SABS, and the NRCS, together with a range of appliance manufacturers, distributors and retailers in South Africa. Key international organisations such as the International Energy Agency (IEA), Lawrence Berkeley National Laboratory (LBNL) in California and CLASP also played a significant role in the development of the programme and will continue to be involved, with CLASP funding the initial salary for the Project Manager, based at SANEDI.

Appliances for which the display and use of the South African Energy Efficiency Label is compulsory include: washer-dryer combinations; washing machines; tumble dryers; electric ovens; fridge-freezer combinations; freezers; electric water heaters (geysers); fridges; dishwashers; air-conditioners; and TV and audio-visual equipment (these do not need to display a label but must have a standby power usage of less than 1 Watt, and 3 Watts for set-top boxes).



## A Taxing Reality for

# ENERGY USERS

In the face of the worsening effects of climate change, increasing energy prices in South Africa, and a more challenging business environment, companies have been left with no choice but to improve their operations and strive to become more energy efficient. Demonstrating this, SANEDI noticed an increased number of Section 12L Energy Efficiency tax incentive applications since March 2020.

The 12L Tax incentive, according to the Income Tax Act, 1962 (Act No. 58 of 1962), provides an allowance for businesses to implement energy efficiency savings. The savings allow for a tax deduction of 95c/kWh saved on energy consumption. SANEDI implements and oversees the application process of the incentive claimant to the issuing of the 12L Tax Incentive certificate at the application approval. From March to May 2020 the number of applications more than doubled. The uptake of this incentive is a good news story, showing the government's commitment to decarbonising South Africa's industrial and commercial industries.

In addition to financial concerns, it appears that people finally had time to consider their energy bill and Carbon Tax payable during lockdown level 5. Large power users, and South Africans in general, are well-informed about the country's energy landscape and have finally woken up to the reality of Carbon Tax. The national shutdown in March 2020 seems to have given businesses the time to assess their operations, and act on their intentions to become more energy efficient.

South Africa's Carbon Tax, which came into effect in 2019 after almost a decade in the works, has also given industry a reality check. Companies are finally understanding that there are real financial implications involved, not to mention the environmental aspects. With South Africa being the 14th largest greenhouse gas emitter in the world, the country has a prominent role to play in resolving climate change.





# COOL SURFACES:

A sustainable, low-cost intervention for keeping cool



*Cool surface technology offers an immediate, direct and inexpensive solution to South Africa's strides towards an economy built on clean energy. Through this technology, the environment benefits from a passive-energy cooling solution that includes cool roofs, cool walls, and cool roads.*

National rollout and interventions



SA's national energy supply is under constant threat, compounded by a fragile grid that is dealing with increasing demand. Untenable rising energy costs are reducing citizens' monthly cash flow for other necessities. In such a scenario, SANEDI believes that energy efficiency should be at the front and centre of any energy strategy in this era of economic depression.

SANEDI is encouraging South Africans to manufacture cool coatings for roofs, walls and roads, establishing new industries and job opportunities. A national rollout of cool surfaces will greatly aid the government in not only alleviating pressure on the grid – as a passive energy solution – but also create much-needed local economic development manufacturing and employment opportunities.

Additionally, cool surfaces support the government's drive to achieve multiple mandates. Cool roads for example can assist the Department of Transport to reduce the need for road maintenance and tyre damage, as it significantly reduces the surface and ambient temperature of roads, effectively extending their lifespan.

Cool surface technology can assist the Department of Trade and Industry in the revival of the economy, which includes a product lifecycle from manufacturing, testing to distribution and application. The Department of Human Settlements can benefit from a low-cost intervention that increases the standard of low-cost living, reduces energy costs and limits subsequent maintenance.

## Urban benefits

In urban areas, SANEDI's Cool Surface projects provide coating application training to local communities and partner departments, particularly those suffering from high unemployment. Successful graduates are offered paid jobs as supervised interns during project deployment and bring back invaluable experience to their communities.

The deployment of cool surface technology also greatly improves urban air quality, reducing energy and health costs. It reduces the urban heat island (UHI) effect as it cools the ambient temperature over cities, providing resilience to heat events and climate change.

A UHI is a metropolitan area that is a lot warmer than the immediate areas surrounding it. Heat is created by energy from people, cars, buses, and trains in big and densely populated cities. These UHIs usually have worse air and water quality than their immediate neighbours, and night-time temperatures remain high.

On an individual building scale, cool surfaces improve the thermal comfort of occupants in buildings without mechanical air-conditioning, like some schools, warehouses, homes and factories. The technology improves health and productivity, saving on medical bills and reducing absenteeism from work and schools. Also, it substantially reduces the cost of building maintenance as it is waterproof, fire retardant, inexpensive, low-tech and quick and easy to deploy.





# COOL ROOFS

## CHALLENGE ACCEPTED:

### Lowering temperatures and improving living conditions

*SANEDI is currently one of ten global teams awarded a \$100 000 grant by the Million Cool Roofs Challenge to deploy solar reflective coatings between August 2019 and August 2021. The Million Cool Roofs Challenge is a \$2 million global competition to rapidly scale up the deployment of cool roofs in developing countries suffering heat stress and lacking widespread access to cooling services.*

*Cool roofing usually involves the coating of roofs with a durable, reflective membrane that reflects the heat of the sun. However, in some of the SANEDI projects implemented with the Department of Defence, we have coated both the roofs and walls of buildings made with corrugated metal. It is an inexpensive and highly effective passive energy, low-tech cooling intervention. Reducing the electricity demand required to power mechanical cooling systems, cool roofs offer significant cooling to South African homes in the heat of summer.*

*SANEDI has undertaken several initiatives since receiving the grant. These projects have not only improved the living conditions of recipients; they have also uplifted the community thanks to the training of local unemployed individuals. SANEDI provides access to certified training for these individuals, meaning they receive a recognised trade qualification. They also gain supervised painting experience across thousands of square metres. This gives them a huge bank of experience which will increase their chance of employment when entering the job market.*

**Here are some of the cool surfacing projects which SANEDI has recently facilitated.**

### Lephalale SANDF Medical training facility

SANEDI implemented a successful cool surface proof of concept (PoC) project at the Department of Defence's (DoD) Lephalale South African Military Health Service (SAMHS) Training facility in Lephalale, Limpopo. The project entailed the resurfacing of 15 000 m<sup>2</sup> of walls and roofs with cool surface technology.

The Lephalale SAMHS operates as a training facility and accommodation for doctors, nurses and other health practitioners serving in the South Africa National Defence Force (SANDF). Most of the facility's accommodation building material is made up of corrugated iron and prefabricated buildings, which means the indoor temperatures are scorching during hotter months.

Immediately after completing the project, SANEDI took a reading of the outside temperature at the accommodation rooms. It was a staggering 47,2°C. The facility had been using industrial air-conditioning to cool down the various buildings, which was extremely costly particularly during soaring temperatures in summer. After coating the buildings, the indoor temperature was 29,8°C – a remarkable achievement. To date, six months down the line in summer, the military personal staying in the buildings are reporting a dramatically improved thermal comfort and are very pleased with the results of this pilot project.

SANEDI is monitoring the performance of the technology across two years of seasons, to demonstrate that cool surface technology offers a tangible and inexpensive solution to curbing heat and making buildings more liveable. It also is expected to result in far less electricity consumption and wear and tear on the air-conditioning units at the base. SANEDI hopes to roll out the cool surfaces project at various SANDF bases across the country.

### Sekutupu Old Age Home, Limpopo

The SANDF in partnership with SANEDI successfully completed the donated installation of a cool roofs project at the Sekutupu Old Age Home, situated in the Lepelle Nkumpi Municipality in Limpopo. The residents now benefit from significantly cooler living facilities that are particularly beneficial during the province's sweltering summer months.

The Sekutupu Old Age Home is a recipient of the SANDF Legacy Project which aims to give back to worthy causes. The cool roofs installation formed part of a SANEDI - Department of Defence driven community support project at the old age home. Approximately 2700 m<sup>2</sup> of roofs were coated with the product. The cool roofs have made such a difference to the daily lives of the residents of Sekutupu Old Age Home. The SANDF

is encouraging communities across the country to use cool roof paints.

