



# ENERGY EFFICIENCY SHOWCASE & AWARDS

## SOUTH AFRICA 2021

Innovative German Technologies to Enhance Energy  
Efficiency in South African Industry and Buildings

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## About the German Energy Solutions Initiative



With energy prices on the rise and fossil fuel resources becoming scarce, both economic prosperity and competitiveness increasingly depend on our ability to use new energy sources and energy efficiency solutions. This applies to all countries worldwide. The use of innovative energy solutions offers enormous potential for energy conservation in all fields.

The promotion of smart and sustainable energy solutions in Germany has resulted in the establishment of an industry which offers some of the world's leading technologies. This industry encompasses several thousand small and medium-sized enterprises specialised in the development, design and production of renewable energy systems, energy efficiency solutions, smart grids and storage technologies. Also new energy technologies like Power-to-Gas and fuel cells are the basis for cutting-edge energy solutions.

The transfer of energy expertise, the promotion of foreign trade and the facilitation of international development cooperation are part of the German Energy Solutions Initiative. We offer:

- ✓ networking and business opportunities both in your country and in Germany
- ✓ showcasing of reference projects
- ✓ know-how exchange

Coordinated and financed by the German Federal Ministry for Economic Affairs and Energy (BMWi), the initiative is implemented in cooperation with partners such as German bilateral chambers of commerce (the AHKs), the German Energy Agency (dena) and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

For more information, please visit [www.german-energy-solutions.de/en](http://www.german-energy-solutions.de/en).

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## Welcoming words from the Federal Ministry for Economic Affairs and Energy



The technology showcase is a celebration of innovative German energy-efficient solutions in the South African industry. It is a great opportunity to promote successful South African-German-partnerships, which have led to increased levels of efficiency in industry and buildings, reduced energy costs and lower CO<sub>2</sub> emission levels in South Africa. The five innovative projects, which are being shown in the framework of the technology showcase, present South Africa as an attractive location for German companies seeking concrete partnerships and market opportunities.

The advanced technologies, know-how and expertise from the German companies involved in these projects conducted in South Africa are representative of a wider success story: Germany is a world leader in the field of energy efficiency. Cutting-edge German technology is featured in all energy efficiency market segments, including insulation systems, insulated glazing, heating and cooling technologies, efficient home appliances, smart metering, energy-efficient lighting systems, cogeneration systems, as well as pumps and compressed air systems. German companies generate a turnover of about \$72 billion per year in this industry.

Since 2007, the Federal Ministry for Economic Affairs and Energy has successfully supported South African-German partnerships via the German Energy Solutions Initiative. The South African market has proved to be very open to German suppliers of energy-efficient products, systems and services. Since this initiative was launched, the Southern African-German Chamber of Commerce has been active in creating and hosting successful cooperation platforms such as energy trade missions and fact-finding missions. This showcase project gives the German Ministry for Economic Affairs and Energy a welcome opportunity to celebrate some great examples of South African-German partnerships in energy efficiency in industry and the built environment.

Christina Wittek  
Head of Division  
German Energy Solutions Initiative  
Federal Ministry for Economic Affairs and Energy

## Introduction to the Energy Efficiency Showcase South Africa 2021



The Southern African-German Chamber of Commerce and Industry is delighted to host their first Show Case Event for Energy Efficiency in South Africa, awarding South African-German collaboration in energy efficiency in industry and buildings.

With energy prices on the rise and lowering the carbon footprint of economic activities becoming an international norm, both economic prosperity and competitiveness increasingly depend on our ability to apply sustainable energy sources and energy efficiency solutions in industry processes.

Due to the high energy efficiency-standards in Germany, German technology providers and institutions are ideal cooperation partners to bring energy-efficient solutions and technical know-how into the South African market. In order to illustrate the successful implementation and impact of German technologies, products, and services in energy efficiency improvements in South Africa, we present and award five South African-German reference projects.

The selected reference projects show innovative German energy efficiency technologies in areas of application highly relevant to South Africa, including compressed air, lighting solutions, pumping, combined heat and power and energy management systems. All five projects show a high replication potential and provide a glimpse of a much larger amount of German efficiency technologies already installed in South African industries and buildings.

