wattnow

THE OFFICIAL PUBLICATION OF THE SOUTH AFRICAN INSTITUTE OF ELECTRICAL ENGINEERS

TRANSPORTATION

NOVEMBER 2025

SAIEE

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CONTENTS

4 SAIEE President's Message

6 SAIEE 2026 Membership fees

8 Industry News

28 Student News

32 Phantom Defects
- The Auto Industry's Silent Recall Epidemic

38 Reforming the Railways? Reform the Skills
Significant reforms are needed to improve an ageing infrstructure.

42 Smart Cities and Beyond

48 IEC YP Essay Competition winners

62 Opinion

72 SAIEE Council

74 SAIEE Centres

75 SAIEE Events Calendar

Dear **watt**now Reader,

As we reach the final issue of Wattnow for 2025 and approach the festive season, I have chosen to focus this edition on transportation.

South Africa boasts an extensive transport system that includes road, rail, air, and maritime options. Road transport is the most dominant, featuring a mix of private vehicles, formal public systems like the Bus Rapid Transit (BRT), and a significant informal minibus taxi industry, which is the most commonly used mode for work trips. The rail network remains essential; however, its efficiency has declined for many commuters. Major airports, such as OR Tambo, King Shaka, and Cape Town International, serve air travel needs.

In this issue, the first feature article on page 32 discusses "Phantom Defects" and examines how the auto industry stands at a critical crossroads, facing a growing phenomenon. These elusive issues, such as reports of "phantom braking" in Tesla vehicles, present significant challenges not only to vehicle safety but also to the integrity of manufacturers.

On page 38, the article "Reforming the Railways? Reform the Skills" discusses the significant reforms occurring in South Africa's rail sector. Strategic initiatives aim to revitalise passenger and freight networks, improve service reliability, and modernise ageing infrastructure.

I would like to wish all SAIEE members and Wattnow readers a very blessed festive season. Wherever you may travel, please do so safely.

The February 2026 issue will focus on energy storage, with article submissions due by January 16, 2026. Please send your articles to minx@saiee.org.za.

Herewith the November issue, enjoy the read!

PS: Click here to download the 2026 SAIEE media pack which include the 2026 wattnow features and deadlines.

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Veer Ramnarain
2025/6 SAIEE President

Driving Change

- SOUTH AFRICA'S EVOLUTION TOWARDS INCLUSIVE MOBILITY AND RENEWABLE ENERGY

With October being transport month in South Africa and the focus on the journey towards inclusive mobility, as an Institute, we need to introspect on the role we have played and need to play in developing the country's future transportation infrastructure.

During his inaugural address in 1909, Campbell, the first President of the South African Institute of Electrical Engineers (SAIEE), emphasised the growing importance of electrical engineers as the rail transitioned from steam-driven locomotives to those powered by electricity. He emphasised the collective wisdom of the various disciplines during that transition. In particular, he acknowledged the other streams of engineering in relation to the railways: Civil for earthworks, Metallurgist for rails, Chemists for metals, Mechanical for design and operation, Mining for production, and Electrical for communication and lighting.

It is interesting that in 2025, more than a century later, we are in another significant transition. This time, it is from Internal Combustion Engines (ICE) to New Energy Vehicles (NEV). Again, we must stress the importance and necessary contribution of the various disciplines of engineering in ushering us into a new era of transportation. Just as Chemical Engineers influence that evolution on battery technology, Civil Engineers design and build road and rail infrastructure, Mechanical Engineers design safer vehicles with lighter materials, Computer Engineers designing software for self-driving cars; Electrical Engineers need to work aggressively in ensuring that there is sufficient generation capacity and distribution infrastructure to enable the charging of Electrical Vehicles (EV) with least inconvenience to the users.

The transition from ICE to NEVs has to be as seamless as possible. At the recent Smarter Mobility Conference held in South Africa, various international speakers emphasised the importance of trust as an essential ingredient for making future mobility solutions work. It is my view that South Africa has the technical resources to drive this transition. Most countries in the world that experienced the influx of Chinese EVs into the transport sector have noticed that the sales of ICE vehicles are fast catching up with those of traditional brands.

In Africa, we are experiencing the same, albeit at a slower pace. Unfortunately, the installation of charging infrastructure has not kept up with the pace of EV uptake. This deficiency now calls for partnerships with the Private Sector to enable the provision of battery charging stations. An example of this would be the decision taken by the Chinese vehicle maker, BYD, to install 300 fast-charging stations in South Africa by the end of 2026.

We are aware that energy inflation in South Africa may require some form of price hedging to increase EV uptake. However, when Time of Use Tariffs are implemented for residential customers, opportunities will be created for energy arbitrage and peak shaving of the residential load profile to manage energy inflation. For property developers, it has been stated that internationally, the introduction of EV charging stations increases the value of property by approximately 15%. The message is that, besides the carbon impact, there are numerous financial benefits to embracing the transport transition.

The highlight during September was the 74th Bernard Price Memorial Lecture. This year, I decided to invite the Chairman of NERSA, Thembani Bukula, to deliver the lecture on the envisaged journey towards a competitive electricity trading market. The lecture was delivered at the University of Witwatersrand and screened live at the various centres. It was evident from the discussions during and after the lecture that the subject was very topical, especially as we journey towards the liberalisation of the power grid and start with energy trading. I would encourage readers to view the talk on SAIEE TV on YouTube.

The national framework for energy trading/wheeling has been discussed at various workshops. The demand from customers seeking alternate energy sources, as well as from Independent Power Producers (IPP) seeking grid access, will 'force' this transition once municipalities develop their wheeling tariffs.

For those working in the energy sector, creating a pool of generator sources that includes both baseload stations and renewable energy projects with Battery Energy Storage Systems (BESS) will mitigate the risk of load shedding, rather than relying on a single supplier. It is an energy transition that we must all actively participate in to avoid returning to the dark days of load shedding again.

As we approach the festive season and this is the last issue of wattnow for the year, I want to wish all our members and their families a very safe and blessed festive season. wn

Veer N. RAMNARAIN - Pr Eng
2025 SAIEE PRESIDENT
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MEMBERSHIP FEES EFFECTIVE 1 DECEMBER 2025

The Council meeting held on 5 September 2025 approved subscription & entrance fees as from 01 December 2025 as per schedule indicated below.

PLEASE NOTE: In terms of Bylaw 3.2 annual subscriptions are due on 1st December 2025

MEMBERSHIP FEES CAN BE PAID IN MONTHLY RECURRING PAYMENTS

Council agreed to a discount for fees paid before 31 March 2026. Members are therefore encouraged to pay promptly to minimize increase impact.

Grade of Membership	Annual Subscriptions paid before 31 March 2026		Annual Subscriptions paid after 31 March 2026		New Members FEES * see Notes 1 & 4 below.	
	RSA incl VAT (R)	Outside RSA excl VAT (R)	RSA incl VAT (R)	Outside RSA excl VAT (R)	RSA incl VAT (R)	Outside RSA excl VAT (R)
Student	nil	nil	nil	nil	nil	nil
After 6 yrs study	1 947	1 693	2 336	2 031	2 336	2 031
Associate	1 947	1 693	2 336	2 031	2 336	2 031
Member	2 152	1 871	2 582	2 245	2 582	2 245
after 6 years	2 514	2 186	3 017	2 623	3 017	2 623
after 10 years	2 631	2 288	3 157	2 746	3 157	2 746
Senior Member	2 631	2 288	3 157	2 746	3 157	2 746
after 6yrs/age 40	2 851	2 480	3 422	2 975	3 422	2 975
Fellow	2 851	2 480	3 422	2 975	3 422	2 975
Retired Member (By-law B3.7.1)	1 209	1 052	1 451	1 262	n/a	n/a
Retired Member (By-law B3.7.3)	nil	nil	nil	nil	n/a	n/a

1. The fee for all new applications is R3532.00 which includes an entrance fee of R950.00. On election to the applicable grade of membership the new member's account will be adjusted accordingly and refunds/additional payment made on request.

2. Transfer fee to a higher grade is free for all grades of membership.

3. Members are encouraged to transfer to a higher grade when they qualify. It will be noted that the fees of Member and Senior Member grades after 10 and 6 years respectively are equal to the fees at the next higher grade.

4. Members elected after May 2026 pay a reduced subscription fee.

5. By-law B3.7.1 reads “Where a member in the age group of 55 to 70 years has retired from substantive employment in the engineering profession, such member may make written application to Council for recognition as a retired person and a reduced membership fee".

6. By-law B3.7.3 reads “any member complying with the conditions of B3.7.1 but who has been a member of the Institute for not less than 25 consecutive years, shall be exempt from the payment of further subscriptions.” Members who comply with the requirements of By-Law B3.7.3 may make written application to Council for exemption from paying subscriptions".

7. By-law B3.9 reads “any member in good standing who has been a member for fifty (50) consecutive years shall be exempt from the payment of further subscriptions.”

8. Members not in good standing by failing to pay their subscriptions by end of June of each year will, subject to Council decree, be struck-off the SAIEE membership role.

9. Members in good standing and no longer in substantive employment and do not receive payment or salary for work done may apply to Council for a reduction in their annual subscriptions.

10. The members monthly magazine ("wattnow") is available on line and members who require a hard copy may acquire same on request and for a nominal fee subject to minimum uptake numbers.

11. Members who wish to pay their membership fees in recurring payments should activate the payments on their banking portal. Members will receive the early bird discount only if their fees are fully paid by 31 March 2026.

2026 SAIEE MEMBER BENEFITS

STUDENT MEMBER	ASSOCIATE MEMBER	MEMBER	SENIOR MEMBER	FELLOW
Jobs portal for WIL	Jobs portal access	Jobs portal access	Jobs portal access	Jobs portal access
Mentorship	Mentorship	Mentorship	Services Directory	Services Directory
Exclusive Networking Events	Exclusive Networking Events	Exclusive Networking Events	Mentorship	Mentorship
CPD training discounts	CPD training discounts	CPD training discounts	Exclusive Networking Events	Exclusive Networking Events
Charge Reward Programme earnings	Charge Reward Programme earnings	Charge Reward Programme earnings	CPD training discounts	CPD training discounts
Bursary programme	Bursary programme	Long standing member gifts	Charge Reward Programme earnings	Charge Reward Programme earnings
Publication access (**watt**now & ARJ)	Publication access (**watt**now & ARJ)	Bursary programme	Long standing member gifts	Long standing member gifts
Site visits	Site visits	Publication access (**watt**now & ARJ)	Bursary programme	Bursary programme
SAIEE Centres	SAIEE Centres	Site visits	Publication access (**watt**now & ARJ)	Publication access (**watt**now & ARJ)
		SAIEE Centres	Site visits	Site visits
			SAIEE Centres	SAIEE Centres
			Eligibility for nomination as Center Chair	Eligibility for nomination as Center Chair
				Eligibility for nomination as an Office Bearer

MEMBERSHIP UPGRADE DISCOUNT STRUCTURE

LENGTH OF MEMBERSHIP	DISCOUNT UPON UPGRADE
10 - 19 years	5%
20 -39 years	10%
40+ years	15%

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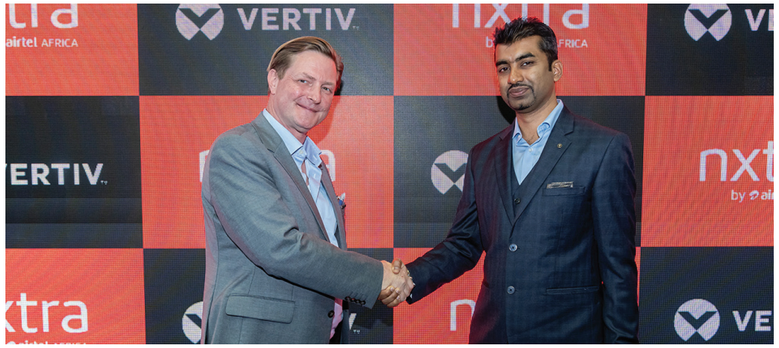
Vertiv Supports Nxtra's Expansion in the African Market

Wojtek Piorko, Managing Director Africa, Vertiv.



Nxtra collaboration.

Vertiv, a global leader in critical digital infrastructure, is extending its collaboration with Airtel Africa through Nxtra, their Data Center division. Starting with Nigeria, this collaboration is a first step in Nxtra's strategic objective of establishing one of the largest high-capacity data centre networks in Africa, strategically located in major cities and bolstered by its extensive operations experience in India.

"Nxtra has been a valued customer for nearly three decades," said Karsten Winther, president of Europe, Middle East, and Africa (EMEA) for Vertiv. "This next chapter in our collaboration demonstrates the power of combining local support in Africa with international manufacturing and innovation."

"As we invest into high capacity, high quality data centers for Africa, it was crucial to partner with a vendor who combines global capabilities with strong local presence," said Yash Issur, CEO of Nxtra by Airtel Africa. "Vertiv's extensive multinational expertise, coupled with their established service team in Africa, provides us the reliability and support we need. We're particularly pleased to name Vertiv as a main vendor for the first project in Nigeria and extend a collaboration ranging from India to Africa."

PLANNED GROWTH ACROSS AFRICA

The Nigerian facility of 42 megawatts (MW) of capacity will be completed in a four-phase rollout process, expected to be fully operational by 2028. Vertiv will provide thermal management solutions and uninterruptible power supply (UPS) systems with batteries for the project, marking the start of a three-year rollout across Africa that will deliver energy-efficient, scalable, and reliable infrastructure. Vertiv will also provide commissioning, handover, and five years of maintenance services supported by its established Nigerian service team. This enables Nxtra's facilities to have strong on-the-ground support for long-term operations.

Says Wojtek Piorko, managing director for Africa at Vertiv: "Africa's growing, data-hungry population is a key driver of digital growth on the continent, and more data centres are required to meet this demand. Our collaboration in Africa with Nxtra marks an important milestone in strengthening Africa's critical digital infrastructure. Together, we are bringing proven global expertise and advanced technology into Nigeria and beyond." wn

Ewseta Empowers South Africa's Next Generation of Water Professionals Through Digital Enablement

Safeguarding South Africa's water future starts with people who are skilled, innovative, and prepared to lead. The Energy and Water Sector Education and Training Authority (EWSETA) is leading this national effort, promoting change through education, technology, and skills development opportunities.

At the 2025 Water and Sanitation Education Programme (WSEP) National Awards, 477 participants, including learners, educators, coordinators, and provincial representatives, were recognised across six national categories for their creativity, leadership, and innovation in water education.

As part of its commitment to digital access and Fourth Industrial Revolution (4IR) preparedness, EWSETA awarded 26 tablets to winners across all categories. The initiative supports learners and educators in staying connected, accessing digital learning, and guiding South Africa towards a sustainable water future.

"The future of South Africa's water sustainability depends on the skills, innovation, and determination of our learners. By nurturing this potential, we are securing the nation's collective future," said Candice Moodley, EWSETA Corporate Services Executive Manager.

The event, supported by the Department of Water and Sanitation (DWS), Trans-Caledon Tunnel Authority (TCTA), and the Water Research Commission (WRC), was honoured by the presence of Deputy Minister of Water and Sanitation, Honourable David Mahlobo.

Alongside EWSETA, these partners are strengthening South Africa's skills pipeline and cultivating a digitally enabled generation of water leaders who will promote innovation, inclusion, and sustainable water management across the country.

BUILDING SOUTH AFRICA'S WATER SKILLS PIPELINE

EWSETA continues to enhance South Africa's water skills pipeline through developing new, nationally aligned qualifications that directly address sector needs.

These include the Water Use Specialist (NQF 7), Borehole Pump Operator (NQF 4), Water and Sanitation Project Facilitator (NQF 5), Water Control Officer (NQF 6), Water Resource Management Practitioner (NQF 8), and Water Conservation Practitioner (NQF 4).

These qualifications reflect EWSETA's commitment to keeping training programmes relevant, practical, and responsive to South Africa's changing water challenges—including climate change, infrastructure management, and sanitation innovation.

DRIVING INVESTMENT IN A SUSTAINABLE WATER FUTURE

Over the past five years, EWSETA has invested more than R1.44 billion in the water sector, supporting over 18,000 learners through skills development programmes, bursaries, and research initiatives. By empowering young South Africans with knowledge and digital skills, EWSETA is nurturing a generation of water professionals who will shape a sustainable and inclusive sector for the future. wn

South Africa's B20 task force profiles India's transition to electric vehicles as a blueprint for G20

As South Africa prepares to host the G20 Summit in November 2025, it presented groundbreaking lessons from India's transformation to the G20 presidency through the B20's Industrial Transformation and Innovation Task Force, which have urgent implications for developing and emerging economies across the G20 and beyond.