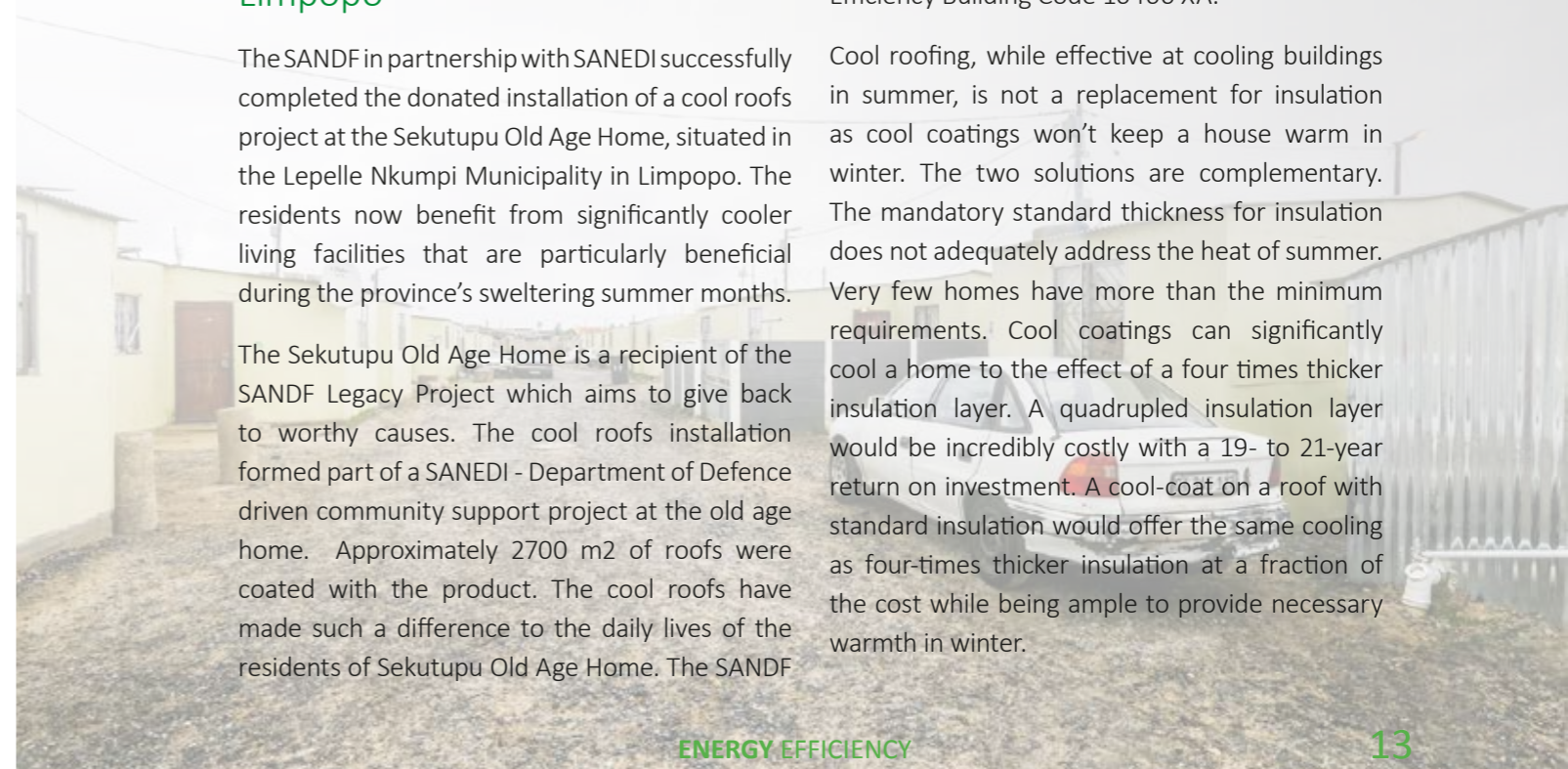
Both the Sekutupu Old Age Home and Lephalale SANDF training facility projects were executed under SANEDI's Renewable Energy Centre of Research & Development (RECORD).

### Cape Town settlements

SANEDI is also rolling out 26 500 m<sup>2</sup> of cool roofing technology in the City of Cape Town as part of the Cool Roofs and Insulation Collaboration. This rollout will show the power of passive cooling when cool coatings are used in conjunction with insulation. The community selected for this project is the Masonwabi informal settlement, as these structures are comprised of corrugated metal walls and roofs with a wooden frame, and thus in urgent need of these interventions.

This project is the first of its kind in South Africa and has been undertaken in partnership with the Thermal Insulation Products and Systems Association SA (TIPSASA). The intention is to use the collected data as evidence for the mandatory inclusion of passive thermal control in the Energy Efficiency Building Code 10400 XA.

Cool roofing, while effective at cooling buildings in summer, is not a replacement for insulation as cool coatings won't keep a house warm in winter. The two solutions are complementary. The mandatory standard thickness for insulation does not adequately address the heat of summer. Very few homes have more than the minimum requirements. Cool coatings can significantly cool a home to the effect of a four times thicker insulation layer. A quadrupled insulation layer would be incredibly costly with a 19- to 21-year return on investment. A cool-coat on a roof with standard insulation would offer the same cooling as four-times thicker insulation at a fraction of the cost while being ample to provide necessary warmth in winter.





# AN ENERGY EFFICIENCY MILESTONE ACHIEVEMENT:

## Issuing SA's first Energy Performance Certificate

***SANEDI believes that the issuing of the first-ever Energy Performance Certificate (EPC) for a building in South Africa recently is a landmark achievement that will encourage energy efficiency across the board. According to the International Energy Agency, buildings account for approximately 30% of global energy consumption and 40% of total direct and indirect CO<sub>2</sub> emissions. These figures could easily grow in Africa – and particularly in South Africa – due to increasing urbanisation.***

On 18 February 2021, the Admin B building at Stellenbosch University, which houses the vice-chancellor and executive team, received the first-ever EPC for a building in South Africa, in recognition of its commitment to energy efficiency. Bluedust Engineering Solutions, Stellenbosch University's energy management consultants, were instrumental in achieving their EPC. The EPC was issued by Energy Management and Verification Services (EMVS), the first inspection body accredited by the South African National Accreditation System (SANAS), to assess and issue an EPC rating for eligible South African buildings.

### Background to EPCs

In December 2020, the Department of Mineral Resources and Energy (DMRE) passed into law a set of "Regulations for the Mandatory Display and Submission of Energy Performance Certificates for Buildings".

EPCs are recorded by SANEDI, who is specifically tasked with hosting and maintaining a national Building Energy Performance Register, to keep track of progress towards the achievement of the goals and targets set out in the EPC Regulations.

EPCs rate buildings' energy performance from A to G, with A being the most energy efficient and G the worst, with D being the mid-point when benchmarking against the average figures quoted in the national South African Building Standard SANS 10400-XA. Buildings must try and achieve at least a D-rating which is on par with the national benchmark. Their EPC must be displayed at the building entrance, no matter what their rating, in order to be compliant with the regulations.

For the purposes of the EPC, a building's energy performance is measured in terms of kilowatt hours per square metre per annum (kWh/m<sup>2</sup>/pa) of net floor area in accordance with the National EPC Standard (SANS 1544). The regulations apply to non-residential buildings (specific occupancy classes) with a net floor area of at least 2000m<sup>2</sup> in the private sector, and 1000m<sup>2</sup> for buildings owned, operated or occupied by an organ of the state.

Property owners and government entities have until 7 December 2022 to ensure that their buildings adhere to the regulations. Penalties for non-compliance have not yet been stipulated, and currently stand at the discretion of the Mineral Resources and Energy Minister, Mr Gwede Mantashe.