I would like to express my gratitude towards the German Energy Solutions Initiative of the Federal Ministry for Economic Affairs and Energy for making the Awards possible. Since many years, the initiative has provided the platform and funding for activities promoting the cooperation and know-how exchange between South African and German businesses in the field of energy efficiency and renewable energy. These activities have created a mutual understanding and laid the foundations for new business relationships.

We are confident that the Energy Efficiency Show Case South Africa 2021 will make a significant contribution to further support South-African German cooperation and look forward to continuing to initiate and accompany business partnerships in the field of energy efficiency in South Africa.

A handwritten signature in black ink, appearing to read 'Matthias Boddenberg'.

Matthias Boddenberg

Chief Executive

Southern African-German Chamber of Commerce and Industry

## Relevance of Energy Efficiency to South Africa

South Africa can be classified as a relatively energy intensive economy ranking 7<sup>th</sup> in the world in terms of economic energy intensity. The economy is still heavily structured around, and dominated by energy intensive and energy inefficient large-scale industries. Energy demand will continue to grow in the face of a growing population and economy unless significant interventions are implemented to greatly increase the level of energy efficiency and lower demand.

As the industrial sector remains the largest energy-consuming sector, accounting for 45% of all electricity consumed, the role of industrial energy efficiency to reduce national power demand cannot be overstated. Energy efficiency and energy management interventions have proven to deliver significant energy savings in the South Africa industrial environment – as demonstrated by the five selected South African-German Show Case Projects.

The total annual energy savings of the South African Industrial Energy Efficiency Project (run by the NCPD) and energy efficiency activities by SANEDI over the period 2011 to 2020 amounted to 30 TWH compared to the total national consumption in 2020 of 220 TWH. This represents only two of the many organisations promoting energy efficiency in South Africa. It is clear that the potential savings arising from energy efficiency are extremely significant. A reduction in peak demand of this magnitude would effectively reduce energy constraints and decrease the pressure on Eskom's infrastructure.

Industrial companies are direct beneficiaries of energy efficiency as they increase their competitiveness and maintain growth. In a wider perspective, the population at large is a beneficiary both through avoided loss of jobs as well as benefits through reduced negative environmental impact, and reduction of electricity blackouts, which have severe social impacts.

Energy efficiency therefore has the potential to make a very great impact on the South African economy, and that of the wider region, too. The scale of the impact is such that economic growth will not be impaired and many tens of thousands of jobs will be secured. Other broader objectives and benefits of energy efficiency initiatives include the following:

- Although companies will have to make investments in order to realise significant energy efficiency improvements, these organisations will benefit from reduced costs incurred in electricity purchases. Considering the rise of electricity tariffs, significant savings and lower payback periods can be anticipated;
- By making a major contribution towards curtailing the energy crisis, industrial firms will benefit from increased, or at least restored, production levels. For those firms that have resorted to auxiliary power generation, using diesel generators, fuel costs will be reduced; and
- Reduced GHG emissions of around 22 million tonnes per year

Until now in many countries, policies around energy and energy efficiency are driven by the government and not from the industrial sector. Still, it is the industrial sector that is the main energy user in almost every country and it can either make the policies work or not. Businesses need to be convinced that it is profitable to manage energy in order to allocate resources to this task.

The required approach is to consider industrial energy optimisation as an integrated part of productivity optimisation and economic growth and link the project with the national priorities for sustainable development.

## CS INSTRUMENTS

### Project: Compressed Air System Optimisation at a Foundry

<b>Location</b>	Atlantis, Western Cape, South Africa
<b>Year of Implementation</b>	2019
<b>Key Characteristics</b>	<ul style="list-style-type: none"> <li>Flow metres installed, which constantly measure whether the compressed air flow system has any leakages.</li> <li>By having permanent flow meters installed it is now possible to maintain the system and keep the leakage rate at a minimum.</li> </ul>
<b>Achieved Efficiency Gains</b>	560kW compressor taken offline, leading to an annual energy saving of 4,816 MWh.
<b>German Contribution</b>	<ul style="list-style-type: none"> <li>Compressed air system optimisation audit</li> <li>Installation of permanent flow meters and data loggers</li> </ul>

#### Description of the Project

The client for this project is a foundry, that originally commissioned CS INSTRUMENTS to do a compressed air system optimisation audit (CASO) on their compressed air system. The compressors of the client ran constantly and the combined compressor capacity was in excess of 1 MW.