The B20 Task Force, chaired by Toyota South Africa CEO Andrew Kirby, highlighted three key focus areas as the foundation for industrial renewal: enabling industrial growth through innovation, deepening value chain capabilities, and embracing sustainable technologies that drive economic transformation.

FROM INDUSTRIAL CHALLENGE TO ECONOMIC OPPORTUNITY

India's experience demonstrates how strategic policy frameworks can transform entire industrial sectors while creating substantial economic opportunities. By financial year 2023-24, India achieved a remarkable industrial transformation: electric vehicle sales soared past 1,5 million units. Even accounting for population differences, this represents a massive gap in industrial development and market.

"Each country must develop their strategy on the transition to zero emission vehicles," explains Hiten Parmar, Executive Director of The Electric Mission. "India's experience shows us exactly how a country with a strong automotive industry can make this transition work for industrial development and economic growth."

STRATEGIC INDUSTRIAL POLICY

India's transformation wasn't achieved through subsidies alone, but through a comprehensive industrial policy that created predictable, long-term frameworks giving manufacturers clarity for strategic planning and investment decisions.

The setting of technical standards for the industry, specifically fuel efficiency standards, sets fleet-wide performance benchmarks.

This encourages manufacturers to choose their innovation pathway—whether through improved conventional technology or accelerated electric vehicle development—while contributing to national industrial objectives.

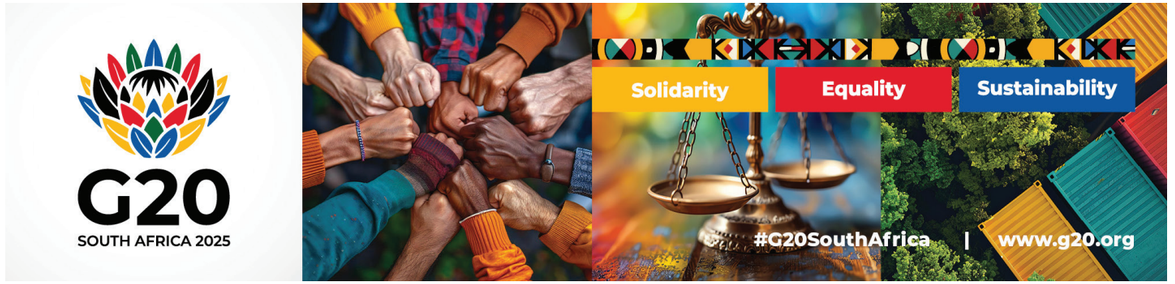
This dual pathway approach allowed the automotive sector to continue developing existing capabilities while simultaneously building new industrial competencies in emerging technologies.

INDUSTRIAL TRANSFORMATION RESULTS

India's strategic approach delivered measurable industrial transformation:

- Electric vehicle production capabilities expanded dramatically
- New employment opportunities emerged across the green technology value chain
- Reduced dependence on imported oil, saving billions in foreign currency
- Positioned the country as a manufacturing hub in the rapidly expanding global electric vehicle market
- Attracted significant investments in clean technology manufacturing

Through complementary programs like FAME II, India invested strategically in industrial infrastructure and supply chain development, creating the conditions for sustained industrial growth.



LESSONS FOR G20 AND DEVELOPING NATIONS

"India's experience demonstrates how well-targeted demand and supply incentives, and infrastructure investments, can increase the adoption of clean technologies and support national policy to accelerate low-carbon industrial transformation," says Parmar.

The timing of this B20 submission is particularly significant as powerful economic shocks and mega trends signal the emergence of a new industrial era. With a slowing economic growth outlook, countries need to accelerate resilient and inclusive industrial development.

STRATEGIC ROADMAP FOR INDUSTRIAL TRANSFORMATION

The B20's Task Force recommendations highlight that developing and emerging economies can follow India's strategic approach by:

- Establishing predictable, long-term industrial policy frameworks that provide manufacturers with planning clarity
- Creating performance standards that drive innovation while allowing flexibility in technological pathways
- Investing strategically in industrial infrastructure to support new technology adoption
- Developing comprehensive incentive frameworks that support both demand creation and supply chain development
- Building industrial capabilities that position countries as leaders in emerging global markets

CRITICAL OPPORTUNITY FOR G20 LEADERSHIP

With South Africa leading the G20 presidency, the November Summit represents a critical opportunity for developing and emerging economies to commit to industrial transformation strategies that can deliver both economic growth and technological leadership.

The choice confronting G20 nations is clear: adopt strategic industrial transformation that generates new economic opportunities and positions countries as leaders in emerging global markets, or risk falling behind in the new industrial era.

The B20 Industrial Transformation and Innovation Task Force submission demonstrates that with the right strategic approach, industrial transformation can deliver multiple economic dividends while building the foundation for sustained, inclusive growth.

ABOUT ELECTRIC MISSION

The Electric Mission is a not-for-profit organisation based in South Africa with extensive experience in the electric mobility and energy sectors through its leadership.

It is represented in several local and international forums, championing the advancement of the electric mobility ecosystem to empower sustainable and equitable mobility and energy systems for all. wn

Cross-country electric vehicle road trip showcases e-Mobility readiness for South Africa

NAAMSA's 90th anniversary and South African Automotive Week 2025, in Gqeberha, was the destination for electric vehicle road trippers from Johannesburg, Durban and East London. "The automotive sector in South Africa is a vital component of South Africa's manufacturing industry, and a significant contributor to employment and gross domestic product," says Hiten Parmar, Executive Director of The Electric Mission. "The opportunity for growth in the sector is highlighted by the increase in new vehicle sales, which are up 24.3 per cent on the figures a year ago."

The total distance of the electric vehicle road trip covered more than 4,000km with six 100 per cent electric vehicles, and a few hybrids for the 50+ participants. The electric vehicles used on the 2025 road trip included the BYD Sealion, Leapmotor B10, Mini Cooper SE, Volvo EX30 Cross Country, EX90, and XC40.

These road trippers act as ambassadors for the electric vehicle transition in South Africa while showcasing the growth and innovation in national charging infrastructure. One of the first charging stops included an entirely off-grid charging hub in Wolmaransstad, North West, that fast-charged six vehicles simultaneously, powered by solar only.

"This second road trip in the lead to SA Auto Week, themed as 'Escaping the Noise', proves that electric mobility in South Africa is not only possible today, but practical for local drivers and the locally available electric vehicle models", says Parmar. "There is a diverse selection of public charging infrastructure en route between the major centres, and it is growing across multiple operators and investors." The annual Global EV Outlook publication of the International Energy Agency profiles South Africa within the top 20 globally on the electric vehicle to charger ratio.

The Eastern Cape province, which laid the foundation for South Africa's automotive industry in 1924, leads in public charging infrastructure diversity, offering the most versatile network of public fast chargers that provide seamless electric mobility from cities to rural areas. "Urban travel is crucial to the electric mobility transition, but in South Africa, linking urban and rural areas is of huge importance to connect communities separated by geography and employment opportunities," says Parmar.

The 2025 road trip is built on the success of last year, which saw participants travel from Johannesburg to Cape Town on a route covering over 2,000 kilometres with five 100% electric vehicles. "Globally, electric vehicle models and pricing are transforming, and now even here in South Africa, more affordable models are making it to market, making electric mobility more accessible", says Parmar.

Participating in an opening panel discussion at SA Auto Week 2025, Parmar emphasised that the current state of the automotive market critically requires a shift in gears. Well-targeted demand and supply policies, along with infrastructure investments, will increase the adoption of emerging technologies and support national ambitions for competitive industrial transformation.

With Europe being South Africa's primary market for exports of locally produced vehicles, South Africa's automotive policy and supporting industry need to critically align local vehicle and component production with Europe's 2035 timeline for banning imports of internal combustion engine vehicles. During the recent State of the Union address, EU Commission president Ursula von der Leyen highlighted that 'No Matter What, the Future Is Electric.' wn

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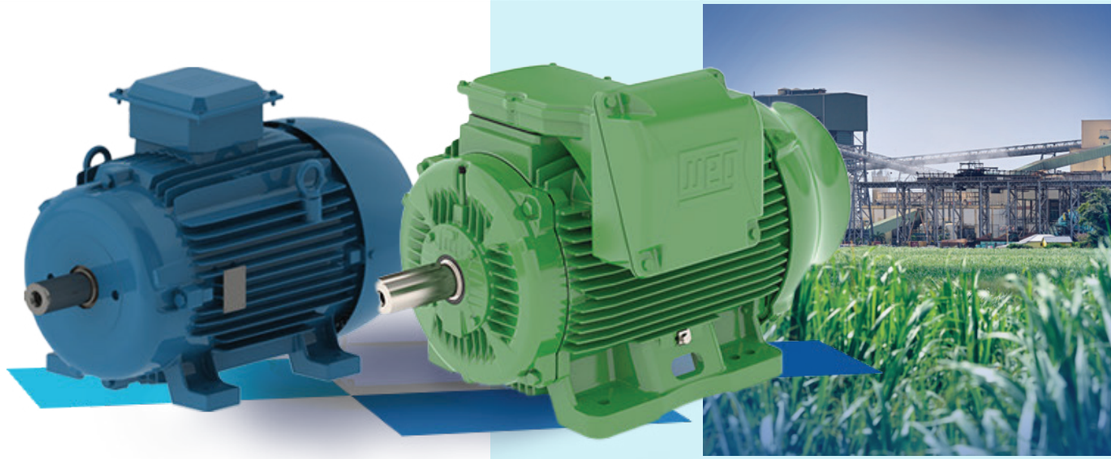

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Driving efficiency and sustainability

LHM delivers monumental fan project, reinforcing leadership in mining ventilation

LH Marthinusen (LHM), a division of ACTOM (Pty) Ltd., has successfully completed a significant fan installation project for a primary mine in the Phalaborwa region, solidifying its position as a leading provider of electro-mechanical solutions for the mining industry. The project involved the design, manufacture, and installation of four overhung centrifugal fans, one of the largest installations of its kind in the Southern Hemisphere.

PROJECT SPECIFICATIONS AND IMPACT - SIZE AND SCALE

Each of the 4-metre-diameter centrifugal fans is powered by 3MW 11kV ACTOM motors and delivers 400m^3/s of airflow at 5500 Pa. This impressive fan performance is precisely controlled by an integrated Inlet Guide Vane (IGV) system, ensuring optimal ventilation efficiency. The entire fan assembly, including outlet ducting, stands approximately 15 metres tall, spans 7.2 metres wide, and is designed to handle substantial amounts of water in the airstream.

"This project represents a major achievement for LHM," states Gareth Bodley, General Manager of the Fan Division at LHM. "We've delivered a robust and reliable ventilation solution that will enhance safety and operational efficiency for the mine. The size and complexity of this installation showcase LHM's capabilities in handling large-scale, demanding projects for the mining industry."

The fan system provides critical redundancy for the mine's ventilation, ensuring continuous operation even during maintenance. "These fans are the lungs of the mine," Bodley emphasises. "With this new system, the mine can maintain full production without interruption, enhancing both safety and productivity."

ENGINEERING EXCELLENCE AND BENCHMARKING INNOVATION

The project's scope included the refurbishment and reuse of existing equipment, along with the design and manufacture of new components. LHM engineers implemented innovative design improvements, such as specialised, maintenance-free bearings for the IGV assemblies, ensuring long-term reliability and efficiency.

"LHM is not only a leader in electro-mechanical repairs and refurbishments, but also a provider of cutting-edge solutions supported by our technology partner TLT-Turbo GmbH, whose expertise in advanced ventilation solutions continues to inspire industry-leading innovations," Bodley explains. "This project demonstrates our ability to design and deliver advanced fan systems that meet the unique challenges of the mining industry. We have enhanced the previous design to ensure longevity and minimise future problems."

MANUFACTURING AND PROJECT TIMELINE

The project, which commenced in October 2023, was scheduled for completion in June 2025. The first phase, involving the installation of new equipment, was completed in December 2024, while the second phase focused on the refurbishment of existing components. The key elements of this project were manufactured and assembled in LHM's state-of-the-art 6000 sqm Fan facility in Driehoek, Gauteng.

"We are proud to have delivered this project successfully, showcasing our expertise and commitment to the mining industry," Bodley concludes. wn

Key sectors served by ACTOM's equipment supply and solutions offering include:

Power Generation
Transmission
Distribution
Utilities
Healthcare
Industrial Processing
Mining
Oil & Gas
Paper & Pulp
Petro-chemical
Rail Transport
Signalling
Renewable Energy
Sugar
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Rail electrification and EV solutions for integrated transport systems

A comprehensive range of solutions for rail electrification and electric vehicles is available from leading technology provider ABB, contributing significantly to integrated and sustainable transport systems.

Rail is being rediscovered as a sustainable and energy-efficient form of transport. ABB understands the importance and implications of running railway networks. It provides complete solutions that protect the infrastructure and meet the expectations of users and transport stakeholders for all key applications. These include infrastructure, passenger stations, control and signalling units, tunnels and rolling stock.

For example, ABB provides advanced traction power supply systems that ensure efficient and reliable power for rail networks. These systems include substations, transformers, and switchgear, which are essential for converting and distributing electricity to trains.

ABB's control and signalling solutions enhance the safety and efficiency of rail operations. These systems manage train movements, reduce delays, and improve overall network performance. In addition, ABB manufactures and services components and subsystems for urban, intercity, and high-speed trains. This includes traction motors, converters, and onboard power systems that improve energy efficiency and reduce emissions.

Technology from ABB connects the entire electrified public transit ecosystem, from the utility grid to the vehicle, ensuring power is distributed safely and reliably at an electric vehicle (EV) charging site. It includes a range of distribution technologies like medium- and low-voltage switchgear, step-down transformers, surge protective devices, electric panels, switchboards, circuit breakers, safety switches, and EV chargers.

The latter includes the ABB Terra Fast Charger, a high-power charging solution designed to meet the growing demands of EV infrastructure, explains Veron Maharaj, Product Marketing Specialist, Smart Buildings. It can deliver up to 350 kW of power, allowing for rapid charging of EVs, and can charge a vehicle to 100 km of range in under three minutes.

The charger supports dynamic DC power sharing to optimise the use of charging assets by distributing power between multiple vehicles, a valuable feature for busy charging stations. The ABB Terra Fast Charger is modular, making it scalable and adaptable to different installation requirements and allowing for easy upgrades and futureproofing.

It features a user-friendly interface with customisable options, including LED strips and payment terminals, to enhance the user experience. Despite its high power, the Terra Fast Charger has a compact design, making it suitable for various locations, including urban areas and highway corridors. "The ABB Terra Fast Charger is a key component in the transition to sustainable and efficient transportation systems, supporting the growth of e-mobility and reducing the environmental impact of road transport," comments Maharaj.

ABB E-mobility is at the forefront of charging innovations for EVs, including public transit, offering a range of innovative solutions tailored to different scenarios for operators. Electric public transportation, including buses, trams and trains, is key to reducing greenhouse gas emissions. ABB is driving this shift with its comprehensive electrification solutions from grid to charger, enhancing urban transit efficiency.

ABB provides integrated solutions for electric buses and cars, including depot charging systems and infrastructure for public transit. These solutions help reduce urban congestion and pollution. In terms of its contribution to sustainable transport, ABB's technologies are designed to maximise energy efficiency, reducing the overall carbon footprint of transportation systems.

This includes the use of renewable energy sources and energy management systems. By electrifying public transit and providing efficient EV charging infrastructure, ABB helps reduce greenhouse gas emissions and air pollution, contributing to cleaner urban environments. Moreover, its solutions are designed to be integrated into existing transport networks, enhancing their sustainability and efficiency.

This includes digital solutions for monitoring and optimising performance, ensuring long-term sustainability. ABB's commitment to innovation and sustainability is evident in its comprehensive approach to modern transport challenges, making it a key player in the transition to greener and more efficient transportation systems. wn

Hitachi Energy is named the world's leading supplier of grid automation products and services

Hitachi Energy was recognised as the global market share leader in grid automation for electric power transmission and distribution utilities by ARC Advisory Group, a leading technology research and advisory firm for industry, energy, and infrastructure. The findings are part of ARC's comprehensive market and technology study titled "Grid Automation Global Market Study 2024-2029" (June 2025).