### Encouraging responsible energy decision-making

South Africans should not see this as a punitive expense, but as the responsible thing to do in addressing climate change and sustainability matters. EPCs are, in essence, a tool that provides a snapshot view of a building's energy performance, empowering building owners to make informed decisions relating to energy efficiency improvements and renewable energy integration.

Stellenbosch University's A-rated EPC being achieved so soon after the regulations were gazetted is a phenomenal achievement. Hopefully, this achievement will encourage other building owners to follow suit. The national drive towards energy efficiency will unlock the wider value chain, as building owners look to implement more efficient systems. Economic activity will be stimulated, as building owners work towards achieving compliance in areas such as HVAC, lighting, building retrofit, energy monitoring and more energy-efficient appliances and equipment, to optimise and reduce energy usage. This will involve engineering firms and other energy service companies, who will typically be contracted to do these energy efficiency upgrades, thereby creating much-needed job opportunities in the energy sector.





## Ensuring professional and accountable **ENERGY SERVICE COMPANIES**

An Energy Service Company (ESCO) is a business that provides a broad range of energy solutions including the design and implementation of energy savings projects, retrofitting, energy conservation, energy infrastructure outsourcing, power generation and energy supply, and risk management. SANEDI acknowledges the importance of these companies in aiding the transformation of South Africa's energy landscape. Most notably, these companies are instrumental in executing building energy efficiency upgrades which may be required for buildings to receive their Energy Performance Certificate (EPC), in terms of the EPC Regulations gazetted by the Department of Mineral Resources and Energy (DMRE), on 7 December 2020.

With this in mind, the ESCo Register – supported by the Department of Mineral Resources and Energy (DMRE), SANEDI and the Deutsche Gesellschaft fuer Internationale Zusammenarbeit (GIZ) in 2017, was recently updated. The number of participating companies increased from 58 to 89. The number of classified Tier 1 ESCos increased from 14 to 29 and Tier 2 ESCos increased from 24 to 25. Many companies progressed to Tier 1 status. Forty companies had to be disqualified, as they did not provide sufficient information or proof of their capacities and services offered. While this is unfortunate, SANEDI believes it ultimately results in a more sound, accountable and professional register of ESCo's who can be hired with confidence.

In total, the actual ESCo Register comprises of 54 qualified ESCos offering various services in the field of energy efficiency and renewable energy. Those qualified ESCos ensure coverage in all nine provinces.

The following technologies were documented: LEDs for public lighting, building lighting, high-efficient HVAC, high-efficient water heating systems, high-efficient steam boilers/systems, high-efficient motors and pumps for fresh and wastewater, wastewater processes, co-generation, biogas, energy management and smart metering, small scale solar PV systems, amongst others.

Sectors covered include residential, commercial, light industry, heavy industry/mining and public infrastructure/municipalities. The registered companies are ready to provide services covering energy auditing, measurement and verification of EE savings, engineering design, project implementation, energy management, supporting the improvement of Energy Performance Certificate ratings, energy performance contracts, financing of energy projects and the full ESCo offering, including the provision of energy services and financing.

The ESCo register is an important tool to facilitate market development and growth of ESCos in South Africa and is utilised by both the public and private sector organisations to identify, plan, develop, finance or implement energy efficiency projects.


## **INDUSTRIAL ENERGY EFFICIENCY**

### in the spotlight

In efforts to boost South Africa's energy efficiency performance and reduce our greenhouse gas emissions, SANEDI believes that no stone should be left unturned when it comes to finding potential for improvement. It is critical that homes, businesses, commercial, agricultural and industrial sites all play their part in minimising their electricity use. This is not only for the benefit of our national grid which is under strain, but for the benefit of our country and planet. While South Africa is the 32nd biggest economy in the world, we are the 14th biggest emitters of greenhouse gasses.

Large power users and big industrial operations should be considered when we look for prominent energy savings opportunities. The South African Industrial Energy Efficiency (IEE) Project is progressing with a data-intensive study to assess the potential for energy savings in the local automotive and pulp & paper industries.

The mainstreaming of energy efficiency in industry forms part of the broader energy efficiency and demand-side management programme objectives led by government, SANEDI and the business community amongst others. This initiative would contribute significantly towards the national energy efficiency targets as stipulated in the National Energy Efficiency, Strategy (NEES).



Multi-stakeholder project places key industries under study in search of efficiency gains

### Background to the project

The IEE Project was initially launched in 2010 (Phase I), to assist industries around the country to save energy and money, improve effectiveness and demonstrate the positive impact of energy management on the reduction of GHG emissions. Phase II of the project essentially focuses on promoting IEE through further accelerating and mainstreaming the adoption of Energy Management Systems (EnMS) and Energy Systems Optimisation (ESO) within South African industry and ensuring the outcomes of the SA IEE Project are expanded and become sustainable market-orientated fixtures within the national industrial landscape.

The project is the outcome of a partnership with the United Nations Industrial Development Organisation (UNIDO), the Department of Mineral Resources and Energy, through SANEDI, and the Department of Trade, Industry and Competition, through the National Cleaner Production Centre, South Africa (NCPC-SA). The project is funded by the Global Environment Facility (GEF) with co-funding through the Department of Trade, Industry and Competition.





PROJECT FOCAL AREAS	
<b>Component 1.0: Data quality improvement to facilitate data-rich industrial energy efficiency and energy management policy implementation</b>	<b>Component 2.0: Strengthening policy implementation and support frameworks for EnMS, ESO and Energy Management Standards</b>
<p>Expected outcomes include strengthened energy management planning (and related energy and GHG emissions reduction target setting) through improved data and reporting on energy consumption and potential savings under EnMS and ESO. The project will assist the SA government to improve industrial energy consumption data gathering and quality, as this remains a significant barrier to policy implementation.</p>	<p>Expected outcomes include enhanced promotion of investment in IEE through strengthened policy and regulatory frameworks and support to increase the uptake of energy management standards. The project will work with multiple Government Departments and Agencies to assist in better implementation and coordination of policy and regulatory mechanisms. The original SA IEE Project worked extensively to institutionalise the main ISO 50001 standard, the SA IEE Phase II GEF Project will continue this work but expand to the rest of the series (ISO 50002, ISO 50003, ISO 50006, ISO 50015, which is analogous to SANS 50010).</p>

### No sector too small

By turning attention to the paper and pulp and automotive industries, which are relatively small in number in South Africa with just a few key role players, the project aims to help uncover further savings potential and advise on improved ESO and EnMS. While the industries may be small in operations, they are energy intensive.

- **Pulp & paper industry**

The pulp & paper industry is diverse, consisting of many different and complex processes, depending on the pulp and paper grade produced, (e.g. tissue, packaging, writing and chemical pulp). This industry is one of the most energy intensive

industries in the world, and an effort must be made to help this sector reduce its energy consumption. Some companies produce pulp, while others cover a full production cycle from fibre resources to final paper grades. Pulp and paper can be produced from virgin pulp (derived from wood), or recovered paper. The pulp & paper industry is the fourth largest energy user, requiring various forms of energy and heat needed for pulping, paper and pulp drying, black liquor evaporation and some intermediate operations. The IEE Project is aimed at establishing the energy savings potential in the industry and furthermore supports adequate interventions.

- **Automotive industry**

The potential of the automotive sector to contribute positively to the South African economy has been recognised by the government and has led to several initiatives set up to strengthen the sector. The Industrial Policy Action Plan (IPAP) by the then Department of Trade and Industry (dti), now the Department of Trade Industry and Competition (dtic), identified the automotive industry as a critical segment of the economy. This sector in 2008 contributed 7% to South Africa's GDP and today it significantly contributes to manufacturing exports and holds great potential for job creation. The IEE Project will also establish the energy-saving potential, keeping in mind this sector is known to already be very efficient in its energy use.

The main players in these two industries are by no means new to the energy efficiency game. All are internationally competitive and have implemented green initiatives at their facilities, in line with global best practice. However, when this funding opportunity arose in South Africa, the DMRE proposed the paper and pulp and automotive industries, after conducting a Gap Analysis on the available energy data in these industries, to reliably inform the targets set out in the South African National Energy Efficiency Strategy. While many of the facilities assessed in the project may be in competition with each other, the initiative by no means seeks to serve anti-competitive behaviour through the publication of sensitive data.