Figure 1: Flow metre at the Foundry  
© CS INSTRUMENTS

The audit revealed a leakage rate of 43-45 % with the majority of the leaks were allocated to faulty pulsating valves in the company's bag houses. By monitoring the compressed air flow into each of the 12 bag houses it was possible to pick up the faults and repair the leaking valves.

As a permanent solution, twelve CS INSTRUMENTS inline flow meters and two data loggers were installed to monitor the system on a continuous base. By having permanent flow meters installed it is now possible to maintain the system and keep the leakage rate at a minimum. This system improvement enabled the company to take a 560kW turbine compressor offline and put it on standby for redundancy. Before that, the air delivery of one turbine compressor was feeding the leakages in the bag houses on a continuous base.

#### Innovation and Achieved Energy Efficiency

Compressed air systems in South Africa have in general high leakage rates, because most companies do not monitor important parameters on their compressed air system. Hence, using measuring equipment to begin with was already an innovative step.

The installed measuring technology (flow metres) allow to quantify how much air is going towards each bag house in the factory. Through online monitoring of the airflow towards the bag houses it is possible to identify leakages in the bag houses and that the measuring technology provides the client a tool to calculate their energy consumption. Going forward,

they can monitor the flow and hence allocate costs better. The client now has a preventative maintenance tool that is running continuously.

The client's compressed air leakage rate was significant, amounting to about 45%. By monitoring the compressed air system with the flow metres, it was possible to take a 560kW compressor offline. This has led to an annual energy saving of 4,816 MWh.

### Market Relevance and Replicability

Compressed air systems always have occurring leaks, and they usually get bigger and higher in number over time. This is because just by changing ambient conditions, the pipework expands and contracts. Hence over time, leakages can occur at basically any joint, fitting or flange. A pressurised system will only accelerate this process.

Normally this issue is dealt with by doing regular leak audits, up to three to four times a year. In South Africa, monitoring air flows is not common practice, which leads to leakage rates of up to 50 % in larger operations. At the same time there are a lot of companies within South Africa which have medium to large compressed air systems. From a certain compressed air system size, about 150-180kW and upwards, it makes financial sense to monitor a compressed air system on an ongoing basis. It helps to reduce leakages to a minimum and to run as energy efficiently as possible. The replicability for these monitoring systems is hence very high.

### About CS INSTRUMENTS

CS INSTRUMENTS is a German company that specialises in compressed air and gas monitoring equipment. All sensors are developed and manufactured in Germany. CS INSTRUMENTS also offers their clients energy audits and air quality audits, to identify the best solution. The technology used to identify and maintain energy saving opportunity is 100% German.

The unique feature about CS INSTRUMENTS is that they provide a full portfolio of solutions to monitor compressed air and gas systems. Next to flow metres they offer dewpoint sensors, pressure sensors, leak detection, monitoring software, air quality measurements and other services. This enables them to monitor all important parameters on compressed air systems.

CS INSTRUMENTS manufactures all the relevant sensors completely from start to finish. Their metres provide a high accuracy, are long lasting and come at a price advantage compared to most competitors.

CS INSTRUMENTS South African subsidiary, CS INSTRUMENTS (Pty) Ltd, has offices in Cape Town and Johannesburg.



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## Wilo Pumps SA (PTY) Ltd

### Project: Hoopstad Wastewater Pump Stations

<b>Location</b>	Hoopstad, Free State
<b>Year of Implementation</b>	2021
<b>Key Characteristics</b>	<ul style="list-style-type: none"> <li>▪ Retrofitting of an existing pump station with Wilo's Emu-Port solid separation systems</li> <li>▪ Solves all blockage issues associated with traditional pump stations</li> <li>▪ Dramatically reduces maintenance costs</li> <li>▪ Easy installation reduces time on site</li> </ul>
<b>Achieved Efficiency Gains</b>	up to 25% reduction in power consumption
<b>German Contribution</b>	<ul style="list-style-type: none"> <li>▪ Wilo Emu-Port solid separation systems</li> <li>▪ Commissioning of installation</li> <li>▪ Maintenance of equipment</li> </ul>

#### Description of the Project

This project is situated in Hoopstad in the Free State and was endorsed by the local provincial government. The contractor of the project was HT Palatone. The Free State Local Government funded and managed the project.