According to the report, Hitachi Energy is the No. 1 provider of grid automation products and services worldwide. The company was also recognised as the market share leader in key software categories, including Grid Control & Management, Outage Management, and AI Applications. ARC's study also revealed Hitachi Energy leads the market in several hardware categories, including Wireless and Wired Networks, Measurement devices, and RTUs.

"Grid automation is essential to operating and maintaining the modern grid," said Richard Rys, director of consulting at ARC Advisory and lead researcher for grid automation. "Our extensive market share analysis of suppliers in this highly competitive space shows Hitachi Energy at the top of the leaderboard. We believe this company's deep-rooted heritage in energy, extensive domain expertise, the breadth and depth of their integrated solutions, and strong focus on digitalisation and AI/ML capabilities will continue to drive their leadership in the industry."

The report points to substantial growth in grid automation software, hardware and services due to a changing mix of generation, new grid-storage assets, and new market structures such as virtual power plants and support for demand response. In particular, the report states growth is strongest in regions building new electric grids or making major system upgrades or repairs due to weather events or wars that target and damage electric distribution systems.

"The grid automation market is at an inflexion point, with rapid global electrification and the urgency of the energy transition placing unprecedented demands on the grid. The future of the power grid depends on accelerating digital innovation and new capabilities," said Massimo Danieli, Managing Director, Business Unit Grid Automation at Hitachi Energy.

"As the market leader, we're proud to work closely with our customers and the industry to deliver the advanced solutions that modernise grid infrastructure, enhance resilience, and speed the transition to cleaner energy systems."

Hitachi Energy offers a comprehensive portfolio of grid automation solutions designed to modernise and optimise the electricity grid. The company helps electric utilities worldwide transform the traditional power grid into a more reliable, efficient, and resilient system, capable of handling the challenges of the evolving energy landscape.

The company's grid automation solutions enable customers to navigate today's energy challenges with a unified, data-driven approach.

From planning and building to real-time monitoring, control and protection, as well as maintenance and trading operations, Hitachi Energy's technologies enable safer, more reliable, and sustainable grid performance – connecting customers to what's next across the energy lifecycle. wn

B&K Precision Announces New Frequency Counter With Unmatched Value

B&K Precision, a leading designer and manufacturer of reliable, cost-effective test and measurement instruments, has a new Series 1820B Universal Frequency Counters. These compact and versatile instruments are designed for a wide range of frequency measurement applications, from telecommunications to verification and validation of oscillators.

The 1820B Series features a transparent 0.5" LCD and support for frequency, period, ratio, pulse width, and event counting measurements. This series uses a reciprocal counting technique to provide high resolution at all frequencies, from 1 mHz to 3 GHz (1823B) or 6 GHz (1826B). The counters deliver eight significant digits in 1 second of measurement time, nine digits in 10 seconds, and 10 digits in 100 seconds.

Equipped with a high-quality temperature-compensated internal frequency reference, the 1820B Series provides exceptional stability and accuracy, with a low ageing rate of ±1 ppm across the entire temperature range. Input A offers flexible signal conditioning over DC to 125 MHz, with configurable coupling (AC or DC), input impedance (1 MΩ or 50 Ω), attenuation (1:1 or 5:1), threshold (fully variable) and active edge. Input B provides 50 Ω impedance from 80 MHz to 3 GHz. The 1826B also includes an additional input C with an N-type connector, 50 Ω input impedance, and a frequency range of 2 GHz to 6 GHz.

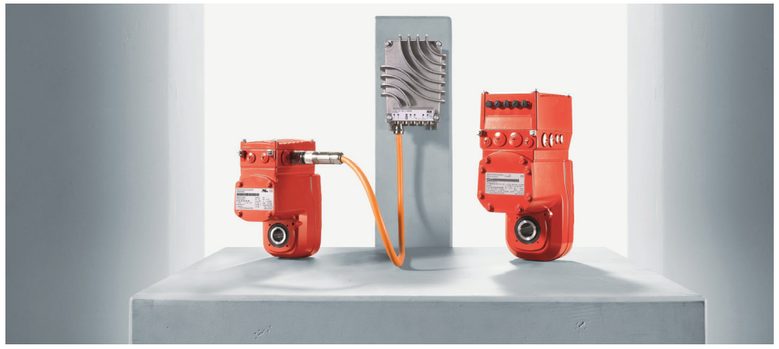
The 1820B Series provides a USB interface for remote control and powering the device via a computer. Additional powering options include continuous AC operation with the supplied AC charger or up to 24 hours on internal battery power.

For more information, Contact COMTEST at sales@comtest.co.za or visit www.comtest.co.za for more information on **B&K Precision's New Frequency Counter 1820B Series.** wn

SEW-Eurodrive Drives Innovation At Automotive Plant With MOVIGEAR® Installation

Willem Strydom, Electronics Business Development Manager at SEW-EURODRIVE.

A major automotive manufacturer in Gauteng has boosted its operational efficiency, safety and energy savings with the installation of SEW-EURODRIVE's advanced MOVIGEAR® mechatronic drive system in its newly expanded buffering zone.



The project saw the delivery of 150 MOVIGEAR® units, supplied to drive conveyors in a high-density storage area. According to Willem Strydom, Electronics Business Development Manager at SEW-EURODRIVE, the customer's goal was to standardise equipment to simplify stockholding and maintenance, while meeting strict safety and performance requirements.

These goals were met using just two variants of MOVIGEAR®, avoiding the need for up to 30 conventional motor variants and significantly reducing inventory complexity.

Each MOVIGEAR® unit integrates a servomotor, gearbox and electronics, offering decentralised functionality with onboard communication and safety features. The system eliminates the need for traditional control panels by linking all units to a compact PLC via hybrid cabling in a daisy-chain configuration, which accelerates installation and lowers infrastructure costs.

SEW-EURODRIVE worked closely with the original equipment manufacturer responsible for the conveyor installation, providing design input and on-site support during installation and commissioning.

The reliability of the MOVIGEAR® units has already been proven across multiple industries, including the food and beverage industry. The units at this site have been running reliably since commissioning in January 2025.

A second phase of the project introduced condition monitoring using MOVIGEAR®'s digital data interface, enabling real-time tracking of performance variables such as vibration and temperature. This data is used to predict maintenance requirements by creating a digital twin of each unit, helping to prevent unexpected failures and extend equipment life.

With ultra-premium efficiency IE5 SEW electric motors, the MOVIGEAR® system also delivers substantial energy savings—estimated at over 38% compared to conventional motors—while offering IP69K protection for demanding environments. wn

The solar paradox

WHY HAVEN'T WE HARNESSED ITS FULL POTENTIAL?

The 30th meeting of the Conference of the Parties (COP30) is set to take place in Belém, Brazil, this November, and South Africa's climate commitments will once more be under the spotlight. The country's Nationally Determined Contribution (NDC) calls for cutting greenhouse gas emissions to as low as 350 million tonnes of carbon dioxide equivalent ($MtCO_2e$) by 2030, a target that has faced widespread criticism as highly ambitious.

Coal remains the main source of South Africa's electricity, providing about 80% of power generation. Despite efforts to shift away from coal, the Organisation for Economic Co-operation and Development (OECD) reports that in 2024, low-carbon energy sources made up only around 17% of electricity. This falls significantly short of the Paris Agreement's 1.5˚C target. The country's reliance on coal has been a double-edged sword, driving economic growth while also locking South Africa into a high-carbon path that harms the environment and public health.

A promising solution to this climate and energy crisis is solar energy, which provides a way to shift from coal power while balancing economic growth, social equity, and environmental responsibility, thereby reducing the country's carbon footprint. South Africa is blessed with more than 2,500 hours of sunlight annually, and its geographic location is ideal for harnessing solar power at scale. The country's Climate Change Act 22 of 2024 has also established sectoral emissions targets and carbon budgets to promote enforceable action, while companies such as GoSolr offer pioneering solutions, like subscription and rental models, that enable a broader segment of the population to access reliable energy at affordable rates.

THE QUESTION REMAINS: IF SOLAR IS OUR ACE CARD, ARE WE PLAYING IT WELL?

Not yet, it appears. Several obstacles remain, including the high upfront costs of solar installations (up to R300,000) and maintenance, certification requirements, socio-economic inequalities, and varying levels of deployment and progress across the country. Regions reliant on coal mining risk being left behind without targeted policies and investment. Johannesburg has simplified small-scale embedded generation (SSEG) but has been slow to implement an effective feed-in tariff.

These developments still hold promise and can speed up the deployment of distributed renewable energy and ease the pressure on the national grid. South Africa's NDC targets require a multi-faceted approach to energy transition and transformation, and the scalability of solar energy makes it a vital part of this plan.

Andrew Middleton, CEO of GoSolr, said: "To overcome the barriers slowing solar adoption, we need solutions that are both flexible and accessible. Subscription and rental models empower more South Africans to embrace renewable energy without the burden of upfront costs. Our commitment at GoSolr goes beyond providing technology; we want to lead the transition to an energy future that benefits everyone, creating opportunities while supporting the country's climate ambitions."

The potential of solar energy, especially in a country like South Africa where sunshine is plentiful, is vast. Solar power can sustainably energise the country, lower greenhouse gas emissions, and encourage a fair transition that benefits all communities. wn

Carbon budgets raise the urgency of company plans to reduce emissions

Philippa Burmeister, partner and principal environmental scientist, SRK Consulting.

South Africa has taken an essential step towards meeting its carbon reduction commitments under the Paris Agreement, with carbon budget regulations that will demand tangible action from the country's large emitters.

Published for comment in early August 2025, the draft National Greenhouse Gas Carbon Budget and Mitigation Plan Regulations set the stage for companies to plan precisely how they will cut their carbon emissions, against real targets they will be legally obliged to meet. Philippa Burmeister, partner and principal environmental scientist at SRK Consulting South Africa, explains that the regulations are aimed at companies that emit more than 300,000 tonnes of carbon dioxide equivalents per year.

"These identified companies will need to provide their greenhouse gas (GHG) emission inventories as a baseline, which will need to be rigorously verified," said Burmeister. "From this basis, they will be required to draft time-bound plans for reducing their emissions – plans which the Department of Forestry, Fisheries and the Environment will review and approve."

SIGNIFICANT RISK

In its evaluation of these plans and targets, the department is not obliged to accept the proposals and can establish its own benchmarks for each applicant. She highlights that this could pose a significant risk to companies, which may be required to meet even more challenging targets for carbon reduction. The regulations align with South Africa's commitments to cut emissions, as outlined in its Nationally Determined Contributions (NDCs) under the Paris Agreement. In its revised NDCs submitted in 2021, South Africa plans to reach annual GHG emissions of 398-510 Mt of carbon dioxide equivalents by 2025 and 350-420 Mt by 2030.

"When compared to the GHG emissions generated by South Africa between 2000 and 2022, these commitments equate to a 0-22% reduction by 2025 and an 18-32% reduction by 2030," she said. "It is worth noting, though, that sector-specific reduction targets have not yet been issued and could require reductions above the country average for high emitters."

REPORT ON ACTIONS

Although the carbon tax system was already in place and requires emitters to report GHG emissions for tax purposes, the latest regulations go further than just affecting companies' financials. Those who do not meet the legally required reductions will face fines, imprisonment, or both.

"After a company is issued with a final carbon budget, it will have six months to report on the actions it plans to take to meet these targets," said Burmeister. "The regulations will operate on five-year cycles during which a company must monitor and demonstrate its progress toward the targets."

SRK Consulting SA chairman Vis Reddy highlighted that the regulations help bring the Climate Change Act of 2024 to life by further driving the country in realistic ways towards reducing carbon emissions.

FEEDBACK ESSENTIAL

"The country's citizens – corporate and individual – need to understand that the regulatory process is progressing and that we are committed to our global

promises," said Reddy. "It is also essential that stakeholders engage with the draft regulations positively and provide the necessary feedback to highlight any aspects that could hinder effective implementation."

He observes that public comment is crucial to develop final regulations that can be reasonably implemented and enforced. Well-crafted regulations will improve certainty and clarity of purpose, enabling companies to plan ahead – as many will need to make significant financial commitments to upgrade systems or enhance infrastructure related to emissions.

"The regulations' five-year horizon of initial expectations is not very long, given the investments and technological advancements that will need to be made by companies to improve their environmental performance," he said.

"Understanding what your carbon budget will be is a key benchmark in this process, but companies really need to have built up some momentum on this issue by now – and should be ready to act decisively on their plans sooner rather than later."

AWARENESS VARIES

Burmeister noted that the majority of those affected by the regulations would know how to report emissions. However, some may still be coming to grips with quantifying their emissions and may face significant challenges in identifying reduction opportunities.

"It is not clear yet how the budget determinations will be calculated and applied, and whether these will be on a case-by-case basis for each company, or whether certain minimum reduction requirements will be applied on each industry or sector," she noted.

Like the Minimum Emission Standards under the National Environmental Management: Air Quality Act, these regulations therefore require proactive involvement at the commenting phase – alongside effective planning and action to avoid business risks. wn

Salvage Auctions are Booming in South Africa

Gert Labuschagne of the well-known salvage auctioneering company GoBid.

Rising vehicle and spares costs are driving a sharp increase in salvage auctions where garages, enthusiasts and parts merchants bid to buy vehicles at a fraction of retail cost.

While the popularity of these types of auctions is filled with opportunities for buyers, it is also important to note the ins and outs of the business and to seek out trustworthy and reputable auctioneers who work within the boundaries of the law and are members of the industry's official professional body, the South African Institute of Auctioneers (SAIA).

Gert Labuschagne, Chief Operations Officer for SAIA at auction company GoBid, explains that salvage auctions focus on selling vehicles deemed uneconomical to repair by insurers. Vehicles classified as "salvage" are not necessarily beyond repair; instead, the classification often results from the combined costs of repairs, car rental, and related claim expenses exceeding the vehicle's post-repair value. Once these vehicles are repaired to meet roadworthy standards, they may be returned to use.

Salvage auctions play a vital role in the insurance and financial sectors by helping recover value from vehicles deemed uneconomical to repair and reducing fraud through regulated channels. These vehicles range from accident-damaged to repossessed and used cars, and are sold "as is or voetstoots" via professional auction platforms. The vehicles are categorised as either Code 2 (used and repairable), Code 3 (rebuilt or permanently unfit motor vehicle), Code 3A (scrapped for parts only), or Code 4 (permanently demolished and not for resale).

"In tough economic times, South Africans are looking for affordable vehicle solutions and salvage auctions give buyers a chance to access vehicles well below retail prices - some in repairable condition, others ideal for parts."

SAIA chief operations officer, Sonja Styger, adds that with the increasing popularity of salvage auctions, coupled with a rising number of outlets and technology platforms, it is now possible to find daily auctions where bidders can participate from anywhere in the country.

In these cases, buyers can identify the vehicles they are interested in and arrange viewings before the auction and bidding. Typically, auctioneers should be able to answer questions about the vehicle to ensure transparency and build buyer confidence in the process.

Typical buyers range from everyday South Africans to seasoned professionals:

- Mechanics and panel beaters seeking vehicles to repair and resell
- DIY rebuilders taking on projects for personal use
- Parts dealers are harvesting components for resale
- Dealers looking for competitively priced vehicles
- Fleet managers sourcing budget additions

Gert concurs, adding that the online format has opened the door for anyone — from an entry-level entrepreneur to a large dealership — to participate on a national scale. However, this accessibility also attracts unaccredited operators, leading to issues such as cloned vehicles, misrepresented conditions, hidden fees and other activities not in line with industry standards, all of which can result in significant costs for buyers. That's where SAIA's role becomes essential. "SAIA-accredited auctioneers comply with a strict Code of Conduct, operate within all legal frameworks and provide full transparency to protect both buyers and sellers. Failure to comply with these requirements will therefore have consequences and serve as a deterrent to chancers or fly-by-night operators."

Sonja concludes that whether a buyer is looking for a budget vehicle, a project car or a business opportunity, salvage auctions offer real value. "Just be sure to deal with a SAIA-accredited auctioneer to ensure your rights and investments are protected."