### A data-driven study for world-class results

A crucial element for ensuring actionable and reliable outcomes of the study is to ensure the use of the most valuable data, which can reliably inform researchers on the baseline situation and the additional energy savings potential in both industries. Data availability and accuracy is historically a problem in South Africa, which is another reason this activity provides an important focus.

To aid the study's objective, SANEDI has received best-practice templates for data collection from the International Energy Agency (IEA). The IEA has considerable experience in similar studies across the world, which it uses to shape energy policies for a secure and sustainable future. With their help, industry best practice is being used to ensure that the study can be undertaken smoothly and provide sound outcomes, in line with internationally accepted norms and standards.

Combined with this, the role of digitalisation cannot be ignored. While many facilities may have already implemented green initiatives, technology is continuously developing and always offering additional potential for operational improvements. Assessing what technology is used, how it is used, what data it generates, and what is done with that data will form a big part of this study.





## Beneficial outcomes

The project aims to contribute to the sustainable improvement of industrial energy usage practices in the pulp & paper and automotive sectors, thereby reducing carbon-dioxide emissions and pressure on energy resources and further demonstrating the impact of energy efficiency practices in terms of financial and environmental benefits.

The key benefits of the project are:

- Providing industry with easy access to energy management solutions. This will be achieved by the adoption and promotion of EnMS and ESO solutions (ISO 50001). Additionally, the promotion of 12L tax incentives in Industrial Energy Efficiency to industry consumers would provide financial benefits.
- Encouraging the creation of an enabling policy environment by reviewing existing IEE National policies.
- Empowering industry consumers to help them understand their electricity consumption, by determining what they're using, and understanding which process components use the most energy.
- Demonstrating the potential and impact of IEE on the bottom line and sustainability of a business through case studies, demonstration plants and awareness-raising.
- Implementing gender mainstreaming by incorporating gender equality within all activities in the IEE project.
- Reducing carbon emissions and energy usage within these industries.

## Encouraging women in energy

It is important to note that the multi-party IEE Project is one of many initiatives contributing to increasing female participation in the energy sector. This is crucial, as a 58% gender gap remains between men and women in terms of economic participation. On the other hand, gender diversity has been found to lead to a better quality of decision-making, lower risk, improved global image, and greater innovation.

In line with this, the project is identifying a largely female team of researchers, data collectors and other competencies to undertake the study. Further, the study will assess the extent to which the target sectors have implemented gender mainstreaming in their organisations. This is not to condemn them, but to rather aid them on their journey to a transformed workforce.

# RENEWABLE ENERGY





## SOLARTURTLE: AN OFF-GRID PLAN FOR INFORMAL TRADERS

The **SolarTurtle** project is one of many solar projects completed under the Department Science and Innovation Solar RDI Programme. The technology comprises of micro-energy-solar-kiosks. Each energy kiosk has a solar charging unit, an e-learning platform, along with an integrated Information and Communication Technology (ICT) management system.

Three different prototypes are available; a smaller suitcase/backpack version, a mid-sized bicycle trailer and a larger car trailer. Vendors can use a range of transport options to get to taxi ranks, train stations, markets, or sporting events where they can deploy the energy-solar-kiosks to generate income from consumable goods or food, while offer recharging and printing services using the energy kiosks.

The energy kiosks will offer Wi-Fi hotspots so that customers can make use of internet and email services. **SolarTurtle** entrepreneurs making use of the energy kiosks can provide cellphone recharging services, upload their daily cash transactions, generate revenue and loss reports, and assess stock on hand. This provides a new paradigm of learning and community interaction, notwithstanding developing markets in rural and dense urban environments.

The technology leverages the benefits associated with solar power, promoting entrepreneurship, and promoting the green economy. The project also advances sustainability given that it promotes black women and youth owned businesses in townships and dense urban settings.

## PROJECT IN FOCUS:

# Providing clean water backed by clean energy

In 2020, SANEDI partnered with the Department of Defence (DoD) for a Water Treatment Works project at the SANDF Air Force Base in Hoedspruit in the Maruleng Municipality, Limpopo in light of the pandemic. The provision of safe water, sanitation and hygienic conditions continues to be essential for protecting human health during the pandemic. Commencing on 28 April 2020, the project has been focused on the provision of reliable clean water and energy efficiency to support and promote good hygiene, curbing the spread of infectious diseases.

Reliable and sufficient energy form the backbone in the effective delivery of clean water and waste treatment systems. Hoedspruit is situated in a severely water-stressed climatic zone compounded by a municipality that faces many electricity and water supply challenges. The Maruleng Municipality must deliver services hampered by an aging, often defunct and energy inefficient infrastructure of sewage and water treatment works which is located on the SANDF's Air Force Base.

The SANDF facilitated a direct intervention by SANEDI to assess and ultimately implement energy solutions to improve the situation, allowing for clean water distribution within Hoedspruit and surrounds. The collaboration between SANEDI and SANDF is a mutually beneficial one and is expected to expedite this five-year project towards completion.

The Water Treatment Works project initially assessed the current infrastructure on the air force base, looking specifically at energy consumption as well as the current state of repair and operations of the water treatment plant and sewage works. SANEDI is also investigating the opportunities for energy efficient and renewable energy interventions across this water treatment infrastructure. Based on the above assessments and available data, SANEDI recommended the relevant energy and water system interventions.

The project is expected also to include skills development and transfer, long-term maintenance and development of an established inter-institutional support team comprising SANEDI, the SANDF and the Maruleng Municipality.

Apart from facilitating the all-important collaboration with the municipality, the SANDF will provide system maintenance and structural implementation support. Also, any hardware installation will be protected by the SANDF – access control will therefore be stringent, preventing potential theft and vandalism.

SANEDI is well experienced in the execution of clean energy applications in water treatment projects. To date, SANEDI has successfully completed municipal water treatment works projects through its Renewable Energy and Energy Efficiency Partnership (REEP) projects at the !Kheis Local Municipality in the Northern Cape and Nelson Mandela Bay Metropolitan Municipality in the Eastern Cape.



# There's an app for that

*GIZ-SANEDI partnership creates app for better lighting decisions*

With the growing emphasis on energy efficiency in South Africa, the South African German Energy Programme (SAGEN), implemented by the German Development Agency (GIZ) and the South African National Energy Development Institute (SANEDI) have created a new app set to improve investment decisions around energy use in lighting of buildings across the country. The first of its kind in SA, the app has been tailored especially for the local market.

Individually, a lightbulb may not be considered a major energy consumer in a building, especially in a home or small office. However, considered collectively on a larger scale such as in a government facility, school or hospital, the energy efficiency of lighting can have a significant impact on a building's energy use. Streetlighting and outdoor area lighting also use a lot of energy but is necessary for a secure environment. Managing area lighting is more difficult than indoor lighting and energy efficient lighting has an important role to play in reducing costs associated with this expense.

With this in mind, the Tshwane University of Technology (TUT) was appointed by the GIZ to develop an app that helps users implement energy efficient lighting. The app was created in collaboration with SANEDI and the Department of Defence (DoD) and funded by the German Development Agency (Deutsche Gesellschaft für Internationale Zusammenarbeit – GIZ).

Developed for both mobile and PC use, the app guides the user through a lighting energy audit of a building. As the user works their way through a building and its grounds, they count the lights and note their specs, thus gathering data that is entered into the app. The app then provides information on alternative lighting solutions, their cost, energy usage, the investment required and – importantly – the return on that investment in terms of energy and costs saved. The information gathered is housed securely on the SANEDI server, and users do not have access to other users' data.

The GIZ reports that they funded this project due to the growing importance of energy efficiency. It



is estimated that replacing lighting systems with the latest LED technology could save between 30% and 60% of an organisation's lighting bill. Investing in energy efficient lighting offers an immediately affordable intervention as a first step towards energy efficiency and sustainability with a direct monetary benefit. Organisations find it challenging to calculate the replacement cost of existing lighting systems as well as the potential savings that could be realised with energy efficient lighting solutions. The user-friendly tool assists in overcoming this challenge.