The scope of the project was to repair and restore six pump stations that were malfunctioning. This resulted in numerous sewerage spills and increased maintenance cost. Wilo retrofitted the six existing water pump stations with Wilo Emu-Port solid separation systems complete with control panels. Wilo commissioned the installation and will be responsible for the maintenance.

#### Innovation and Achieved Energy Efficiency

The solid separation system has resulted in a 15% to 25% saving in power consumption while reducing maintenance costs by more than 60%.



Figure 2: Wilo's Emu-Port solid separation systems  
© Wilo

This innovative technology is produced in the Wilo Minden factory in Germany and is designed to solve common problems of blockages associated with traditional wastewater pumping stations. The solid separation system reduces the solids going through the pump. Therefore, pumps with lower solid handling capabilities can be installed, resulting in higher efficiency levels. Wilo's Emu-Port solid separation system arrives ready for installation and connection with minimal effort on site. Due to the system being a plug and play pump station, the project implementation was reduced by 6 months.

## Market Relevance and Replicability

The solid separation system is highly relevant to South Africa's current situation. Many wastewater pumps stations in South Africa require urgent attention. If this problem is not addressed instantly, South Africa faces an environmental disaster and further reduced levels of service delivery.

Wilo's solid separation technology system be retrofitted into current systems quickly and effectively to ensure a working pump station that has improved efficiency levels and lower maintenance cost. Wilo also has the capability to provide innovative funding solutions. With these solutions, the pump station is paid for with the savings achieved from reduced power consumption and savings on maintenance costs.

### About *Wilo South Africa*

The Wilo Group is one of the world's leading premium providers of pumps and pump systems for the building services, water management and industrial sectors.

In the past decade, Wilo has developed from a hidden champion into a visible and connected advocate for sustainability and efficiency. Today, they have around 8,000 employees worldwide.

Their innovative solutions, smart products and individual services move water in an intelligent, efficient and climate-friendly manner. They are also making an important contribution to climate protection with their sustainability strategy and in conjunction with their partners. They are already the digital pioneer in the industry with their products and solutions, processes and business models.



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## SustainPower

### Project: Distell Springs– 440kW Biogas Combined Heat and Power

<b>Location</b>	Distell Springs, Marshall Road, Springs 1559, Gauteng
<b>Year of Implementation</b>	2019
<b>Key Characteristics</b>	<ul style="list-style-type: none"> <li>▪ 440KW Biogas combined heat and power</li> <li>▪ Converts biogas from organic wastewater into onsite electricity</li> <li>▪ Distell sees an average daily reduction of 6,000 kWh drawn from the grid</li> <li>▪ CHP currently offsets up to 13 % of total site load</li> <li>▪ At R1.00/kWh, R186 000.00 of savings per month</li> <li>▪ Total project payback of &lt; 3 years</li> <li>▪ Offsets approximately 110 tons CO<sub>2</sub>-eq per month</li> </ul>
<b>Achieved Efficiency Gains</b>	Offset of 1,500 MWh grid electricity in a 12-month operating period
<b>German Contribution</b>	<ul style="list-style-type: none"> <li>▪ MAN gas engine</li> <li>▪ Motortech gas controller system</li> </ul>

#### Description of the Project

Distell, a global beverage company with a wide range of award-winning brands, such as Amarula, Savanna, Hunter's Dry, and many others, continues to ramp-up its sustainability efforts. A CHP unit from SustainPower was installed in 2019 at its Springs cider manufacturing operation to convert the effluent treatment plant's biogas into power. This is the first step to making the effluent treatment plant energy-neutral in the short-term and energy-positive in the future.



Figure 3: Containerised CHP unit at Distell Springs  
© CS SustainPower

Distell's effluent treatment plant, which processes wastewater from the beverage making process, is designed to produce up to 100 m<sup>3</sup> per hour of high-grade biogas with methane levels consistently hovering around 90%. The SustainPower SP-550-BG-CHP, which harvests the mechanical energy from the generator and the thermal energy from the combustion process, provides up to 450 kW electrical power and has 500 kW of thermal energy available for use in the plant process.

SustainPower installed, commissioned and started producing electricity within three days, with a MAN E3263 LE212 biogas engine. SustainPower designed

and implemented an algorithm to match electricity production to gas production, thereby ensuring 24/7 operation, even in times of reduced gas production. The Motortech Detcon system was installed to manage the high grade, high quality biogas produced by the Tecrover effluent treatment plant. SustainPower continues to support the project with ongoing operations and maintenance services.