Visit www.auctioneering.co.za to find a trusted SAIA member near you and explore upcoming salvage auctions across the country. wn

Engineering The Future

- TRAFO POWER SOLUTIONS AND TMC TRANSFORMERS SET NEW STANDARDS IN DRY-TYPE TECHNOLOGY

The TMC production plant features a row of precision-built cast resin transformers undergoing testing and final quality inspection.

As demand grows for safer, more reliable, and environmentally responsible power infrastructure, dry-type transformer technology is gaining ground globally - and leading the charge in Africa is Trafo Power Solutions, in partnership with renowned Italian manufacturer TMC Transformers.

This dynamic collaboration, now in its seventh year, continues to push the boundaries of dry-type transformer design and application. According to Trafo Power Solutions Managing Director David Claassen, the company has played a pivotal role in introducing this technology to a wide range of industries across Africa, from mining and manufacturing to renewable energy and infrastructure.

"Our work with TMC Transformers enables us to deliver custom-engineered dry-type transformer solutions that meet even the most demanding specifications," says Claassen. "Our success lies in a shared culture of innovation, agility and technical excellence."

TMC Transformers Sales Director Andrea Ghidini explains that the company is known for tackling complex challenges with highly specialised solutions. "We are often approached for non-standard applications, such as transformers with ratings up to 25 MVA or primary windings at 50 kV, or units handling extreme harmonic distortion or secondary currents of up to 30,000 amps," he says.

In African mining operations—one of Trafo Power Solutions' primary markets—the challenges extend beyond electrical performance. Transformers must be robust enough to withstand long, difficult transport routes, severe vibration, high dust levels, and extreme temperatures.

"Dry-type technology is ideal in these environments, especially as safety and environmental concerns grow," Claassen notes. "Unlike oil-filled transformers, dry-type units are air-cooled and present minimal fire risk, making them suitable for installation near operational areas and personnel."

Once confined to indoor use, dry-type transformers are now widely used in outdoor applications thanks to technological advancements. Higher protection ratings and improved cooling options, including forced-air, air-to-water and direct or indirect water cooling, allow these units to operate reliably even in Africa's toughest climates.

What sets this partnership apart is its commitment to engineering precision. TMC uses advanced simulation tools, including finite element analysis and thermo-dynamic modelling, to verify every design before production. This ensures optimal performance, long-term reliability and reduced operational risk.

"Rather than just meeting the brief, we interrogate every application to offer smarter alternatives or highlight potential issues," says Ghidini. "That is the value of custom engineering."

Claassen adds that customers benefit from this depth of expertise: "We don't just sell transformers - we deliver engineered power solutions that support long-term operational success." wn

Why Engineering Students should join the SAIEE

Engineering students in South Africa are highly encouraged to consider joining the South African Institute of Electrical Engineering (SAIEE). This prestigious organisation offers numerous benefits that significantly enhance their academic and professional development.

ABOUT THE SAIEE

Formed in 1909, the SAIEE has ±6000 members professionally engaged in various engineering activities, including academic research, manufacturing, electronics, telecommunications, measurement and control, mining, and power infrastructure services. Members make meaningful contributions to the quality of life in communities and the steady advancement of technology. Their efforts are acknowledged in many countries worldwide.

One key advantage of joining the SAIEE is access to a network of experienced professionals in the engineering field.

As members, engineering students have the opportunity to connect with industry experts who can provide valuable mentoring and career guidance. These connections can help students gain insights into the latest trends and developments in the industry, as well as potential job opportunities and internships.

Furthermore, SAIEE membership provides exclusive events, workshops, and seminars tailored to help engineering students enhance their skills and knowledge.

These events offer valuable opportunities for students to learn from experts in the field, collaborate with peers, and stay updated on the latest advancements in engineering.

The SAIEE Student membership is free from 1 December 2024, and with that, the SAIEE Student member (StM) receives the following benefits:

- **Jobs portal for WIL**
  SAIEE Student Members receive preferential placing for their Work Integrated Learnership (WIL) with our SAIEE Corporate Partners
- **Mentorship**
  The SAIEE has a cohort of mentors who are willing and eager to assist our student members with their studies and career guidance
- **Exclusive Networking Events**
  StMs attend all SAIEE events for free and are exposed to industry decision-makers
- **CPD training discounts**
  To maintain your continuous development, the StM receives significant CPD training discounts
- **Charge Reward Programme earnings**
  As a StM, when attending SAIEE events, you earn Charge Reward Points, which can be claimed against paying for training courses, etc.
- **Bursary programme**
  StMs receive preferential treatment when they apply for a SAIEE Bursary
- **Publication access**
  Student members have access to all SAIEE publications since its inception in 1909, which include the monthly online wattnow magazine and the peer-reviewed Africa Research Journal
- **Site visits**
  SAIEE Student members are invited to site visits free of charge, which is CPD accredited, where you can learn hands-on how manufacturing facilities operate
- **SAIEE Centres**
  SAIEE has nine centres nationwide, and we encourage students to get involved at their local SAIEE Centre and represent your student chapter on the Centre EXCO committee.

The South African Institute of Electrical Engineering is a valuable investment for students from all engineering disciplines and tertiary establishments who are serious about advancing their careers in engineering. To learn more about joining the SAIEE, click here. wn

Serving Since 1909

Formed in 1909, The South African Institute of Electrical Engineers sports ± 6000 engineering professionals.

Why Join Us

Our members are professionally engaged in various engineering activities, including academic research, manufacturing, electronics, telecommunications, measurement and control, mining, and power infra-structural services. Members make meaningful contributions to the quality of life in communities and the steady advancement of technology. Their efforts are acknowledged worldwide. Join us today and start making a difference!

Student Bursaries

Our bursaries are for candidates who have completed a first-year study for a degree or diploma in Electrical, Electronic or Computer Engineering at an accredited South African tertiary institution.

Skills Development

One of our core objectives is to harness and foster the growth of students to study Science, Technology, Engineering, and Mathematics (STEM) subjects.

Student Activities

Becoming involved in a Student Chapter and participating in meetings can teach a student member valuable business skills. SAIEE offers mentorship, coaching and vacation work.

Our Purpose

To enhance the practice of electrical engineering in South Africa and the stature of our members through knowledge, networking, influence, education and communication.

SAIEE

Contact Us

SAIEE House, 18A Gill Street, Observatory, JHB
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Mark **Dehong Xu**

Dr Xu has authored ten books and over 200 papers, holds more than 40 patents, and his research focuses on power electronics, renewable energy, and energy efficiency.

Frede **Blaabjerg**

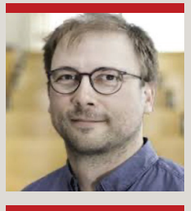
Dr Blaabjerg's research focuses on power electronics applications, reliability, harmonics, and adjustable-speed drives.

Xionfei **Wang**

Prof Wang is a professor at the KTH Royal Institute of Technology in Stockholm and a part-time professor at Aalborg University.

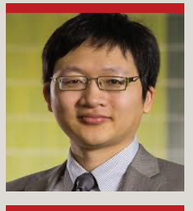
Changfu **Zou**

Dr Zou is currently an Associate Professor. His research interests include advanced modelling and automatic control of energy storage systems, and particularly batteries.



Andreas **Liske**

Dr Liske's research focuses on modelling, control and condition monitoring of electrical drives and power electronics.



Minjie **Chen**

Dr Chen has received several accolades and holds three issued patents and has several patents pending.

Günter **Keller**

Dr Keller has instructed over 70 industrial and university workshops and seminars worldwide, as well as more than 10 conference workshops and tutorials globally.

Petar **Grbović**

Dr Grbović's research focuses on advanced energy storage devices, power converter topologies, and control of power converters.

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FEATURE

Phantom Defects

- THE AUTO INDUSTRY'S SILENT RECALL EPIDEMIC

The auto industry stands at a critical crossroads, grappling with a growing phenomenon known as phantom defects. These elusive issues, exemplified by reports of "phantom braking" in Tesla vehicles, pose significant challenges not only to vehicle safety but also to manufacturers' integrity. As the complexity of automotive design and production increases, so too does the risk of hidden defects that can compromise safety without obvious signs.

Article courtesy of the
International Drivers Association

This article delves into the nature of phantom defects, exploring their causes, the impact on consumers and manufacturers, and the urgent need for a more transparent and practical approach to vehicle safety. In an age where trust is paramount, the auto industry must confront these silent issues head-on to protect passengers and restore consumer confidence.

UNDERSTANDING PHANTOM DEFECTS

Phantom defects, such as the notorious "phantom braking" in Tesla vehicles, represent a significant challenge in the auto industry. These issues not only question the safety of vehicles but also the transparency of manufacturers in handling such defects. By definition, a safety defect is any problem that presents an unreasonable risk to vehicle safety, potentially affecting groups of vehicles with the same design or manufacture. The nature of phantom defects is particularly insidious because they often don't manifest in an obvious or predictable manner, making them harder to identify and rectify. The complexity lies in the need for manufacturers to report and remedy any vehicle-safety defect under Federal law. Yet, despite the established obligations, the follow-through to address these issues is often lacking, leading to repeated recalls and, tragically, preventable accidents and fatalities. As the auto industry continues to evolve, the persistence of phantom defects underscores the need for a more robust, transparent defect-reporting and remediation process to safeguard passengers and restore consumer trust.

CAUSES OF PHANTOM DEFECTS

In the intricate world of automotive manufacturing, "phantom defects" are emerging as a perplexing challenge, primarily due to the complexity and precision required in modern car production. These defects, often elusive and intermittent, such as Tesla's infamous "phantom braking," underscore the industry's critical vulnerabilities.

To understand the root causes of these phantom defects, it's essential to delve into the manufacturing processes and the various factors that contribute to such anomalies. One of the primary causes of phantom defects is the sheer complexity of vehicles. Modern automobiles are intricate machines comprising thousands of components, each of which must work in perfect harmony.

Even a minor defect in a single component can lead to significant issues, such as random, jolting stops as experienced by some Tesla drivers. This complexity increases the likelihood of manufacturing defects, which can manifest in unpredictable ways, making them challenging to diagnose and rectify. Another contributing factor is the pressure on manufacturers to innovate rapidly while keeping costs low.

This drive for efficiency can sometimes lead to oversights in quality control, allowing defects to slip through the cracks. The reduction in the number of defect investigations by the federal auto-safety watchdogs, as reported by Consumer Reports, highlights a regulatory environment that may not be keeping pace with these challenges, potentially allowing dangerous defects to surface undetected. Moreover, defects in the manufacturing process itself, such as poor sealing or faulty assembly, can lead to issues like microwave radiation leaks or transmission malfunctions, as observed in other consumer products and vehicles.

These defects may not always be immediately apparent, but can pose serious safety risks when they do manifest, particularly in the automotive context where the stakes are much higher.

IMPACT ON THE AUTO INDUSTRY

The auto industry is no stranger to recalls, but the phenomenon of phantom defects—suspected issues that are not always confirmed—has introduced new challenges for manufacturers.

These silent recalls have profound implications for both the industry and its stakeholders.

EROSION OF CONSUMER TRUST

In an era of transparency, phantom defects pose a significant reputational risk to auto manufacturers. The consumer-manufacturer relationship hinges on trust, which is jeopardised when defects are not openly communicated or addressed. As a result, manufacturers must strive for transparency concerning potential defects to maintain consumer loyalty and preserve their reputations.

REGULATORY SCRUTINY AND CHALLENGES

The U.S. auto industry has historically been criticised for its lack of technological advancement, with a focus on style and horsepower rather than safety. However, the emergence of phantom defects has increased regulatory scrutiny, pushing manufacturers to adhere to stricter safety standards and compliance measures. This shift is further influenced by international agreements aimed at reducing emissions and encouraging the production of electric vehicles, which add another layer of complexity for manufacturers navigating these regulatory landscapes.

FINANCIAL IMPLICATIONS

The financial impact of phantom defects can be significant. Regulatory investigations and recalls—phantom or otherwise—can affect stock market reactions, leading to potential financial losses for the involved companies. Moreover, manufacturers may face hefty penalties and legal fees in crashworthiness cases, where they are held accountable for safety defects that cause severe injuries or fatalities.

This underscores the importance of proactive measures to identify and address potential issues before they escalate.

TECHNOLOGICAL INNOVATION

On the brighter side, the pressure to address phantom defects has catalysed innovation within the industry. Manufacturers are now more focused on integrating advanced safety systems, such as automatic emergency braking, which have been recognised as crucial for enhancing vehicle safety. This drive for innovation is not only a response to regulatory demands but also a competitive differentiator in an increasingly crowded marketplace.

CASE STUDIES

In recent years, the phenomenon of "phantom braking" has emerged as a critical safety concern within the automotive industry, underscoring the need for stringent quality control and regulatory oversight. This section explores notable case studies involving major automobile manufacturers, highlighting the prevalence and impact of these elusive defects.

TESLA'S PHANTOM BRAKING SAGA

Tesla, a leading innovator in electric vehicles, has faced significant scrutiny over its braking systems, particularly the "phantom braking" issue. This defect causes vehicles to make unexpected, abrupt stops without any clear obstruction, posing a danger to both drivers and passengers.

An investigation by the National Highway Traffic Safety Administration (NHTSA) in 2022 targeted over 750,000 Tesla vehicles following numerous complaints about this sudden braking problem.

Despite the controversy, neither Tesla nor the plaintiffs' attorneys have publicly commented on recent legal rulings related to these defects.

continues from page 33

HONDA'S AUTOMATED EMERGENCY BRAKING WOES

Another prominent case involves Honda, whose Automatic Emergency Braking (AEB) system has been implicated in similar phantom braking incidents. The NHTSA launched an investigation into over 295,000 Honda vehicles, including the Passport and Insight models, due to complaints that the AEB system activates randomly, even when no obstacles are present.

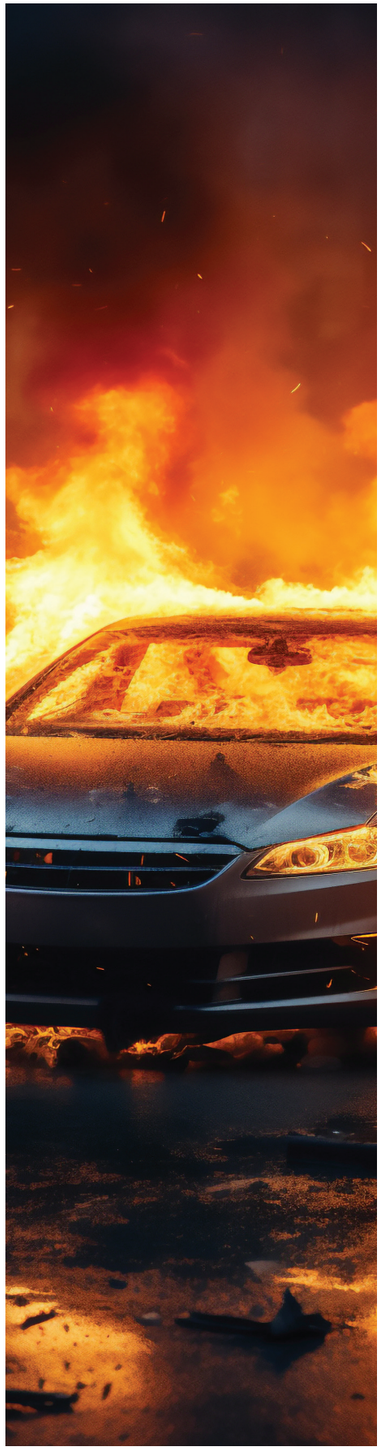
These reports, comprising 106 complaints and 475 field reports, suggest a potential for rear-end collisions and other hazardous situations, highlighting the serious safety risks posed by phantom braking.

THE BROADER IMPLICATIONS

These case studies illustrate a pervasive issue in the auto industry: phantom defects that can lead to tragic accidents and fatalities. Despite the life-saving potential of automatic emergency braking systems, their implementation in some models has introduced new dangers. As manufacturers and regulatory bodies grapple with these challenges, the importance of rigorous testing and transparent reporting becomes increasingly apparent. The industry must prioritise proactive safety measures to prevent such defects from endangering lives on the road.