The app has been designed with municipal and government buildings in mind as the primary target market, however both GIZ and SANEDI hope to see uptake in the private sector, too.



Effort was placed on ensuring the app provides the right suggestions based on correct and current technology and cost data. To this end, the app adapts its recommendations based on the user's location, taking into account the price of lightbulbs in that area, as well as the relevant electricity tariff. SANEDI does not expect users to make immediate complete facility-wide changes, unless they had planned to do so. However, the app's recommendations can be used to inform decisions on future replacement, repair and maintenance plans.

The app has been tested in an extreme application, in collaboration with the DoD with varied and unique lighting requirements. The app was used to audit the lighting of a defence base near Pretoria, which has very specific lighting needs for security and surveillance. Initial auditing revealed that the base could save as much as R200 000 a year, with an ROI of less than 12 months, should the base choose to implement all the app suggestions. Importantly, the app suggestions ensure the user would ultimately have the benefit of the same if not better lighting quality, and environmentally friendly reduced energy use.

A team of five technologists at TUT were supported by relevant professors as they worked on the app throughout 2020. The app surpassed expectations and includes additional functionality and information not originally anticipated.



## PROJECT IN FOCUS:

# SANEDI develops biogas training material

Biogas is one of the more challenging renewable energy technologies to implement because it is extremely dependent on the human factor. As such, it is important that the individuals that will be working with this technology be trained on how it functions and what their roles and expectations around biogas implementation should be. To this end SANEDI, using in-house expertise, has developed a biogas training manual and associated lecture slides that give potential biogas users and beneficiaries the necessary theoretical knowledge to enable the integration of biogas in their systems, and thus enable them to enjoy the associated technology benefits.

In August 2020, SANEDI delivered training to its partners in the Department of Defence. The Department will be implementing two biogas digesters at different scales on bases in Limpopo province. This training is designed to impart knowledge as well as to stimulate passion for this renewable energy technology, and was well received. In March 2021, SANEDI began the biogas pilot project with the Department, and construction and commissioning are under way.

## PROJECT IN FOCUS:

# Solar water heating pays off

A pilot project for solar water heating with the Department of Defence (DoD) was commissioned in May 2019. Since then, SANEDI has been monitoring the performance of the system and plotting the returns against the initial capital cost and running costs over the lifetime of the system.

To date, the dual 1500 L systems (total 3000 L), installed at two accommodation buildings at the South African Air Force Gym, Air Force Base Hoedspruit, have been functioning using 95% solar energy showing. The investment has shown a payback period of around two years. By the end of March 2021, the system had achieved an electrical saving of 316 299 kWh. This translates to a rand saving of approximately R630 000 and a CO2 saving of approximately 75 tons.

Over the project lifetime, a projected internal rate of return for the project stands at 34%, a return on investment of 570% and projected savings of over R7 million. This project is considered to be a very successful pilot that has leading to increased solar thermal implementation within the South African National Defence Force thanks to the impressive showcase presented in this initial project's collaboration.

The project has been greatly successful in demonstrating the value of renewable energy applications. While the environmental benefits are always important, SANEDI is pleased to be promoting the business case for going green.





# WASTE TO ENERGY

## - PlasWen Pyrolysis Technology

South African industries operate in an economically depressed environment and explore many ways to reduce operating costs. Such savings are possible through improved and cost-effective waste disposal, with the additional benefit of providing energy. Global attention on renewable energy sources, and the role it should play in the country's energy mix, has gained significant attention.

To this extent, SANEDI in collaboration with NECSA have developed a Plasma Waste-to-Energy project (PlasWen). This technology essentially comprises a plasma gasification system, in which waste materials, including municipal, tyre, medical, organic, and nuclear waste, is converted into useable and versatile syngas. The syngas comprises of a mixture of N<sub>2</sub>, CO and H<sub>2</sub>. Ideally, the syngas can be converted into a range of renewable energy sources. Such sources include electricity, methanol, methane, steam, heat and hydrocarbon fuels and associated products.

The PlasWen technology offers numerous renewable energy and waste management alternative benefits. Landfill traditionally consume extensive tracts of land, causes significant pollution, and causes Green House Gases and ultimately global warming. Landfills under anaerobic conditions produce methane gas (GHG) which is released into the atmosphere. Methane is 21 times more lethal than carbon dioxide.

PlasWen technology can process both organic and inorganic waste, which is beneficially diverted from landfills, while producing renewable energy, which can be diverted to the municipal grid. The PlasWen system can be scaled to process up to 100 tons per day of waste, is mobile and can be stationed at municipal waste drop-off sites, thereby encouraging recycling. Once fully operational, the PlasWen system is self-sustaining with reference to electricity supply.



## PLACING THE SPOTLIGHT ON skills development for the wind industry

In a good news story for the South African wind energy industry, there has been a massive upswing in the sector's skills development. The industry has seen an influx of skilled wind turbine technicians and, in further good news, the response from wind turbine manufacturers and wind farms has been positive, with clear demand for these skills.

December 2020 saw the graduation and subsequent employment of the fifth group of certified wind turbine service technicians (WTST) trained by South African Renewable Energy Technology Centre (SARETEC), which is hosted at the Cape Peninsula University of Technology (CPUT) in Cape Town.

Highlighting the critical need for WTSTs in the coming years, Ntombifuthi Ntuli, CEO of the South African Wind Energy Association (SAWEA) reports that to meet the goal of Integrated Resource Plan of 2019 (IRP 2019), 192 new WTSTs will have to be trained on an annual basis to match the deployment schedule. The IRP 2019 aims to deploy 1.6 GW of new wind capacity yearly from 2022 onwards.

Dr David Phaho, Deputy Vice-Chancellor: Research, Technology, Innovation and Partnerships at CPUT indicated that SARETEC will be training 135 technicians in the coming three years, and selection for the next group of WTST students is already under way.

The two most recent intakes of students for the WTST programme were sponsored by the South African Wind Energy Project Phase 2 (SAWEP) which is funded by the Global Environment Facility (GEF), implemented by the DMRE and supported by the UNDP SA country office and SANEDI.

The R3.4 million SAWEP sponsorship was allocated towards the 24 students over a period of seven months which included five months at SARETEC and two months' workplace training at an original equipment manufacturer (OEM) wind turbine supplier. The funds also provided a stipend to students during their training.

WTST is a globally sought-after qualification which trains specialised technicians to work on wind turbines undertaking construction, maintenance, service, fault finding and repairs. SARETEC is currently the only training centre in SA equipped to offer the seven-month WTST qualification which is accredited at the National Qualifications Framework (NQF) Level 5. SARETEC has also obtained necessary accreditation from the Quality Council for Trades and Occupation (QCTO). This means that the WTST qualification is recognised throughout South Africa and internationally. The WTST 7 qualification is also supported by the Manufacturing and Engineering Related Skills SETA (MerSETA).





# CLEAN MOBILITY



## LITHIUM-ION BATTERIES: *An electrifying opportunity for South Africa*

The global move to low-carbon transportation options, such as electrical vehicles (EVs), brings battery technologies to the fore. This provides unique opportunities for policy makers and local producers to explore South Africa's competitive advantage in the lithium-ion batteries (LIBs) value chain.

This emerged as a key theme from a study on opportunities to develop the lithium-ion battery value chain in South Africa, initiated by the United Nations Industrial Development Organisation (UNIDO) and the Department of Trade, Industry and Competition (dtic) as one of the deliverables of the Low Carbon Transport project in South Africa. A report on the study, which was conducted by Trade and Investment Policies (TIPS) on behalf of the project, has been published.

The report feeds into the broader debate around low-carbon transport, green industrial development and policy shifts in terms of the development of the EV value chain. The report mentions the increased prominence of EVs entering the market, highlighting battery technologies as an important component of sustainable development. The study investigated the potential for a South African LIB value chain in light of government's and industry's commitment to ensuring the local automotive manufacturing value chain is a key player in the mobility of the future.