## Innovation and Achieved Energy Efficiency

The installation was the first MAN 550kW biogas CHP in South Africa, producing a consistent 420kW output at Johannesburg altitude.

Because of the SustainPower CHP installation, Distell now enjoys an average daily reduction of grid electricity demand of up to 6,000 kWh. At R1.00/kWh, this produces R186,000 of monthly savings to the client. These savings lead to a project payback period of under 3 years. The CHP offsets of up to 13 % of the plants total load and reduces the Distell's carbon footprint by approximately 110 tons of CO<sub>2</sub> per month.

## Market Relevance and Replicability

The potential for biogas projects in South Africa is enormous. A potential generation capacity of 2.5 GW is attributed to biogas power generation. In addition to energy generation, biogas can be considered as an effective contribution to sustainable waste management and corresponding reduction of CO<sub>2</sub> emissions. SustainPower's installation at Distell demonstrates the positive outcomes of biogas for the client – both in terms of sustainability and monetary savings off their energy bills.

Furthermore, the project highlights the effects of committed partnerships: German efficiency technology, put to work by a highly skilled South African workforce. Roughly 60% of the components were imported, with the remaining 40% of the components sourced in South Africa. South African engineers, technicians and labourers produce a 100% South African design. This balance personifies the fantastic relationship between German and South African counterparts. Together, they can help power Africa in a more sustainable manner.

## About SustainPower

SustainPower provides modular gas-to-power solutions for biogas, natural gas, and landfill gas that are housed and transported in custom-fitted shipping containers. Based in Cape Town, with clients throughout Africa, they provide sustainable, clean power in emerging and developing countries.

SustainPower designs and supplies clean energy solutions for domestic & industrial markets. For industry, they offer biogas, natural gas, & other gas-to-power solutions for continuous, prime, or emergency standby power supply. With a special focus on energy efficiency, SustainPower's systems save clients' money through power-outage protection, peak shaving, & waste heat recovery, displacing environmentally harmful sources of energy such as coal and diesel. In the domestic and light commercial space, they offer solutions in the form of gas generator set and battery technology, providing a clean & quiet back-up alternative to the traditional petrol and diesel options.



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## Professional Light Control, Steinel Distributors Southern Africa

### Project: DSV Park Gauteng

<b>Location</b>	16 Serengeti Blvd, Witfontein, Johannesburg, 1620, Gauteng
<b>Year of Implementation</b>	2021
<b>Key Characteristics</b>	<ul style="list-style-type: none"> <li>▪ Installation of advanced KNX German Motion and Presence detectors: occupancy and lux level based lighting control, adapting according to the natural light coming into the warehouse</li> <li>▪ Generation of additional savings using cutting edge sensor technology vs standard sensor technologies</li> <li>▪ The detectors / sensors are NRCS (SABS) approved which is compulsory in South Africa</li> </ul>
<b>Achieved Efficiency Gains</b>	<p>The average lighting savings achieved is 30% or 60,000 Watts of the lighting load</p> <p>In addition, the KNX system can be integrated into other building technologies (e.g. HVAC systems), where the savings are expected to be in the region of 50% of a buildings total consumption</p>
<b>German Contribution</b>	<ul style="list-style-type: none"> <li>▪ Advanced KNX Motion and Presence detectors</li> <li>▪ Building Automation Detectors</li> </ul>

#### Description of the Project

DSV Park Gauteng is the largest logistics facility of its kind in Africa. The logistics centre consists of approx. 130,000 m<sup>2</sup> of buildings and covers supply chain solutions from first to last mile controlled and managed under one roof. The sprawling complex houses a logistics warehouse of 79,000 m<sup>2</sup>, a cross-dock facility of 41,000 m<sup>2</sup> and office space of 10,000 m<sup>2</sup>.