THE ROLE OF TECHNOLOGY

In the fast-evolving automotive industry, technology plays a pivotal role in identifying and mitigating the impact of phantom defects—elusive malfunctions that may not immediately affect a vehicle's performance but pose long-term risks to safety and reliability. Advanced inspection software and sophisticated tracking systems are at the forefront of this technological evolution,



enabling manufacturers to document and monitor defects effectively. These systems ensure a seamless transition from detection to documentation, creating a comprehensive record that supports both quality control and regulatory compliance. Furthermore, the integration of system dynamics modelling in the automotive manufacturing process exemplifies how technology can be harnessed to address complex production challenges. By simulating real-world scenarios, manufacturers can anticipate potential issues and implement proactive solutions, thereby reducing the likelihood of defects occurring in the first place.

This predictive capability is crucial for maintaining the industry's commitment to safety and innovation. As the sector increasingly relies on digital tools, the importance of robust quality control measures becomes ever more apparent. Regular audits and thorough documentation, powered by technological advancements, are essential for adhering to industry standards and ensuring that vehicles meet stringent safety criteria. In an era where the smallest defect can have widespread implications, the auto industry's embrace of technology is not merely advantageous—it is imperative for safeguarding consumer trust and safety.

INDUSTRY AND REGULATORY RESPONSE

The automotive industry and regulatory bodies are perpetually entwined in a dance of vigilance and compliance, especially when it comes to vehicle recalls. As the complexity of modern vehicles increases, so too does the intricacy of managing and responding to defects. Regulatory bodies like the National Highway Traffic Safety Administration (NHTSA) play a crucial role in maintaining automotive safety standards and overseeing recalls. They ensure that manufacturers report safety-related defects promptly, which is essential for upholding legal standards and fostering accountability within the industry. Despite these efforts, challenges remain. Auto defect cases can arise from design flaws, manufacturing errors, or a failure to communicate potential risks to consumers, each bringing its own set of complications. NHTSA, under its authority from the National Traffic and Motor Vehicle Safety Act of 1966, diligently monitors these processes, holding manufacturers accountable for addressing safety concerns swiftly and effectively.

This oversight is critical, as evidenced by the massive number of vehicle recalls in 2010, underscoring the agency's need to improve the safety defect recall process continually. The industry, on its part, engages in proactive measures to enhance vehicle safety and manage crises. Manufacturers like Toyota actively participate in industry forums and conferences, sharing best practices and learning from each other's experiences to improve safety, quality control, and crisis management. This collaborative approach not only helps individual companies but also elevates industry standards as a whole. In an era where consumer trust is paramount, transparency about vehicle capabilities and limitations becomes indispensable. Maintaining open communication lines about existing or potential defects is crucial for preserving reputation and consumer loyalty. As the industry evolves, particularly with the rise of electric vehicles, vigilance from regulatory bodies and proactive industry practices remain vital to ensuring that even the most innovative companies meet the highest safety standards.

CONSUMER PERSPECTIVE

Navigating the labyrinth of automotive safety can be daunting for the average consumer. At the heart of their concerns is the assurance that the vehicles they purchase and operate are free from defects and safe for use. This expectation is closely tied to the Consumer Product Safety Commission (CPSC), an agency responsible for safeguarding consumers from dangerous and hazardous products, including automobiles. One of the primary concerns for consumers is the transparency of manufacturers' communication.

Trust is a key component in the relationship between consumers and automotive companies. Open lines of communication about vehicle capabilities, limitations, and potential defects are essential for maintaining this trust. This transparency is not only vital for consumer confidence but also critical to preserving manufacturers' reputations and consumer loyalty. The impact of a regulatory investigation or a supplier defect can ripple through the automotive industry, affecting not just consumer trust but also investor confidence.

The response to an automobile recall, for instance, is often scrutinised by stock investors who gauge the long-term implications for a company's market standing. Safety expectations are especially pronounced for products for children, such as car seats, which parents rely on to protect their most precious cargo. With car seat use mandated by law in every state, consumers assume a high level of safety. This reliance underscores the importance of rigorous safety standards and proactive measures by agencies like the CPSC to ensure these products do

continues from page 35

not pose a hazard to young occupants. In essence, consumers demand not just a promise of safety, but a demonstrable commitment from both regulatory bodies and manufacturers. The silent recall epidemic, marked by phantom defects, challenges this commitment, making it imperative for all stakeholders to enhance their transparency and responsiveness to bolster consumer confidence in the auto industry.

SPECIAL CONSIDERATIONS FOR VULNERABLE DEMOGRAPHICS

In the labyrinthine world of auto safety, certain demographic groups face unique challenges that demand special attention. Among these, elderly drivers and young children emerge as particularly vulnerable, each with their own set of risks and safety considerations that the auto industry must address.

ELDERLY DRIVERS: NAVIGATING COGNITIVE DECLINE

As populations worldwide age, the number of elderly drivers on the road is expected to rise significantly. This demographic shift underscores the urgent need for tailored road safety policies that specifically target older drivers. Research has highlighted the complex relationship between cognitive changes associated with ageing, such as dementia, and road safety. This intersection not only impacts individual geriatric care but also broader public health outcomes. Technological advancements in automobiles, including Advanced Driver Assistance Systems (ADAS) and In-Vehicle Information Systems (IVIS), present both opportunities and challenges for elderly drivers. While these systems can potentially enhance safety, they also risk reducing situational awareness, posing additional safety concerns. The development of comprehensive guidelines and research agendas is crucial to navigate these complexities and ensure the safety of elderly drivers on the roads.

YOUNG CHILDREN: THE CRITICAL ROLE OF CAR SEATS

Children are another vulnerable group that requires special consideration when it comes to vehicle safety. Car seats, or child restraint systems (CRS), have become indispensable in protecting young passengers. Over the past half-century, they have significantly reduced the risk of death in infants and toddlers involved in motor vehicle accidents. However, the transition from car seats to seat belts remains a critical period, often marked by poor compliance. Many children graduate from booster seats to seat belts too early, increasing their risk of injury. Parents and caregivers must ensure the correct use of car seats and booster seats to maintain high safety standards for young passengers. Missteps in this area can have dire consequences, as evidenced by studies showing a decline in proper car seat usage after a child turns three.

FUTURE OUTLOOK

As the auto industry navigates the challenges posed by phantom defects, the future hinges on improved transparency, regulatory compliance, and innovative safety technologies.

Manufacturers are under increasing pressure to address safety-related defects more promptly, in line with mandates from regulatory bodies such as the National Highway Traffic Safety Administration (NHTSA). This compliance is essential not just for legal adherence but also for maintaining trust with consumers, who demand open communication about vehicle capabilities and potential defects. The emphasis on transparency is growing, as consumers become more informed and demand higher accountability from manufacturers. With an expanding fleet of vehicles—such as the 416,000 Tesla Model 3 and Model Y vehicles under scrutiny—ensuring that safety defects are communicated and resolved promptly is more critical than ever.

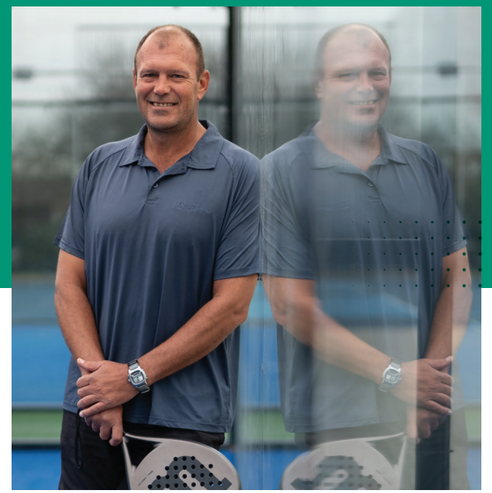
Failure to address these issues could result not only in safety hazards but also in significant reputational damage and loss of consumer trust. Innovative safety technologies are expected to play a pivotal role in the industry's future. Automatic emergency braking systems, recognised for their importance in reducing accidents, exemplify advancements in vehicle safety features.

The continued development and implementation of such technologies could mitigate the risks associated with defects and enhance overall road safety. Moreover, the role of regulatory bodies will likely evolve to incorporate more stringent guidelines and enforcement measures. These organisations are tasked with creating comprehensive safety standards that manufacturers must adhere to, aiming to minimise the occurrence of defects and subsequent recalls. As such, the partnership between regulatory agencies and manufacturers will be critical in advancing vehicle safety and preventing accidents. Looking ahead, the auto industry must balance the rapid pace of technological innovation with the need for rigorous safety standards.

By fostering collaboration among manufacturers, regulatory bodies, and consumers, the industry can work to minimise the impact of phantom defects and ensure a safer driving experience for all. wn

WHEN YOU THINK YOU'RE TOO YOUNG

Willie's Story and the Life-Saving Power of Severe Illness Cover



THE MYTH OF BEING TOO YOUNG

When you're young, healthy, and building your life, serious illness feels like something that happens to other people. You're starting a career, planning your future, maybe building a family. You're focused on growth, ambition, and momentum, not a health crisis. But the truth is: illness doesn't wait for you to be older or ready. It shows up without warning.

Just ask Willem van Zyl, or Willie as he's known. At just 29, fit, active, and with his whole life ahead of him, he was diagnosed with testicular cancer. What followed was a journey of shock, treatment, and eventually healing, made possible because of one unexpected decision he made: taking out Severe Illness Cover with Old Mutual, just three months before his diagnosis.

WILLIE'S STORY: FROM AMBITION TO DIAGNOSIS

Willie was the kind of guy who lived in motion. A sport organiser, teacher, and semi-pro cricketer from Bethlehem, he spent weekends playing cricket, rugby, or golf. He had just started dating the woman who would become his wife.

Then one day, he was injured during a cricket game. His urologist immediately admitted him to the hospital the next day, and he had surgery. A week later, he heard the words that froze time: "You have cancer."

WHEN CANCER COMES EARLY

The news hit hard. Willie's mother had passed away from cancer years earlier, so the diagnosis carried a heavy emotional weight. "The first thing you think is, how much time do I have left?" he says. But very quickly, the emotional toll gave way to logistical questions: What hospital? What care? Will I be able to work? How will I afford treatment?

THE ROLE OF COVER: A LIFELINE IN CRISIS

Fortunately, Willie had Severe Illness Cover with Old Mutual.

"I had no idea how important that decision would be. I just took it out on advice from a colleague. I never thought I'd need it. But three months later, I did."

WHY IT MATTERS: ESPECIALLY FOR YOUNG ADULTS AND COMMISSION EARNERS

Willie's story illustrates a powerful truth: you're never too young to get cover.

Serious illnesses like cancer aren't reserved for older people. Many claims at Old Mutual come from people in their 20s and 30s. In 2024 alone, 46% of disability claims (lump sum and income) came from customers aged 30–50. And 73% of all severe illness claims were for the "Big Four" which include: cancer, heart attacks, coronary artery bypass grafts, and strokes.

The financial pressure of an illness can be devastating, especially for commission earners and professionals with young families or new financial responsibilities. Willie experienced this firsthand. "There were weeks I just couldn't work. Chemo leaves you exhausted. But the payout helped me stay afloat, focus on healing, and even plan for the future."

A TRUSTED PARTNER IN CRISIS: OLD MUTUAL'S TRACK RECORD

Old Mutual isn't just a provider—they're a 180-year-old promise to stand by South Africans when it matters most. In 2024, they paid over R14.7 billion in claims—more than R57 million every working day.

THE POWER OF ADVICE: WHY YOU NEED AN ACCREDITED FINANCIAL ADVISER

Willie's story also reveals another truth: the importance of **working with an accredited financial adviser**.

Whether you're a young professional, a newlywed, or a parent with young children, your financial needs are unique and ever evolving. Having the right adviser means having someone who helps you make the best decisions today, so you're protected tomorrow.

RECOVERY WITH PEACE OF MIND

One of the most overlooked aspects of being financially prepared is the mental relief it brings. Willie was able to recover without the weight of financial stress.

"It gave me peace of mind," he says. "I didn't have to worry about how to pay for the next round of treatment or if I needed another procedure. That mental freedom was a big part of my recovery."

ADVICE TO HIS YOUNGER SELF

Looking back, Willie is grateful—but also reflective. "If I could speak to my younger self, I'd say: don't wait. Get proper cover now. Talk to a financial adviser. You never know what tomorrow holds."

CONCLUSION: PLAN TODAY FOR PEACE TOMORROW

At 29, preparing for the unexpected allowed Willie the space to heal, plan, and continue building the life he dreamed of—as a husband, father, and professional.

Speak to an accredited Old Mutual adviser today. Get the cover that fits your life, not just your age. Because your health might be unpredictable, but your protection doesn't have to be.

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Reforming the Railways? Reform the Skills

South Africa's rail sector is undergoing significant reforms. Strategic initiatives aim to revitalise passenger and freight networks, improve service reliability, and modernise ageing infrastructure. Investments in rebuilding commuter lines and upgrading signalling systems using electronic interlocking technologies are central to these efforts.

By Simphiwe D. Mtanti (Pr.Eng)
SAIEE Railway Chapter Dep. Chair

Recent policy implementation has introduced third-party access to the national freight rail network, opening corridors to new operators. This marks a shift towards a more competitive and decentralised rail environment, with the potential to increase freight volumes and stimulate innovation.

Yet, while frameworks and funding are in place, implementing these reforms faces persistent challenges. Chief among them is skills development and transfer. Without a strong foundation of specialised skills, even advanced electronic interlocking systems cannot achieve their intended impact.

Skills development and transfer in rail is more than reading a new system manual. It involves acquiring the knowledge to operate, maintain, and sustainably improve systems.

Electronic interlocking systems, for example, are replacing outdated mechanical and relay-based signalling technologies across South African commuter and freight lines. These systems are critical for increasing train frequency, improving safety, and reducing delays. But they also demand engineers and technicians trained in signalling logic, systems integration, and digital rail operations.

Recent signalling upgrades have demonstrated the potential of these systems to enable shorter headways, remote diagnostics, and centralised control. However, their success depends on local capacity to manage and maintain them effectively. Without these specialised skills, technology upgrades become slow, costly, and dependent on external expertise. Maintenance issues, configuration errors, and delays in localisation are common when local capacity is limited.

THE SKILLS AND EDUCATION GAP IN THE CONTEXT OF RAIL REFORMS

South Africa does not currently offer widespread, dedicated higher education programmes in railway engineering. While general civil, mechanical, and electrical engineering degrees are available, they do not provide adequate specialised training needed for modern railway systems.

The decline of railway engineering skills in South Africa is characterised by eroding institutional knowledge and limited mechanisms for transferring expertise to younger engineers and technicians.

This challenge is directly relevant to ongoing rail modernisation initiatives, such as electronic interlocking systems and other signalling upgrades, which are being deployed. The shortage of trained engineers slows implementation, reduces system efficiency, and increases reliance on external (and sometimes foreign) consultants.

Encouragingly, some universities have begun integrating railway-specific research into their engineering programmes, focusing on smart infrastructure and digital diagnostics. These initiatives offer a promising model for bridging the gap between education and industry.

TECHNOLOGY AND SKILLS IN PRACTICE

The rollout of electronic interlocking and digital train control systems illustrates the link between skills and technology transfer. Advanced signalling technologies promise safer and more efficient rail operations, but their full potential is realised only when local engineers and technicians can configure, maintain, and adapt them.

The absence of a dedicated skills-transfer channel means that the introduction of new technologies is often delayed or only partially effective. This creates a cycle in which modernisation efforts are slowed, exposure to advanced systems for young engineers is limited, and dependence on foreign expertise persists.

Recent infrastructure upgrades have shown that when local teams are involved in commissioning and diagnostics, implementation is faster and more sustainable. This reinforces the need for targeted training and knowledge transfer.

SKILLS AS THE FOUNDATION OF RAIL ENGINEERING REFORM

To ensure South Africa's rail modernisation efforts succeed, technology upgrades must be paired with skills development. Practical steps include:

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- **University–Industry Partnerships:** Collaborate to develop railway-specific training and research programmes.
- **Dedicated Academic Programmes:** Establish postgraduate diplomas or master's degrees in railway systems engineering, focusing on new technology development in line with the Fourth Industrial Revolution.
- **Technical and Vocational Training:** Introduce rail-specific modules in TVET colleges to train artisans for maintenance and support roles.
- **Knowledge Transfer Clauses in Contracts**: Ensure that procurement of new systems includes mandatory local training, mentorship, and skills handover.
- Centres of Excellence: Develop research and training centres combining academic research, industry collaboration, and practical experience.
- **Engineering Council of South Africa:** To promote discipline-specific recognition and registration of practising professionals, including artisans.