Every stage of the LIB value chain was investigated to identify the country's existing and potential competitive advantage. In addition,

the TIPS research team sought to answer several questions, such as: can the country develop new capabilities relevant to the battery value chain? Should the country focus on specific segments of the value chain or work to build a complete value chain domestically? Finally, it was acknowledged that the country has the minerals required for the production of batteries. The question is, does South Africa and other African countries have the potential to build on their natural resources to support mining and beneficiation?

What emerged is that there is a vibrant value chain, but not all stages are at the same level of development. The report points out:

*"Mining of multiple LIB-relevant minerals, such as manganese, iron ore, nickel and titanium, is already underway in the country and the region. Mineral beneficiation for battery production, while limited, is also present in the country, with existing pockets of excellence in manganese and aluminium and interesting developments in lithium, nickel and titanium. Importantly, battery manufacturing (off imported cells) and battery refurbishing (second-life batteries) is a booming opportunity with many firms operating in this space, leveraging unique expertise and intellectual property, notably in the development of battery management systems. By contrast, cell manufacturing, while explored at the R&D level, is yet to be proven commercially viable in the country. Similarly, the development of recycling is still early days in the country."*





Identifying where in the value chain South Africa is competitive is critical, so as to channel support and resources into the most sustainable activities. Based on the research, four possible technical pathways are proposed to support the development of the LIB value chain: 1) battery manufacturing; 2) mineral refining; 3) cell manufacturing; and 4) battery recycling.

The study noted that developing battery manufacturing and mineral refining are ready for scale-up whilst cell manufacturing and recycling could be explored in the medium to long term, provided they prove to be economically sustainable. The report notes that where there are “key pockets of excellence” (battery manufacturing, mineral beneficiation and mining), and efforts and resources should be focused on these activities. The development of the LIB value chain is a fantastic opportunity for South Africa, provided the country invests in its strengths and competitive advantages, rather than unsubstantiated aspirations.



The study pointed out that an established LIB industry is instrumental to the local development of both the (renewable) energy and (electric) transport industries. Hence, ensuring high levels of local content in renewable energy and automotive manufacturing will be dependent on localising the battery value chain as much as possible. In turn, strong partnerships and collaboration between public and private institutions as well as between local and international players is critical in growing the LIB value chain.

Notably, the study also mentions the minerals beyond South Africa, particularly on the African continent. Among SADC are graphite (Mozambique and Tanzania), nickel (Botswana, and Zimbabwe), titanium (Mozambique, Madagascar) amongst others. The potential for regional industrial integration of these minerals should be explored, which could be achieved through the implementation of the Southern African Development Community Industrialization Strategy and Roadmap 2015-2063, and the recent implementation of the African Continental Free Trade Agreement (AfCFTA).

In moving forward, the report highlights that aside from identifying where in the entire LIB value chain South African industries are (or could be) competitive, several key components, such as local testing and certification as well as access to funding for commercialisation of innovations, are required to establish an enabling policy framework for the development of the LIB value chain. In addition, facilitating access to markets, both domestically and globally, and shaping R&D and skills development in line with South Africa’s competitive advantage would play a large part in South Africa succeeding in developing the value chain.



# SMART GRIDS



# SMART GRIDS

## Research Collaboration with the University of Pretoria

A flagship programme within SANEDI is the Smart Grids Programme, which focuses on research and deploys various smart grids concepts within the electricity distribution industry. SANEDI got into partnership with the University of Pretoria and produced a number of research programmes, developed a number of short courses for municipal officials and developed the smart grids laboratory at the University of Pretoria and awarded students bursaries.

This collaboration is expected to have a profound impact on South Africa's electricity grid system and the expansion of a knowledge base that will assist in refining skills and will result in invaluable information to the benefit of the energy sector.

It is envisioned that the research programme will contribute to capacity development within the environment of education and learning, it will facilitate quality knowledge sharing and will

further enhance skills development, as well as excel the innovation of standards and principals for smart grid solutions.

SANEDI in partnership with the University of Pretoria conducted a one-year research on Internet of Things (IoT) Technologies for Effective Municipal Asset Management. The project seeks to explore the implications and opportunities for municipal electricity distribution entities as 4IR is set to disrupt many existing industries as well as enable others to flourish.

### Purpose of the research

This report explores future technological trends, their implications and opportunities for municipal electricity distribution entities. It captures future technological trends, in particular, the Internet of Things (IoT) that are set to disrupt the electricity distribution industry globally.

### Key findings

The key findings of the research are:

- The implementation of IoT technologies requires defining the specified application and the sector to be deployed. A modern municipality has several services which require real-time data coordination, control, measurement and monitoring. The operational perspective of the IoT technologies looks to connect sensors and people anytime in anyplace. The novel IoT introduces connectivity beneficial to municipalities to guarantee performance and a peer-to-peer operational service for the city. This can maximise a green profit for the city and create a golden opportunity of improving sustainable development goals.
- The application of the IoT allows everyone to participate in the improvement of the municipality. The IoT implementation structure is based on the deployment of a sensing network, which can be fixed or mobile. The sensing network operates in a real-time manner to allow a fast coordinating action where the need is essential. This consists of a real-time near accurate or accurate data transfer to a command centre in which the server can act to guarantee the resilience of the designed system. The main issue that the IoT technologies face is the privacy and security of the users due to the interconnection of diverse devices that can contain different communication protocols.
- The smart city aims to adhere to a new generation of the living space where the environment is free of any risk that may negatively affect the living conditions. It is clearly shown that the IoT application in the smart city creates a green space that increasingly improves the health condition of the community. The management of municipal assets has tremendous potential for deploying IoT technologies. Implementing the IoT applications in the city aims to provide

the municipality with diverse opportunities to increase their profit, protect and secure people and guarantee a green space to the living being (human, fauna and flora). IoT technologies can improve the coordination of the electricity and freshwater supply in the municipality, and introduce diverse energy resources. This concept has encouraged the use of IoE, which aims to provide a green environment.

### Highlights of the research

President Cyril Ramaphosa provided a directive on the Fourth Industrial Revolution. The key highlights of the research are:

- The opportunities and challenges of implementing IOT are highlighted.
- The South African power sector is undergoing a significant transformation and can leverage 4IR to reconfigure most of its operational areas.
- Municipalities are key to the sustainability of a vibrant South African economy and have a constitutional duty to provide sustainable services. 4IR can contribute to this objective.

### Benefits of the research report

The 4IR holds excellent potential for improving management and governance and delivering system change to create clean, resource-secure and inclusive economies. The key benefits of the research includes:

- Improved understanding of IOT technologies at a municipal level.
- Understanding of the changing landscapes within IOT
- Positioning municipalities to leverage IOT technologies
- Improved efficiencies
- Improved revenue streams







# APPLIED ENERGY RESEARCH



## THE Energy Secretariat SUBPROGRAMME

### Background to the creation of the Energy Secretariat

During the 2018/19 financial year, the NRF review of the Renewable Energy Hub and Spokes was conducted. As part of the management of the Renewable Energy Hub and Spokes Programme, the NRF undertook an independent review to assess the successful implementation of the programme and put in place corrective measures prior to the programme receiving the next phase of funding support.

The outcomes of the NRF review were presented to the DSI. One of the action items from an EXCO meeting included an analysis of how the recommendations of the study could be applied across the broader Energy Research, Development and Innovation (RDI) Flagship Programmes, resident within the Department of Science and Innovation (DSI) to improve overall performance.

The Ten Year Innovation Plan included an Energy Grand Challenge which focused on advancement towards a knowledge-based economy, using the four elements of increased knowledge generation and exploitation, human capital development, knowledge infrastructure, and enablers to

addressing the “innovation chasm” to address the energy trilemma (energy access, environmental sustainability, energy security).