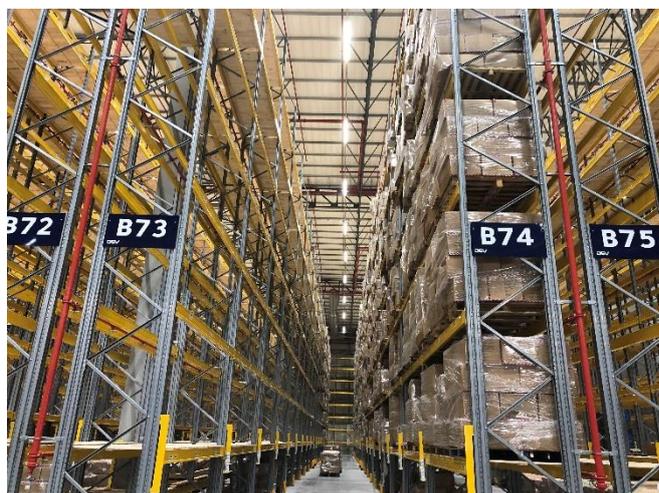


Figure 4: Lighting installation at DSV Park Gauteng  
© Steinel SA

The new DSV facility is packed with solutions and innovations to improve sustainability. Throughout the whole building process global experience have been utilised to construct buildings where sustainability and resource optimisation have been fundamental in all processes. Innovation, sustainability and employee safety are key to the design of the buildings. The implementation of biometrics, solar power, translucent roof sheeting, recycling stations, LED motion lighting, boreholes and water filtration systems ensure that the facility is aligned to the global strategy of sustainable operations, reducing the impact on the environment.

Best of Breed Lighting Detectors and Energy Efficient Lighting Controls from Steinel were specified for the 130,000 m<sup>2</sup> logistics centre to reduce the environmental impact. Sensor tech is the easiest and most cost-effective way of saving energy in either retrofitting of buildings or in new building design.

## Innovation and Achieved Energy Efficiency

As market leaders, Steinel motion and presence detectors have a switching zone specification, which allows for accurate calculation of area of coverage with the help of RELUX, a 3D graphics software program for lighting and motion or presence detectors. The lighting savings achieved will be 30% or 60,000 Watts of the lighting load as the KNX Sensor-lighting system is occupancy and lux level based and therefore adapts according to the natural light coming into the building or warehouse and will constantly adjust accordingly. In addition, the KNX system can be integrated into other parts of the building for example HVAC systems where the savings are expected to be in the region of 50% of a buildings total consumption.

The electricity saving is 60% compared to the replaced conventional system. The new True Presence detectors, which besides incorporating human presence, now also incorporates humidity, CO<sub>2</sub>, lux levels, temperature and air pressure. This offers the possibility of even higher savings.

## Market Relevance and Replicability

Any building is a great savings candidate for the Steinel motion or presence detectors whether Commercial Offices, Warehouses, Factories, Healthcare, Hotel, Retail, Education sector etc. This is due to the relatively ease of implementation of the Steinel motion or presence detectors. Furthermore, the Steinel motion or presence detectors are fully NRCS (SABS) compliant. This technology is very relevant in the building sector and has a quick ROI.

## About Steinel South Africa

Steinel is a global organisation dedicated to the development of cutting-edge technology for the delivery of controlled heat and lighting controls. Discriminating professionals worldwide have come to expect the superior performance, reliability and value only an industry leader can provide. Over half a century of the highest standards in design, manufacturing and service have made the Steinel name synonymous with quality and innovation in over 80 countries. Steinel offers a 5-year product warranty compared to only 1-3 years by most competitors.

Steinel South Africa is the exclusive partner in Sub-Saharan Africa for Steinel GmbH since 1999 and have accumulated Projects covering an area of over 10 million m<sup>2</sup> and growing.