These steps are increasingly relevant as South Africa aligns its national rail strategy with regional master plans, aiming to expand high-speed rail, urban commuter services, and freight corridors.

CONCLUSION

South Africa's rail reforms and infrastructure upgrades represent a positive strategic direction. Yet the slow pace of technological advancements underscores a central reality: modern rail systems depend as much on skilled people as on technology.

Research into the decline of railway engineering skills highlights the fragility of the sector's knowledge base. This article reaffirms that unless the skills gap is addressed, technology advancements will remain slow, costly, and unsustainable.

The future of South Africa's railways will not run on steel and signals alone. It will run on knowledge, skill, and local expertise. wn

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Smart Cities and Beyond

- INNOVATION, SUSTAINABILITY, AND CONNECTIVITY

This article examines global research activity on smart cities from 2020 to 2024 using bibliometric data from the Scopus database. In total, 746 journal papers were reviewed to trace publication trends, assess national contributions, and identify key research themes. China and India had the largest output, followed by Saudi Arabia, the United Kingdom, and the United States.

By Mthobisi Diya, Ofentse Noah, Mokhoana Kganyago and Bongumsa Mendu
SAIEE Smart Cities Chapter

A co-occurrence analysis of 206 keywords using VOSviewer highlighted six principal clusters centred on smart cities, the Internet of Things (IoT), sustainability, sustainable development, developing countries, and China. The results reveal an increasing global focus on sustainability and IoT-enabled innovation in urban systems.

The findings contribute to a better understanding of global patterns of smart city research and provide valuable insights for researchers, policymakers, and practitioners seeking to strengthen innovation and collaboration in future urban development.

INTRODUCTION

Smart cities represent an evolving concept of urban development that lacks a universally accepted definition among practitioners and academics [1]. However, most definitions centre on using Information and Communication Technologies (ICT) to create greater efficiencies in city services and resources [2] and to address growing urbanisation challenges and improve the quality of life for citizens [3]-[4].

The Institute of Electrical and Electronics Engineers (IEEE) Internet of Things (IoT) Initiative defines a smart city as an urban area that uses technological or non-technological services to enhance citizens' social and ethical well-being, improve urban service quality while reducing costs, and increase citizen-government contact [2].

These cities integrate digital technologies, data analytics, and IoT frameworks to create more efficient, sustainable, and responsive urban environments across multiple domains, including transportation, energy, healthcare, and governance [5]-[6].

Smart cities leverage innovative technologies and connectivity to address urban challenges through digital transformation. Innovation plays a crucial role in enabling energy efficiency, emissions reduction, and sustainable development through advanced hardware and software systems that facilitate mutual exchanges between supply and demand sides [8]-[9]. Key innovative technologies include smart traffic management, smart buildings, and smart healthcare systems integrated through ICTs [10]. However, smart city innovation faces significant challenges, including limitations in strategic vision, organisational capability gaps, challenges in domesticating technology, and barriers to ecosystem development [11].

Social innovation provides bottom-up solutions for cities struggling to adapt to technological changes [12]. Success requires establishing cooperation frameworks for open innovation, with sustainable partnerships among stakeholders that create urban innovation ecosystems [13]. Ubiquitous wireless connectivity and ultra-high-speed broadband networks form the essential infrastructure foundation for smart city

implementations [14]. Fundamentally, smart cities place people at the centre of development, incorporating ICT into urban management to stimulate effective governance and citizen participation [7].

This article analyses global research trends and thematic developments in smart city studies from 2020 to 2024, focusing on country-level contributions, emerging research themes, and interrelationships among core keywords. The magazine seeks to provide a data-driven understanding of how countries and research communities have evolved in addressing the technological, social, and sustainability dimensions of smart cities. To achieve this, the specific research objectives were developed:

- Examine publication trends in smart city research from 2020 to 2024, identifying changes in research activity over time.
- Identify and rank the top contributing countries and regions leading in smart city research during the article period.
- Analyse and visualise keyword co-occurrence networks using VOSviewer to reveal thematic relationships and research clusters.
- Explore the dominant themes — sustainability, IoT, and developing countries — that define current smart city research directions.
- Provide insights into emerging trends and knowledge gaps that can guide future research and policy development in smart city innovation.

The remainder of this article is organised as follows: Section II presents the methodology, Section III discusses the results and findings, and Section IV concludes the article.

METHODOLOGY

Data were obtained from the Scopus database using a structured query that searched for the terms "smart cities" or "smart city" together with "countries" or "country" in titles, abstracts, or keywords, limited to the years 2020 to 2024, restricted to English language journal articles, and excluding conference papers, reviews, and book chapters. The results were exported from Scopus, cleaned to remove duplicates and irrelevant items, and each record retained bibliographic details such as year, authors, and source journal. The dataset was then analysed by country using Scopus country/territory data, assigning each publication to a country and aggregating the results to rank the top 10 contributors. This information was presented in a bar chart to show country-level distribution patterns, as presented in Figure 1. These steps formed the methodological process for capturing both temporal and geographical trends in smart cities research. Publications by country are shown in Figure 1, where China leads with 115 publications, followed by India with 110 during these 5 years. This is confirmed in a study by Basumatary et al. [15], which found that the topic experienced exponential growth in this region. Saudi Arabia and the United Kingdom have 49 and 48 publications, respectively, followed by the United States with 45. The remaining publications are scattered throughout Europe and other parts of the world.

RESULTS AND DISCUSSION - SEE FIG 1

NUMBER OF PUBLICATIONS PER YEAR

Table 1 summarises the annual publication output on smart city research from 2020 to 2024. The number of studies increased steadily from 122

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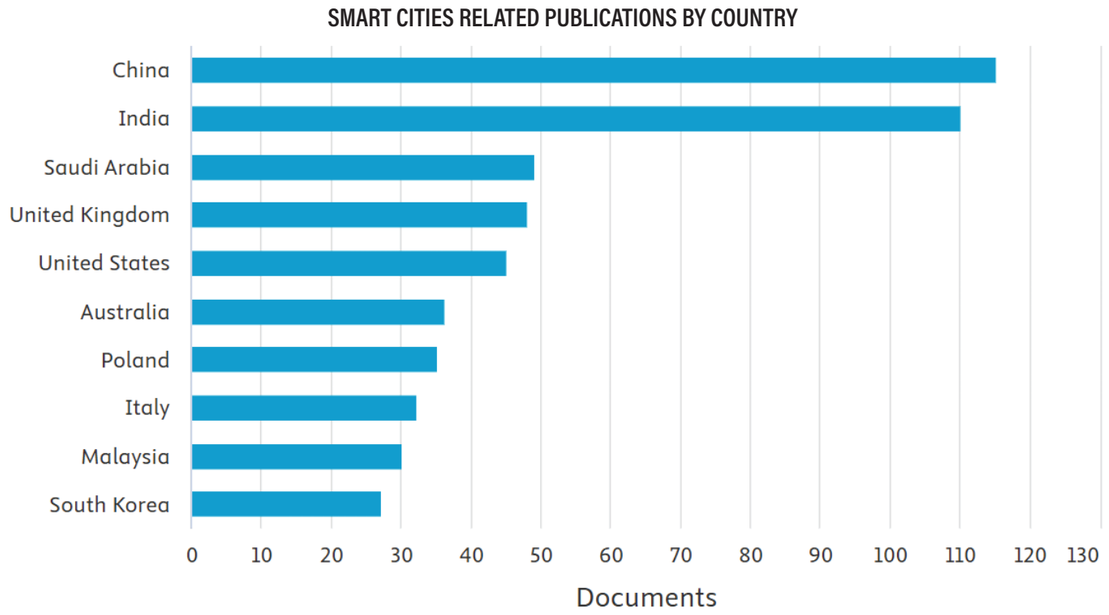

Figure 1: Top 10 contributing countries in smart city research (2020–2024)

in 2020 to 172 in 2024, according to data from the Scopus database. This upward pattern shows a steady increase in global research interest in smart cities. Much of this growth relates to ongoing work in digital technology, sustainable development, and the use of data to improve urban systems. It also indicates that researchers from diverse backgrounds are contributing more actively, bringing together knowledge from engineering, planning, and information sciences to strengthen the application of smart city ideas in practice.

YEAR	NUMBER OF PUBLICATIONS
2024	172
2023	161
2022	150
2021	143
2020	122

Table 1: Annual distribution of smart city publications (2020–2024).

Figure 2 shows how research on smart cities has grown steadily over the past five years. According to Scopus data drawn from 746 journal articles, publication numbers rose from 122 in 2020 to 172 in 2024. This rise points to a continued global interest in how technology and sustainability shape the design and management of cities.

The trend also points to the way the field is widening, as specialists from engineering, computer science, and urban planning increasingly work together. Their combined efforts show a gradual shift toward aligning technical progress with social priorities in the development of smarter, more sustainable cities.

NETWORK MAP VISUALISATION ANALYSIS

Table 2 shows the main keywords that appeared in studies on smart cities from 2020 to 2024 and how they cluster. The term smart cities is the most frequent and most connected, indicating its central position in the research landscape. Keywords such as the Internet of Things, sustainability, and sustainable development appear frequently and are closely linked to technological and environmental themes. The inclusion of developing countries and China points to a growing focus on regional case studies and the varied ways smart city ideas are being applied around the world. These clusters demonstrate how the field links global technological innovation with local implementation challenges.

Figure 3 visualises the relationships among frequently used keywords in smart city research during the period 2020 to 2024. Larger circles represent keywords that appear more regularly, while the lines connecting them indicate how closely related the terms are across different studies. The network reveals several main clusters centred on smart cities, Internet of

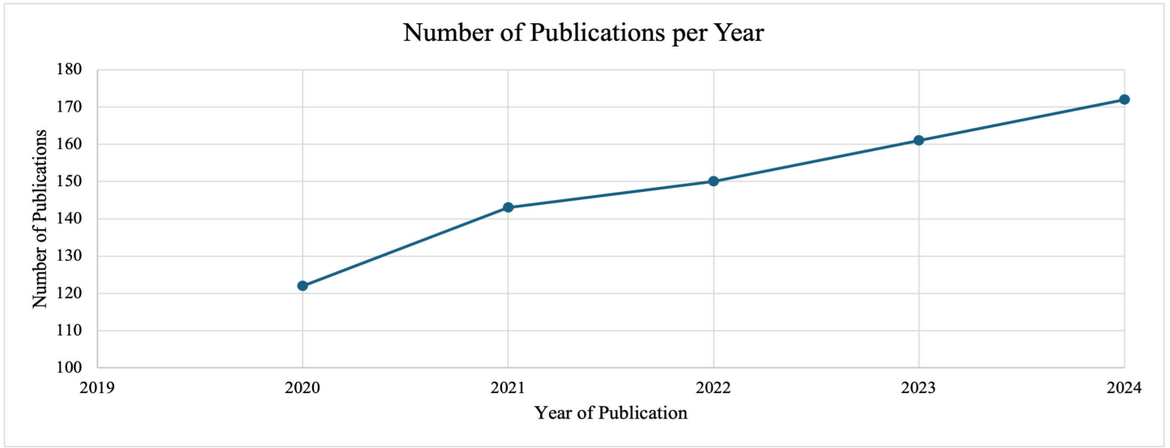

Figure 2: Annual publication trend of smart city research from 2020 to 2024.

KEYWORDS	CLUSTER (COLOUR)	LINK	LINK STRENGTH	OCCURRENCES
Developing Countries	1	156	508	78
Internet of Things	1	118	354	95
Smart Cities	2	205	1975	497
Sustainable Development	3	162	599	94
China	5	110	373	55
Sustainability	6	146	483	89

Table 2: Main keyword clusters identified in smart city research (2020 to 2024).

Things, sustainable development, and sustainability. These clusters show how research combines technological, environmental, and social aspects of urban innovation. The inclusion of terms such as 'developing countries' and 'China' reflects an increasing focus on regional perspectives and the practical applications of smart city concepts across diverse contexts.

Smart cities projects are characterised by the ability to interconnect urban systems —including transport, electricity, waste, water, and gas systems — among themselves and to enable each system to develop. "Smart cities" in the green group have 205 links with other keywords related to smart cities, with a total link strength of 1975 and a maximum occurrence of 497, highlighting the prevalence of the theme at hand. This underscores the amount of research in smart cities by different countries.

"Internet of Things" is also found in the red group, which has 118 links with other keywords, which also shows that it plays a crucial role in smart cities studies and has a total link strength of 354, with a high occurrence of 95, which highlights the platform of choice for smart city research, where the Internet of Things is an enabler. "Developing countries," which is also in the red group, has 156 links to other keywords, indicating how closely it relates to other smart cities topics. The total link strength of 508, the global smart city innovation has been centred in high-income nations, but the most transformative potential may lie in developing countries. The presence of 78 developing countries indicates that the researchers' focus on smart cities is in resource-constrained settings.

"Sustainable development" in the blue group also highlights the significance of smart cities for societal development, with 162 links and a total link strength of 599, which relate to the upliftment of people and planet, and 94 appearances in the subject. "Sustainability", in the light blue group, has 146 links, indicating its importance in aspects related to smart cities—the total link strength is 483, and the number of occurrences is 89. "China", in the light blue group, has 110 links to other keywords, indicating that it is more

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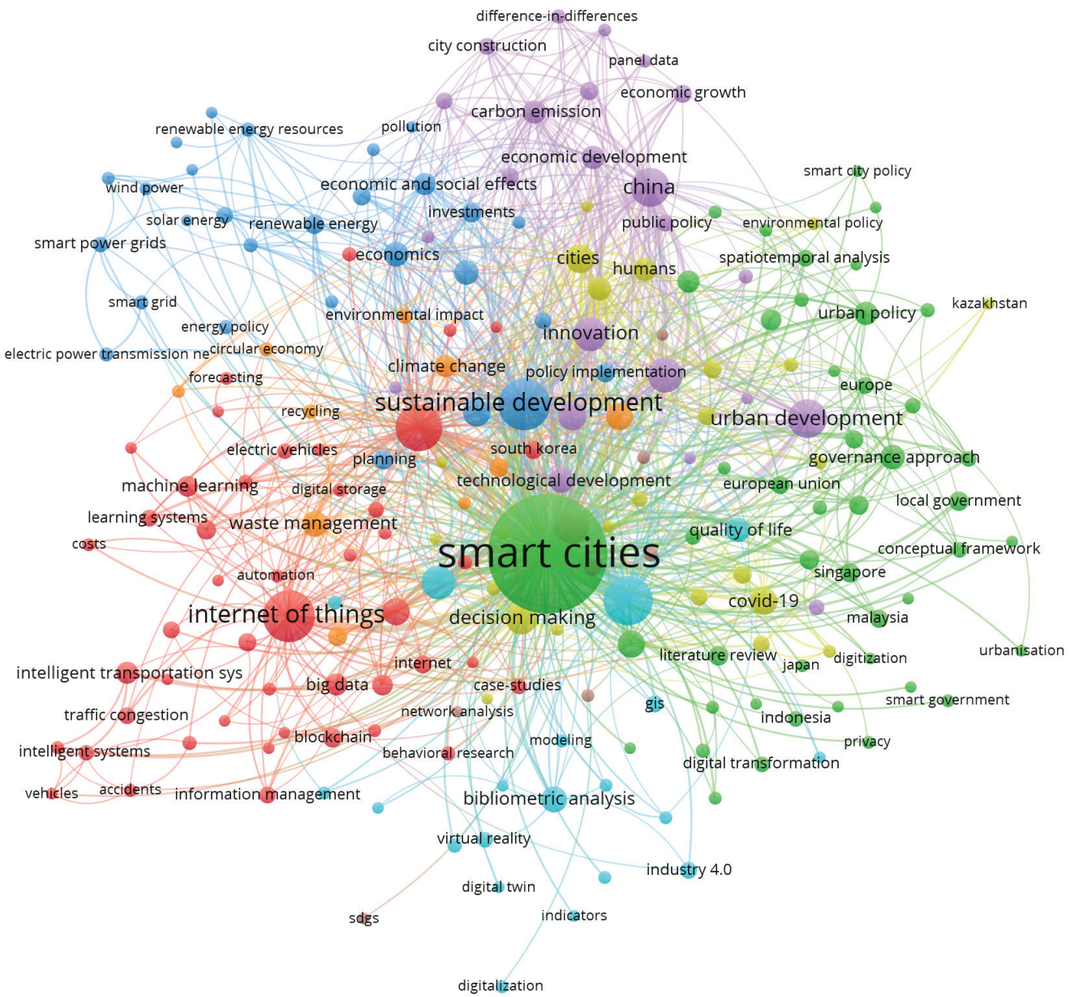

Figure 3: Keyword co-occurrence network of smart city research (2020 to 2024) generated using VOSviewer.

advanced than other countries in the smart city topic.