With regard to knowledge generation, South Africa ranks 38th worldwide in the generation of energy publications. However, a different perspective unfolds if one also considers the size of the Research and Development (R&D) workforce. South Africa has higher levels of productivity when compared to the USA (3.28 per 100 Full-Time Equivalent (FTE) research workforce; with Japan at 2.99 and 5.75 for the energy component of the National System of Innovation. However, when it comes to the movement of technologies from lab to market by overcoming the innovation chasm, there are challenges in the system such that the conversion into commercial products happens at a rate lower than global averages .

### The energy Secretariat Objective

The objective of establishing the Energy Secretariat is to support the successful commercialisation and upscaling of knowledge outputs from the broader energy RDI portfolio and ensuring systemic impact in the National System of Innovation.



## The Energy Secretariat Scope

The Secretariat is an administrative office that carries out the substantive and administrative work, in this case of the DSI as directed by the Chief Director Hydrogen Energy. The scope of the Secretariat will cover the following DSI energy-related programmes;

- Hydrogen South Africa;
- Energy Storage RDI Initiative;
- Renewable Energy Hub and Spokes;
- Coal CO<sub>2</sub> to X RDI Programme;
- SARChiars programme;
- Centres of Competencies

## The Energy Secretariat Roles and Responsibilities

The following roles and responsibilities are applicable:

- Monitoring the implementation of the Energy Science, Technology and Innovation Plan
- Monitoring the implementation of innovation policies relevant to the energy space
- Monitoring the role of alternative and emerging technologies within the implementation of relevant policies at both the national, regional and international level
- Manage and monitor large scale deployments in partnership with Public, private and academia in support of the Presidential District
- Assist with coordinating the training of TVET graduates and University of Technology (UoT) graduates on emerging technologies (i.e. fuel cells, batteries)
- Advocate on behalf of emerging and young researchers, as well as RDI programmes with key stakeholders so that knowledge outputs can be assisted towards commercialisation
- Assist consortiums in applying for and leveraging national and international funding to speed up the process of commercialisation



# WORKING FOR ENERGY



# The Business of BIODIESEL

*A fuel alternative and economic opportunity*



Today, millions of litres of used cooking vegetable oils are wasted – thrown away unceremoniously by households and businesses across the globe without realising that it forms a valuable part of the green economy where resources such as biofuels are becoming a valuable commodity.

These used edible oils, known as Waste Vegetable Oils (WVOs), can be converted into biodiesel. Biodiesel is a biofuel, just like bioethanol, biowaste and other renewable sources. They are a complementary and alternative energy source to fossil fuels.

Unlike ordinary diesel, biodiesel is clean-burning and according to analyst firm, ResearchGate, provides exceptional engine performance with more lubricity while also emitting less carbon dioxide and other toxic gasses. In fact, according to ResearchGate, biodiesel reduces net carbon dioxide (CO<sub>2</sub>) emissions by up to 78% (per a lifecycle) compared to ordinary diesel.

Worldwide, the production and use of biodiesel is also gaining momentum as countries move towards reducing waste and recycling where possible, while also finding ways to lessen their dependence on crude oil based products. It is estimated that the production of biodiesel will reach 41.4 billion litres by 2025, according to a research paper titled, “Biodiesel - From Production to Combustion”.

In South Africa, there is a significant opportunity for entrepreneurs – particularly those in informal and rural settlements – to utilise WVOs or edible oils in the production and resell of biodiesel. In Zambia, for example, a young entrepreneur has grown his business from 200 litres of biodiesel – produced from WVOs – to 3000 litres per month, selling it to local customers for use in vehicles and machinery.

At SANEDI, the Working for Energy (WfE) programme, in partnership with the Biofuels Business Incubator (part of the Small Enterprise

Development Agency) is working towards the development of the biodiesel industry and the concomitant skill development for the emerging economy. As part of its mandate, the partnership has recognised the importance of WVOs and how they can be produced and converted into biodiesel as well glycerine, thereby creating a new industry and associated jobs.

Through the Biofuels Business Incubator, SANEDI is effectively adding value to waste oils by structuring the waste oil collectors to become biodiesel producers as opposed to on-selling in the black market, as this is an unhygienic and potentially harmful practice.

To support this incubation initiative, SANEDI’s WfE and the BBI have developed and deployed South Africa’s first mobile waste oil to biodiesel processing unit, which can reach waste oil collectors in their respective centres in urban areas, thereby supporting community members in valorising this biowaste into something more environmentally benign.

Through ongoing education and training, the hope is to incubate a flourishing biofuel industry where communities can all benefit from the collection and upcycling of biowastes into useable products. These products, such as biodiesel and glycerine, offer a viable alternative to traditional fuels and other products. This is supportive of a just transition to the circular economy.





# BIOGAS

## sector development on the cards

*SANEDI and UJ place the spotlight on  
SA's micro anaerobic biogas digester industry*

SANEDI and the University of Johannesburg (UJ) signed a Memorandum of Agreement (MoA) with an objective to assess the performance of SANEDI's Micro Anaerobic Biogas Digester programme as well as define the optimal niche digester market with the potential for localisation options and commercial viability of the technology.

To accelerate these efforts, SANEDI and UJ appointed the UJ Process, Energy and Environmental Technology Station (UJ-PEETS) to evaluate SANEDI's activities during the last five years as well as develop a feasibility report that will comprise an approach going forward. The duration of the MoA is one year with implementation of results of this work being over the next five years under the overarching MoU.

Based on the outcome of the above, UJ-PEETS will implement a sectoral development plan that will include capacity development through

awareness, education, and process development to aid in the further development of the micro anaerobic biogas digester industry in the country.

The objective of the study is to enable SANEDI to meet its mandate in supporting the government to attain and enhance the objects of the IRP 2019, national skills development and job creation initiatives.

Through the MoA, UJ PEETS also aims to provide insights to improve the biogas industry and outline the potential role and competitiveness of SMEs through the application of specialised knowledge, technology innovation and facilitation of interaction between industry and academia.

The country's micro anaerobic biogas digester industry has the potential to strengthen local renewable energy efforts with an emphasis on the use of biogas as an alternative energy resource in smaller communities.

SANEDI recognises that the technology can unlock the waste to energy potential of the country not only for small-scale applications, but also for the large scale that includes the greater energy industry such as thermal fuels, electricity generation and transportation.

SANEDI wants to develop a micro-scale anaerobic digestion treatment process in order to provide a local, inexpensive, durable and easy-to manage treatment option for rural and urban bio-waste.

Micro anaerobic digestion involves the production of biogas, but on a small scale within farms or small communities. The micro-scale digestion

production units are smaller than 50m<sup>3</sup> and used mainly for thermal applications. Some small-scale agricultural units have gas generation capacity to power small-scale electricity generation capacity between 30 and 100 kW.

As part of the Working for Energy (WfE) Programme over the last eight years, SANEDI installed over 100 micro anaerobic digesters at community development facilities, Early Childhood Development Centres (ECDC), schools, colleges of agriculture, universities and individual households in the Western Cape, Eastern Cape, Limpopo, North West, Gauteng and KwaZulu-Natal (KZN) provinces.

Through the SANEDI-UJ MoA, UJ-PEETS will:

- Review the activity and impact of SANEDI in the micro anaerobic biogas digester space in the last five years.
- Assess the operational performance of the installed digesters.
- Identify root cause problems and operational gaps of the installed digesters, evaluating their impact and recording lessons learned.
- Plot an approach over the next five years to develop a commercially viable segment of the micro anaerobic biogas digester market.
- Host action dialogue and multi-stakeholder engagement to inform on the develop and rollout of a sectoral plan.
- Compile a feasibility study report with recommendation for widespread deployment of micro anaerobic biogas digesters in SA.

UJ-PEETS was established in 2010 under the support of UJ and is funded by Technology Innovation Agency (TIA), which is an agency of the Department of Science and Innovation (DSI) to fulfil this mandate.





## LIMPOPO is getting greener

*SANEDI and University of Venda  
partnership leads waste-to-energy drive*

Through its 'Working for Energy Programme', SANEDI has continued to spearhead its applied research mandate by raising awareness of clean energy technologies for low-income communities across the country. Further, the institute has been promoting access to these technologies in such communities, which stand to benefit from improved access to cost-effective, clean energy.