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## Siemens Pty Ltd

### Project: Siemens Campus Microgrid

<b>Location</b>	Siemens South Africa, 300 Janadel Avenue, Midrand 1685, Gauteng
<b>Year of Implementation</b>	2018
<b>Key Characteristics</b>	<ul style="list-style-type: none"> <li>▪ Innovative system for combined distributed power generation/energy system, smart metering and control of use</li> <li>▪ Upgraded Building Management System for lighting and HVAC system, automated metering system, preventative maintenance, LED lighting, automated borehole</li> <li>▪ Micro-grid 970kWp Solar PV in conjunction with energy efficiency drive</li> <li>▪ 140kWh battery system for storage and peak shaving</li> <li>▪ Total project payback of &lt; 5 years</li> <li>▪ Offset of approximately 250 tons CO<sub>2</sub>e to date</li> </ul>
<b>Achieved Efficiency Gains</b>	<p>Overall 80% electricity cost reduction:</p> <ul style="list-style-type: none"> <li>▪ Electricity demand reduced from 800kva to 600kva</li> <li>▪ Reduced kWh by 30% through Time-of-Use and waste reduction</li> <li>▪ reduced the energy demand from the national grid by ~40%</li> </ul> <p>OPEX maintenance (operating costs) reduced by 5%</p>
<b>German Contribution</b>	<ul style="list-style-type: none"> <li>▪ MAN diesel generator</li> <li>▪ Siemens Smart Metering and Micro-Grid Controller</li> <li>▪ Siemens Desigo CC Building Management System</li> <li>▪ 140 kWh Fluence Battery Storage System</li> </ul>

#### Description of the Project

The Siemens Campus Micro-grid was borne out of necessity, as an analysis of electricity costs, tariffs, energy security and the additional diesel costs incurred by powering a back-up diesel generator revealed escalating prices, unclear billing, high-energy use, large ecological footprint and of course power disruptions due to load shedding.



Figure 5: Embedded energy system at Siemens Midrand campus

© Siemens

The solution was conceptualised as a DES (distributed energy system) and consists of an embedded photovoltaic system on the campus' buildings and parking area, integrated with the diesel generator and a 140 kWh Siemens energy storage system operated by the Siemens Micro-Grid Controller.

A holistic approach was applied in upgrading all of Siemens' buildings and implementing an updated Building Management System, which improved management systems responsible for lighting and HVAC (Heating, ventilation and air conditioning). The Solar PV powered Micro-grid, with 970kWp in conjunction with the existing back-up generator as well a 140 kWh battery for energy peak shaving resulted in cost-effective time-of-use application from the electricity grid. With a metering system for each floor, the DES system was then connected to the Siemens Desigo CC Building Management System and the Siemens Smart Metering network, which further optimised energy consumption and building operations.

## Innovation and Achieved Energy Efficiency

Because of the Siemens' Distributed Energy System, the Siemens campus in Midrand now enjoys a reduced energy demand from 800kva to 600kva. Essentially, it reduced energy costs by 80%. The Solar PV system supports the back-up generator during power outages with renewable energy. The intelligent control of HVAC and lighting, including LED lighting, was another measure that curtailed electricity demand. Thus, peak load electricity demand was reduced by nearly 80% in total. Integrated with the Siemens Building Management Systems, full monitoring functionality is ensured in terms power generation, load and billing.

Siemens Campus Micro-grid has brought about a significant reduction in greenhouse emissions of close to 250 tons of CO<sub>2</sub> to date, which is equal to planting about 7500 trees. The Siemens DES is one of the first Campus Micro-grids on the African continent to realise a holistic and intelligent solution that includes storage and load management.

## Market Relevance and Replicability

While the Siemens Campus Micro-grid is an entire distributed power generation and energy management system, it is expandable and can be integrated with 3<sup>rd</sup> parties. The need to ensure energy security, reduce energy consumption and reduce their ecological footprint applies to all business and indeed households. Thus, while the technology is German the Siemens Smart Metering Network, Building Management System and distributed energy system are more concept and approach than unique product offering.

As energy costs continually increase and one's carbon footprint become increasingly reason for concern, a holistic and intelligent system-based approach can cut costs and up efficiency.

The Siemens Campus Micro-grid with its smart metering for each office floor illustrates how corporate energy systems can be put together in ways that allow for efficient human machine interface. With a clear showcase for ESG (Environmental, Social and Governance) consideration, it is worth noting that while it is German engineering at the forefront, this project was balanced with committed and a highly skilled South African staff complement. This balance underscores the partnership and strong relations between Germany and South African.

## About Siemens Pty Ltd

Siemens Pty Ltd is a leader for Digital Industry and Smart Infrastructure solutions. The company has proven to be front runners and thus at the vanguard of energy efficiency and smart city solutions implementation. These efforts continue to support the decarbonisation in industry and sustainability.

Globally, Siemens is a powerhouse in diversified engineering providing products, systems and solutions across the Electrification, Automation and Digitalization value chain. The company has been in Africa for over 157 years igniting a history of innovation and social development. As an integrated technology company, Siemens aims to play a constructive role in Africa's success story.

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