No conversation about smart cities is complete without mentioning China; this is evidenced by the 373 total link strength. China continues to top the IoT research rankings with 55 occurrences.

CONCLUSION

This article explored how research on smart cities has developed worldwide from 2020 to 2024. Over these years, the number of studies has continued to rise, covering a broader range of regions and topics.

Much of the work comes from China and India, with growing contributions from Saudi Arabia and the United Kingdom.

Analysis of the main research themes showed frequent overlaps between sustainability, the Internet of Things, and the practical challenges of developing urban areas in emerging economies.

Altogether, the results highlighted a growing worldwide effort to use digital technologies to make cities more efficient, sustainable, and responsive to the people who live in them.

By outlining these research directions, the article offers a clearer picture of current progress and encourages further collaboration, innovation, and policy support for more innovative urban development. WN

REFERENCES

IEC ESSAYS

The integration of robotics across sectors is revolutionising industry and daily life. In the 2025 IEC Young Professional competition, winners Mr Caleb Steenkamp (1st place) and Ms Mahlatse Hlanga (2nd place) explored the importance of technology and standardisation in their essays. Read it here. ED

Scaling the South African Robotics Industry through Standards

Caleb Steenkamp
IEC YP Essay Competition First prize winner

In recent years, robotics has emerged as a transformative force globally, reshaping manufacturing, agriculture, healthcare, logistics, and countless other sectors. As advanced economies accelerate their investments in robotics and automation, the urgency for developing countries like South Africa to keep pace is undeniable.

By: Caleb Steenkamp
First place winner
2025 IEC YP Essay Competition
This article is unrevised.

Robotics offers a significant opportunity for South Africa to revitalise its industries, create high-value jobs, address labour shortages in key sectors, and increase global competitiveness. However, unlocking this potential requires more than access to hardware and artificial intelligence (AI), it requires a robust ecosystem underpinned by internationally aligned standards.

South Africa faces multiple barriers to the widespread adoption and scaling of robotics. These include a lack of local manufacturing capabilities, limited technical skills, underdeveloped regulatory frameworks, and insufficient investment in research and development (R&D). Furthermore, many robotic systems entering the local market are designed for foreign conditions, which may not suit the socio-economic or infrastructural realities of South Africa. To ensure relevance and sustainability, a localised approach to standardisation is essential.

Standards are formalised guidelines that ensure the safety, interoperability, quality, and performance of products and systems. In the context of robotics, they govern everything from how robots interact with humans to how they communicate with other machines. International bodies such as the International Electrotechnical Commission (IEC), International Organization for Standardization (ISO), and Institute of Electrical and Electronics Engineers (IEEE) have developed a range of robotics-related standards. However, these must be interpreted and adopted within the local context to address South Africa's unique challenges and opportunities.

This essay explores the critical role of standards in scaling the South African robotics industry. It begins by examining the benefits of standardisation, including interoperability, safety, market access, and innovation. It then analyses current gaps and challenges in South Africa's standards ecosystem before presenting strategic recommendations and a roadmap for action. Drawing on international best practices and South Africa's own developmental objectives, the essay argues that standards should be seen not as technical constraints but as strategic enablers of growth, competitiveness, and social impact.

OVERVIEW OF APPLICABLE STANDARDS

SAFETY STANDARDS FOR INDUSTRIAL ROBOTICS

Industrial robots must comply with rigorous safety standards to protect workers and equipment. The ISO 10218 series is the foundational international standard for industrial-robot safety. It is published in two parts, originally issued in 2011 and recently revised in 2025. ISO 10218-1 covers the robot itself (design and manufacture), while ISO 10218-2 covers robot systems and cell integration (applications). ISO 10218-1 "specifies requirements for the inherently safe design, risk reduction measures and information for use of robots for an industrial environment" [1]. It treats the industrial robot as an incomplete machine – i.e. the robot without its end-effector and installation

– and focuses on hazards intrinsic to the robot (mechanical, electrical, etc.) and measures (guards, safe design, warnings, manuals) to eliminate or reduce risk [1][2]. ISO 10218-2 complements this by specifying safety requirements for integrating a robot into a complete system or cell (including end-effectors, fixtures and other machinery) [2].

together, the two parts address "basic hazards associated with robots [and] robot systems" and provide requirements to eliminate or adequately reduce those risks [2]. Notably, the standard explicitly excludes non-industrial robots: for example, ISO 10218-1 does not apply to underwater, military/defence, aerospace, medical or service robots, nor to consumer appliances or systems designed to lift people [1].

ISO 10218-1 (Part 1) – Safety requirements for robot manufacturers. Specifies safe design features (inherent safety, protective devices, control system requirements, software limits) and information (user manuals, safety instructions) for industrial robots. It treats the robot "as an incomplete machine". Example scopes include guarding, protective stops, safe speed functions, and collision detection.

ISO 10218-2 (Part 2) – Safety requirements for system integrators and end users. Covers the safe integration of robots into cells and applications, including coordination of multiple robots, layout of cells, safe work envelopes, and safety-related control functions.

It ensures hazards arising from the application (e.g. welding, cutting, material handling) are addressed. ISO 10218-2 "specifies requirements and guidelines for the safe integration of an industrial robot into a complete robot system, which includes end-effectors and other related equipment" [2].

Scope/Exclusions – Applies only to industrial robots in fixed installations. ISO 10218-1 explicitly excludes classes such as underwater robots, military and space robots, medical and healthcare robots, prosthetic aids, service/consumer robots and systems lifting people. (Hazards outside intended use, extreme environments, nuclear or explosive atmospheres, etc., are also excluded.) The standard deals with "significant hazards… when used as intended and under specified conditions of misuse".

2025 Revision – The 2025 editions of ISO 10218-1 and -2 (new revisions of the 2011 standards) clarify and expand many requirements. Notable changes include more explicit functional-safety criteria, new cybersecurity guidance, updated safety classifications and testing procedures, and incorporation of collaborative-robot guidance from ISO/TS 15066. For example, the revised ISO

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10218 "consolidates safety guidelines from ISO/TS 15066" into the main standard, giving clearer measures for human–robot interaction [3]. In short, the updated ISO 10218 series remains the global benchmark for industrial robot safety, providing comprehensive design and integration rules to mitigate risks in automated manufacturing [4][2].

ISO/TS 15066: COLLABORATIVE ROBOT SAFETY

ISO/TS 15066:2016 is a Technical Specification that supplements ISO 10218 with detailed safety rules for collaborative robots (cobots). It was published to address gaps in ISO 10218 regarding human–robot collaboration.

ISO/TS 15066 "specifies safety requirements for collaborative industrial robot systems and the work environment and supplements the requirements and guidance on collaborative industrial robot operation given in ISO 10218-1 and ISO 10218-2" [5]. In other words, TS 15066 assumes the basic ISO 10218 requirements are met and then adds specific limits and procedures for shared-workspace operation. Its purpose is to ensure that if humans and robots work in close proximity or direct contact, the risk of injury remains acceptably low.

Key points of ISO/TS 15066 include:

Scope

Applies to industrial robot systems operating in one of the defined collaborative modes (such as speed-and-separation or power-and-force-limiting). It covers both the robot and workspace design aspects needed for safe collaboration. The TS explicitly targets situations where a human may enter the robot's working envelope or come into contact with the robot, whereas ISO 10218 only gave general guidance for such cases.

Collision Limits

ISO/TS 15066 provides quantitative force/pressure limits for contact between a robot and a human. It contains tables of maximum permissible contact forces (for given body regions and conditions) so that compliance can be evaluated. This allows designers and integrators to calculate safe speeds and accelerations for cobots based on mass, geometry and human anatomy.

Operational Modes

It defines the four standard collaborative operation modes (safety-rated monitored stop, hand guiding, speed & separation, and power & force limiting) and specifies the protective measures for each. For example, in Power & Force Limiting mode, the robot's power, speed, and tooling are constrained so that any accidental contact forces remain under the ISO/TS-prescribed thresholds.

Risk Assessment Guidance

The TS gives procedures and examples for performing risk assessments in collaborative applications. This includes how to combine ISO 10218's principles with the new cobot limits, and how to test or measure forces during impact. (For instance, an engineer can compare a robot's theoretical impact force to the TS's "pain threshold" values.)

Adoption

Although ISO/TS 15066 is a Technical Specification (not a full ISO standard), it has been widely adopted in practice. For example, in the U.S. it was implemented as ANSI/RIA R15.06-2012 (and later TR R15.606) for collaborative robot safety.

In the 2025 revision of ISO 10218, much of the TS 15066 content has been incorporated into the main standard, reflecting its importance to modern robotics.

Together, ISO 10218 and ISO/TS 15066 cover both traditional industrial robots and the newer collaborative paradigms. They ensure that whether a robot is fully caged or intended to work alongside people, there are clear design and operational limits to prevent harm.

IEC 60204-1: ELECTRICAL EQUIPMENT OF MACHINES

The IEC 60204-1 standard ("Safety of machinery – Electrical equipment of machines – Part 1: General requirements") deals with the electrical and electronic safety of machinery – including robots. Its scope is all fixed machines (including robotic equipment) supplied by low-voltage power. Specifically, IEC 60204-1 "applies to electrical, electronic and programmable electronic equipment and systems to machines not portable by hand while working, including a group of machines working together in a coordinated manner" [6]. It is generally assumed to cover the low-voltage range (≤1000 V AC or 1500 V DC) [7]. The standard begins at the point where the machine's power is connected (the mains supply input) and then covers all downstream electrical systems.

Key elements of IEC 60204-1 include:

Electrical Design Requirements

Rules for how the machine's electrical components must be selected and arranged. This includes wiring practice, terminal labelling, and protection against overcurrent or short circuits. For example, it specifies minimum conductor sizes, protective bonding (grounding), and requirements for isolation devices.

Control Circuit Safety

Guidelines for emergency stop circuits, safety-related control functions (like safe torque off in drives), control-circuit schematics, interlocks and the use of safety relays or PLCs. IEC 60204-1 requires that machines have one or more emergency-stop devices that override all motions and bring the machine to a safe state. It also covers requirements for fault protection and safe restart.

Protection and EMC

Requirements for protection against electric shock (enclosure ingress protection, creepage distances, etc.), as well as electromagnetic compatibility (EMC) to ensure the machine's electronics do not interfere with other equipment. The standard mandates filters, shielded cabling or other measures as needed.

Testing and Documentation

Criteria for conducting electrical tests (insulation resistance, dielectric withstand, etc.) and providing documentation (circuit diagrams, parts lists, schematics). Proper labelling and documentation are required so that future maintenance does not compromise safety.

Voltage and Frequency Limits

IEC 60204-1 assumes the normal mains frequency is up to 200 Hz (covering industrial 50/60 Hz power). Higher-frequency installations (e.g. aerospace 400 Hz systems) are outside its core scope.

In summary, IEC 60204-1 ensures that the electrical aspects of any machine – including an industrial robot or robot cell – are designed and installed to prevent electrical hazards (shock, fire, unexpected starts, etc.).

Any industrial robot installation must follow IEC 60204-1 (or national equivalent) for its control panels and wiring. In practice, this standard is often adopted nationally (for example, SANS IEC 60204-1 in South Africa) and forms the electrical safety foundation for machinery compliance.

SOUTH AFRICAN (SABS/SANS) STANDARDS

In South Africa, the SABS issues national standards (SANS) that largely adopt these international norms. There are no robot-specific "home-grown" standards; instead, SABS typically adopts ISO and IEC standards as South African standards. For example:

- SANS ISO 10218-1/2: South African adoptions of ISO 10218-1 and -2 (the 2011 editions, updated to align with the 2025 revisions). These are cited as SANS (or SANS ISO) and are identical in content to the ISO texts. They cover industrial robot safety exactly as described above.
- SANS ISO/TS 15066:2016: A national adoption of ISO/TS 15066 for collaborative robots. This SANS mirrors the international TS and provides the same guidance on cobot safety for South African users.
- SANS IEC 60204-1: Adopted from IEC 60204-1, this standard governs electrical equipment safety of machines in South Africa. For example, Eskom procurement documents explicitly reference "SANS IEC 60204-1" for motor control panel safety [8], confirming its use in practice.
- Other relevant SANS: In addition to the above, South African industry refers to the general machinery safety standards. Notably, SANS ISO 12100 (Safety of Machinery – Risk Assessment and Reduction) provides the overarching framework for risk assessment and design principles that underpin all machine (and robot) safety. SANS ISO 13849 and SANS IEC 62061 (control-safety standards) apply to safety-related parts of control systems, which are directly relevant to robot controllers and safety circuits. SANS ISO 13850 (emergency stop) and SANS 61310 (safety signs) also form part of the safety toolbox for robotic installations.

In effect, compliance in South Africa means adhering to these SANS standards (which are usually identical or highly similar to the ISO/IEC originals) and any relevant occupational safety regulations. By following SANS ISO 10218 and SANS IEC 60204 (for example), South African robotics manufacturers and integrators ensure they meet both international best practices and local statutory requirements.

INTEROPERABILITY IN INDUSTRIAL ROBOTICS

Interoperability refers to the ability of different robotic systems and subsystems to exchange information and work together seamlessly, regardless of vendor or platform. In modern manufacturing, this means modular robotic components (arms, end-effectors, mobile bases, etc.) and control systems can integrate plug-and-play under a unified architecture. In practice, interoperability enables vendor-neutral communication protocols and common data models, so that robots from different manufacturers can share commands, status, and sensor data on a common network.

This capability is critical for scalable, reconfigurable production: for example, as A3 Automation observes, "robot interoperability is essential for maximizing efficiency and safety on the facility floor" because only when heterogeneous robots work together can optimal throughput and safe coexistence with humans be achieved [9]. Industry 4.0 envisions factories of "heterogeneous

continues from page 51

devices" all communicating via the network [10]. However, the current reality is fragmented by proprietary fieldbuses and protocols. NIST notes that "integration is impeded by the inability of robots to easily communicate with devices and sensors" [11], so formalizing shared interfaces and information models is seen as key to removing this barrier.

For instance, mixed-brand fleets of autonomous mobile robots (AMRs) operating in a warehouse require a central management system that can "communicate and coordinate with different vendor products using a single control source and interface." Efficient interoperability solutions simplify such scenarios [12]. In short, interoperability – achieved through open standards and common data schemas – underpins modular integration of robots, vendor-neutral communication, seamless data exchange, and the ability to scale or reconfigure systems flexibly on the factory floor [10][12].

STANDARDS FOR ROBOTICS INTEROPERABILITY

Standards play a central role in defining how robotic systems interoperate. International standards bodies such as ISO and IEC have dedicated robotics committees (ISO/TC 299, IEC TC 65/JWG 3) that develop specifications addressing terminology, interfaces, and safety. For example, ISO 8373:2021 defines a common robotics vocabulary, ensuring different systems use consistent terms (e.g. what "robot" or "end effector" mean). The International Federation of Robotics (IFR) notes that ISO standards in robotics cover "safety, performance criteria, modularity, and vocabulary", and cites ISO 10218-1/2 and ISO/TS 15066 as key industrial robot safety standards [13] (these include requirements for safe design and integration of industrial robots). ISO/TS 15066:2016 (collaborative robot safety) and the forthcoming ISO 10218-1/2:2025 (industrial robot safety and integration [1][2]) do not themselves specify interoperability protocols, but they influence how robot cells are engineered and thus indirectly affect plug-compatibility of modules. More directly, ISO/TC 299 has specific working groups on modularity and communication. For instance, ISO 22166-201:2024 ("Robotics — Modularity for service robots — Part 201: Common information model for modules") provides a Common Information Model (CIM) for robot modules to achieve interoperability, reusability, and composability [2].