These interventions also culminate in the development of new knowledge on how communities interact with technologies, and what improvements need to be undertaken to promote a better uptake of sustainability and circular economy interventions. This is done in partnership with leading organisations that also operate in these communities.

The University of Venda (UNIVEN) in Limpopo is leading the field in the research, development and demonstration of waste-to-energy conversion thanks to a partnership with SANEDI and other prominent local and international role players.

Since 2009, the University's Green Technologies Promotion (UNIVEN Green Tech Promo) Drive has embarked on various successful projects which include the completion of a waste-to-energy conversion training and awareness initiative in the Vhembe district in 2014. This project formed part of an overall green economy awareness programme that was sponsored by the Limpopo Department of Economic Development, Environment and Tourism (LEDET).

The UNIVEN's Green Tech Promo Drive has also attracted other local and international support which includes the rollout of the GEF (Global Environment Fund) project, Promoting Organic Waste-to-Energy and Other Low-Carbon

Technologies in Small and Medium and Micro-Scale Enterprises (SMMEs): Accelerating Biogas Market Development, administered by the United Nations Industrial Development Organisation (UNIDO).

During this period, SANEDI co-financed the UNIVEN Green Tech Promo Drive project aimed at enhancing awareness and capacity building amongst Limpopo's women and youth for skills development in clean energy technologies.

This culminated in the greening of the Mhingaville Early Childhood Development Centre, a project which saw the uptake of biogas digesters built by the Vatskeme, a woman-led community-based organisation. The organisation was also trained as part of the SANEDI partnership.

The above extended to the construction of additional nine institutional size biogas systems in the Chavani village using additional local beneficiaries from the training of the partnership. UNIVEN is also currently assisting SANEDI with the impact assessment and restructuring of the Gawula Biogas Project for improved impact to the community.

SANEDI is pleased to partner and support the various and ongoing projects of the University of Venda. They are doing tremendous work to support the communities to transit towards the circular economy, demonstrating how animal and farm waste can be reused to benefit local communities by providing cleaner-burning biogas and biofertiliser which enhance food production. The university's work amongst the women and youth of Limpopo is making an indelible impact that will impart skills, create sustainable jobs and best practices for years to come.

Limpopo municipalities such as the Capricorn District Municipality (CDM) are also supporting the UNIVEN Green Tech Promo Drive which offers solutions to women and youth unemployment, poverty alleviation, addressing inequality, addressing cooking energy shortages, enhancing food security and other climate change impacts like the reduction of greenhouse gases emissions.

# Supporting SA MINeworkers

*SANEDI and MDA partner  
to provide mining  
communities with safer  
and energy-efficient  
cooking solutions*

SANEDI and the Mineworkers Development Agency (MDA) have partnered to bring relief to the country's former mineworkers and their communities in the wake of mine closures and the ever-growing prevalence of mining "ghost towns" and other poverty-stricken areas. The partnership became increasingly vital due to the immediate support required in the context of the pandemic. As a start, 200 families in need were identified in the Free State (Virginia) and the North West province (Orkney). They received safer, more sustainable, and more cost-effective cooking solutions to see them through some hard months.

SANEDI and MDA provided packages that included portable LPG stoves systems with multiple LPG refill vouchers to minimise the impact of lack of access to efficient and effective cooking fuels. While the MDA offers food parcels, a problem arises in the cooking process. The traditional fuels used by these communities are scarce and detrimental, resulting in indoor air quality challenges that can exacerbate the health risks associated with the pandemic. LPG, on the other hand, is a clean and highly efficient cooking fuel. It cooks food fast, is easy to control, and has little

impact on the ambient air quality. Furthermore, it produces no residue or particulate matter because it undergoes complete combustion.

The MDA's mandate is to create sustainable livelihoods in areas of endemic poverty. As in the case with SANEDI, the agency works in tandem with partners such as NGOs and CSI programmes. A key part of the MDA's work is to provide food security, targeted support to emerging farmers and other job creation micro-enterprises. The Agency also supports capacity building among community organisations. These are the areas that are targeted for applied research by SANEDI in its energy access portfolio.

SANEDI is supporting these objectives through the development and use of renewable energy and efficiency systems that use natural and other available resources to enhance the energy optimisation of operations of these community-based establishments. These initiatives will improve the viability of the goods and services produced, thereby enhancing the sustainability of the operations, thus reducing poverty and enhancing livelihoods in targeted areas.

Together with the MDA, SANEDI can establish effective and sustainable energy systems that will ensure communities optimise their energy use while instilling effective resource optimisation combined with sustainable waste management practices. Key to this is a systems approach to resource management including waste-to-energy initiatives that contribute towards the circular economy in these operations.





# TREND FORECAST:

## A bright horizon for South Africa's energy landscape

The recent history of South Africa's energy landscape has not been great. With poorly maintained infrastructure, delayed construction of new capacity, illegal connections and cable theft; news headlines on the topic of SA's electricity are rarely good. However, despite the tough year that 2020 was, there are some good news stories on the horizon, driven by the Constitutional Court's decision on municipal use of renewable energy, and the opening of Bid Window 5 for the Renewable Energy Independent Power Producers Procurement Programme (REI5P). Here are SANEDI's five energy predictions for 2021:

### 1. An even greater move towards renewable energy

2020 was good for the renewable energy (RE) industry which will see an even greater drive and adoption of renewable technologies in 2021 and beyond. This is thanks to draft amendments to the Electricity Regulations Act on New Generation Capacity in May last year, which stipulate that municipalities in good standing may purchase power directly from IPPs. Added to this, the industry is set to grow from the opening of REI4P Bid Window 5, as

well as the commitment from the Department of Mineral Resources and Energy to work with energy producers to accelerate the completion of Window 4 projects. However, government and IPPs are not the only role-players here. Individual consumers are jumping on the bandwagon with solar PV installations to their homes and businesses, helping overcome the challenges of relying only on grid power. The writing is on the wall – we will continue to see a large move towards renewable energy.

### 2. A focus on demand-side energy management

While additional renewable energy capacity certainly assists on the supply side, it will be important for South Africa (both public and private) to consider their energy demand, to assess how best to optimise energy usage before installing an RE system. Failing to do so may mean installing a system that is bigger than necessary, wasting money as well as electricity. This means a greater drive for energy efficiency this year, amongst consumers but also amongst municipalities who should consider the efficiency of their street lighting, water treatment plants and municipal buildings before procuring renewable energy. In this way, government can lead by example.

### 3. The hydrogen economy

Crosscutting the above issues regarding green energy and energy efficiency, lies the hydrogen economy. There has been large-scale investment into and development of hydrogen fuel technology around the world. With South Africa being the largest producer of platinum – a vital part of hydrogen fuel cells – we have a vested interest in the development of this market. We

also have great use-cases for hydrogen fuel technology in our country, for example with our rail network. With a history of cable theft from our trains, a hydrogen-fuelled rail system would not only be a clean, green transport solution, but would stem the theft of overhead electrical infrastructure and ensure a more reliable rail network.

### 4. Digital technology, for real this time

For years, the energy industry has been abuzz with excitement over what digital technology may mean for energy consumption and monitoring. However, South Africa has historically been left behind in this technology adoption. Into 2021 and 2022, however, I predict that we will finally be in a better position to “leapfrog” and play catch-up in the transition to digital technology. This will be underpinned by the use of more energy efficient technology with smart capabilities, enabling the optimisation of energy usage.

### 5. Good news and great awareness

As the REI4P gains more investment in the country, I predict more good news stories about South Africa's energy transition as the private sector shows what it has to offer. It may take some time, but once our fellow South Africans and the wider international environment sees tangible progress in the successful building of renewable energy infrastructure, greater awareness of RE technology is sure to result. This will drive the move to RE, and will help overcome some myths about the technology, for example that it is inefficient and unsuited to complex applications. These myths will get busted as we see a reduced dependence on grid power.





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