Although focused on service robots, its CIM concept exemplifies how standard models can unify data exchange across robot components. On mobile robots, an emerging standard ISO 21423 (currently in draft) is titled "Robotics — Autonomous mobile robots for industrial environments — Communications and interoperability". Industry consortia report that this ISO 21423 is being developed specifically to standardize AMR communications [14], enabling multi-vendor AMR fleets to interoperate under a common scheme. IEC standards also influence interoperability. For example, IEC 61499 defines a distributed control architecture for industrial automation with vendor-independent function blocks, explicitly promoting portability, reusability, and interoperability [15].

This allows controllers (including those in robotic cells) to share function blocks and communicate across a standard bus. IEC 61131-3 (PLC programming languages) is widely used in robotics controllers, and IEC 61496 (safety sensors) and IEC 61508 (functional safety) ensure that safety-relevant devices can integrate predictably. Although safety standards like IEC 61508 focus on system correctness, their certification frameworks also require standardized communication of safety states between devices. Critically, OPC Unified Architecture (OPC UA) is now an IEC/IEEE-endorsed stack (IEC 62541) for cross-platform data exchange. OPC UA provides a secure, platform-independent service-oriented architecture for machine-to-machine data [16]. It defines standard address space models and services (read/write/browse) so that any device (robot, PLC, sensor) implementing OPC UA can share information. The OPC Foundation whitepaper states that OPC UA "addresses the need for standardized data connectivity and interoperability for both horizontal (M2M) and vertical (device-to-cloud) communications" [16]. In practice, many robot controllers (e.g. Siemens, ABB) and industrial PCs now include OPC UA interfaces, meaning they can integrate as native nodes in an interoperable automation network.

At the national level, SABS (the South African Bureau of Standards) typically adopts key ISO/IEC standards as SANS standards to ensure local compliance. For example, South African companies implementing robotic systems follow standards aligned with ISO 10218 and IEC 61508 for safety and control, and thus benefit from the same interoperability guidelines as the global market. In summary, a range of ISO and IEC standards – from formal vocabularies (ISO 8373) to modularity models (ISO 22166) and communication protocols (IEC/OPC UA) – collectively govern how industrial robots can interconnect and exchange data in a vendor-neutral manner [13][16].

FRAMEWORKS AND ALLIANCES FOR ROBOTICS INTEROPERABILITY

Beyond formal standards, several open frameworks and industry consortia provide practical interoperability solutions. ROS (Robot Operating System) is a widely adopted open-source middleware platform that enables modular robot software components to communicate via a common publish/subscribe model. In ROS, sensors, actuators, and controllers exchange messages on standard "topics" or services, decoupling software from specific hardware. This provides a flexible software integration layer across robots. The ROS-Industrial Consortium (led by industry and academia) extends ROS to factory applications, with the explicit goal of "provid[ing] interoperability between industrial robotic platforms" [17]. ROS-Industrial maintains driver packages and interfaces so that diverse robot arms or machine tools can be managed through the same ROS framework. ROS2 (the next ROS generation) further embraces interoperability through industry standards: it uses the DDS (Data Distribution Service) middleware (an OMG/IEEE standard) under the hood and can integrate with OPC UA and DDS-Security for enterprise-wide robotics.

OPC UA, already discussed as a standard, is also supported by an industry alliance (the OPC Foundation) and by Industry 4.0 initiatives. There are multiple efforts to bridge OPC UA with robotics: for example, research prototypes connect ROS nodes to OPC UA servers, allowing ROS-based robots to publish their state into an OPC UA address space for other systems to read [10]. In effect, OPC UA can serve as the interoperability backbone, with companion specifications (e.g. PLCopen's IEC 61131 OPC UA spec) and emerging information models for robotics, so that all devices (including robots) share a unified semantic model. Recent industry roadmaps emphasize OPC UA over TSN (Time-Sensitive Networking) as a path to deterministic, vendor-neutral real-time networks [18].
Industry alliances have also developed specific interoperability protocols for mobile robots. The VDA 5050 standard (initiated by the German VDA/VDMA) defines a common message interface between AMRs/AGVs and a central fleet manager. VDA 5050 provides a "common language" so that heterogeneous robot vehicles can be coordinated by a single control system [19].Similarly, the MassRobotics AMR Interoperability Standard (2023) specifies how AMRs from different vendors share basic status (location, task, capability) so they can be orchestrated together on a warehouse floor [20]. These consortia deliver practical JSON/XML schemas and APIs that robot makers can adopt; they exemplify the "best-of-breed" principle of connecting multi-vendor fleets while preserving unique device features.

Other protocols from the broader industrial ecosystem play roles in robotic interoperability. For example, many industrial robots and controllers support real-time Ethernet-based fieldbuses (EtherCAT, PROFINET, EtherNet/IP). The emergence of IEEE 802.1 TSN (Time-Sensitive Networking) promises to unify these onto standard switched Ethernet. High-level data protocols like MQTT (with Sparkplug B) are also used for lightweight telemetry. Open-source projects like Open-RMF (Open Robotics Middleware Framework) are specifically designed to coordinate multiple robotic fleets and infrastructure (e.g., doors, elevators) in environments from factories to hospitals [21]. In all cases, the emphasis is on published, documented interfaces and data schemas. Taken together, ROS/ROS-Industrial, OPC UA, VDA 5050, MassRobotics, and emerging IIoT protocols create an ecosystem where robots can share information across platforms. By leveraging these frameworks and standards, industrial robotics systems can achieve true plug-and-play integration, cross-vendor communication, and scalable coordination across the factory floor [18][20].

PERFORMANCE STANDARDS FOR INDUSTRIAL ROBOTICS

The performance of industrial robotics systems is a critical factor in their adoption and integration into modern manufacturing environments. Performance encompasses aspects such as speed, precision, repeatability, load capacity, energy efficiency, and reliability. To ensure consistent and safe performance across global markets, international and national standards play a foundational role. In the South African context, performance is governed by a combination of international standards—particularly those from ISO and IEC—and local adaptations and implementations via SABS.

ISO STANDARDS

The ISO has developed a wide range of standards specifically aimed at defining and assessing the performance of industrial robots. Key among these is ISO 9283:1998 – Manipulating industrial robots – Performance criteria and related test methods. This standard specifies test procedures to measure critical performance parameters, including:

- Positioning accuracy and repeatability
- Path accuracy
- Velocity and acceleration capabilities
- Payload capabilities

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These benchmarks are essential for comparing different robot models and ensuring that deployed systems meet operational requirements. Moreover, ISO standards promote interoperability and global trade by aligning expectations across manufacturers and end-users.

IEC STANDARDS

The IEC focuses primarily on the electrical, electronic, and related technologies that power industrial robotics. The performance of a robotic system is also shaped by its control systems, energy efficiency, and EMC. For instance:

- IEC 60204-1 covers the electrical safety of machinery, including robots, ensuring that performance is not compromised by system faults or unsafe configurations.
- IEC 61499 addresses function blocks for industrial-process measurement and control systems, supporting the modularity and flexibility needed for high-performance robotic applications.
- IEC 62832 (Digital Factory framework) helps facilitate the integration of industrial robots into smart manufacturing systems, enabling real-time performance optimization through digital twins and industrial IoT (IIoT).

These standards ensure that performance in robotics is sustainable, energy-efficient, and aligned with smart manufacturing principles.

SABS STANDARDS

As South Africa's national standards body, SABS adopts and adapts relevant ISO and IEC standards to local conditions. For example, SANS 9283, the South African National Standard equivalent of ISO 9283, ensures that performance evaluation procedures for industrial robots are legally and technically recognized in South Africa. SABS also contributes to workforce training, testing, and certification programs, ensuring that local industries can effectively assess and implement robotics technology in a performance-compliant manner.

Furthermore, the alignment of SABS with ISO and IEC frameworks ensures that South African-made or deployed robots are compatible with global systems, which is especially important for export and multinational operations.

THE ROLE OF STANDARDS IN SCALING THE SOUTH AFRICAN ROBOTICS INDUSTRY

Standards are strategic tools that shape markets, guide innovation, and build public trust. In robotics, they provide a foundation for ensuring that systems are interoperable, safe, and fit for purpose. This section outlines how standards can support the growth of the South African robotics sector.

1. **Enabling Interoperability and Modular Design**
   Without shared standards, robotic systems are often locked into proprietary ecosystems, limiting flexibility and increasing costs. By adopting standards like IEC 62832 (Digital Factory Framework) and ISO 10218 (Industrial Robot Safety), South African firms can ensure interoperability between components from different vendors [21]. This modularity lowers entry barriers for small businesses, encourages innovation, and facilitates participation in global supply chains.
   Recommendation: SABS and industry stakeholders should prioritise localising key interoperability standards and developing open-source testbeds to validate multi-vendor integration.
2. **Ensuring Safety and Public Trust**
   Safety is critical in promoting public acceptance of robotics. Standards define safe operating zones (ISO/TS 15066), fail-safe behaviours, and ethical AI protocols. In sectors like mining and agriculture—where automation is increasing—ensuring compliance with safety standards is essential to protect workers and reduce liability risks [22].
   Recommendation: South Africa should establish a national certification scheme for robotics safety and performance, using adapted ISO and IEC standards.
3. **Performance**
   Few performance standards exist in South Africa.
   Recommendation: SABS should accelerate harmonisation with IEC and ISO, by prioritising the updating local standards.
4. **Facilitating Market Access and Export Competitiveness**
   Compliance with international standards is often a prerequisite for exporting goods and services. Robotics products that meet ISO, CE, or ANSI standards have better chances of entering foreign markets [23]. For South African startups, embedding standards from the outset simplifies certification and builds investor confidence.
   Recommendation: The DTIC should support robotics firms in meeting international certification requirements through grants and technical assistance.
5. **Supporting Procurement and Public Sector Innovation**
   Government is a key user of robotics in areas like healthcare, security, and infrastructure. Standards-based procurement ensures product quality and compatibility while avoiding vendor lock-in. It also opens opportunities for local companies to compete on a level playing field.
   Recommendation: National Treasury and SITA should update procurement policies to include robotics-specific standards and create a registry of compliant vendors.
6. **Guiding Local Innovation and Research**
   Standards accelerate research and innovation by defining common architectures and reducing duplication. Universities and startups benefit from having clear guidelines for prototyping and systems integration. Funding agencies should align their evaluation criteria with standard adoption.
   Recommendation: NRF and TIA should require standard alignment in R&D grants and innovation programmes.
7. **Accelerating Skills Development and Professional Recognition**
   The robotics industry requires specialised skills. Integrating standards into curricula ensures that graduates are prepared for industry demands. Professional bodies like ECSA can use standards to define competencies and accredit training programmes.
   Recommendation: Align national qualifications with robotics standards and offer micro-credentials in areas like human-robot interaction.
8. **Promoting Inclusive and Responsible Robotics**
   South Africa's robotics journey must be inclusive and ethical. Standards can promote accessibility, data privacy, and environmental sustainability. They should be developed with input from diverse communities to reflect national values.
   Recommendation: Establish an ethics and inclusion working group under SABS to guide the development of context-relevant standards.

REFERENCES

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The integration of robotics across sectors is revolutionising industry and daily life. In the 2025 IEC Young Professional competition, winners Mr Caleb Steenkamp (1st place) and Ms Mahlatse Hlanga (2nd place) explored the importance of technology and standardisation in their essays. Read it here. ED

The role of Standards in Scaling-up the Robotics Industry in South Africa

- ENSURING SAFETY, INTEROPERABILITY, AND PERFORMANCE

Mahlatse Fortunate Hlanga
IEC YP Essay Competition Second prize winner

Robots are automatically controlled machines that are made to replace human labor, whether they look like humans or do similar tasks [1]. Robots are designed to do jobs with unparalleled speed and accuracy, greatly increasing productivity and cutting down on processing times in sectors like customer service and healthcare.

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2025 IEC YP Essay Competition
This article is unrevised.

In addition to increasing productivity, they can safely perform activities that might otherwise put human workers in danger in dangerous situations.

In 1954, George Devol achieved a revolutionary milestone in automation by creating the first programmable digital robot, which lay the groundwork for modern robotics [2].

Information technology (IT), networking, and artificial intelligence (AI) are key factors propelling the robotic revolution. With the ability for robots to carry out activities ranging from basic manual labor to intricate decision-making, these technologies are revolutionizing company operations, service delivery, and the very nature of work. The emergence of IT-powered linked robotics portends a significant change in the way choices are made, and actions are carried out. Robots are becoming more and more dependent on digital ecosystems, such as cloud computing and the Internet of Things (IoT), and are no longer limited to physical spaces. Understanding that robot's function inside larger IT infrastructures, where data interchange and communication are crucial, is crucial to appreciating the possibilities and constraints of this new era [3]. However, there are ethical issues with the broad use of robotics, such as job displacement, cybersecurity flaws, and data privacy hazards. The irreplaceable worth of human judgment in many fields is highlighted by the fact that, despite their gains, robots still have limits, especially in higher-order reasoning, emotional intelligence, and human-like adaptability.

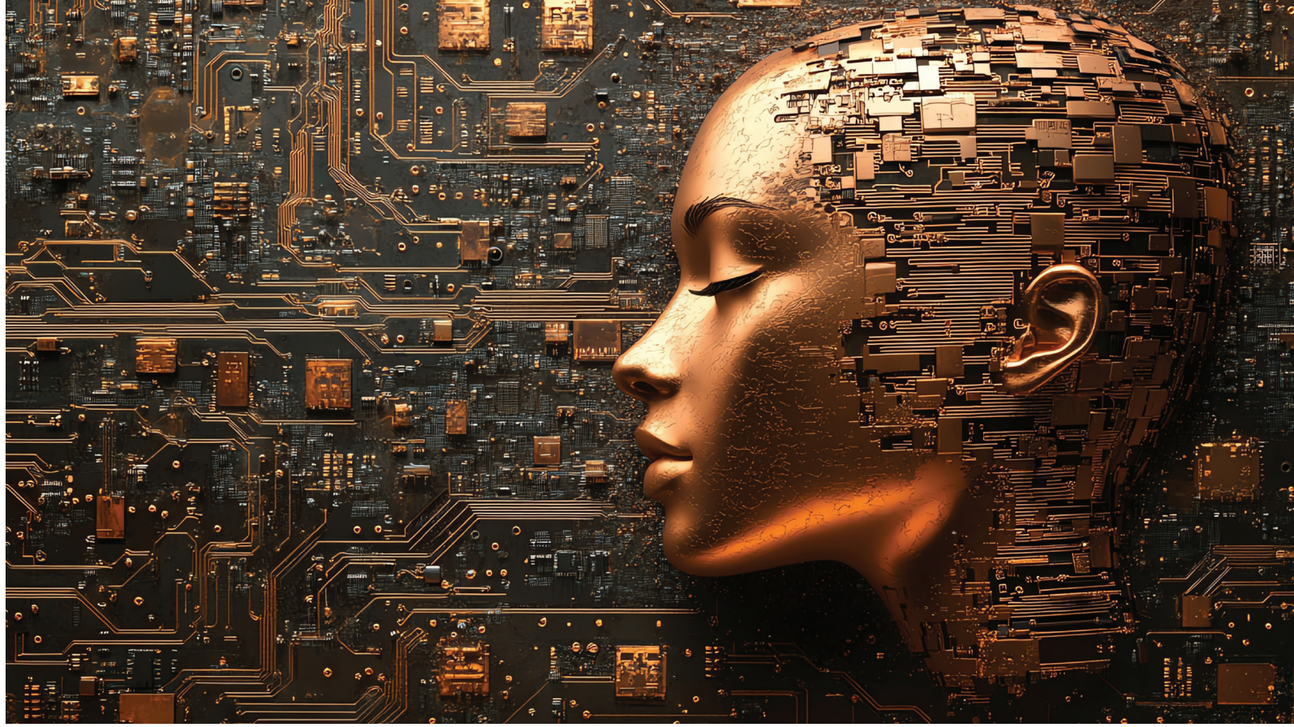
The advent of Industry 4.0 [4], which is characterized by the merging of digital and physical systems, and the unrelenting advancement of technology, portends a future in which robots will play an even bigger role in revolutionizing the healthcare, service, and industrial sectors. This change is more than just automation; it is a fundamental rethinking of human-machine interaction, work paradigms, and the use of intelligent technology to enhance human potential. Robots are evolving from basic tools to vital partners as this evolution progresses, actively influencing our everyday lives and the larger economic environment with their ever-more-sophisticated contributions.

COMMON TYPES OF ROBOTS AND THEIR APPLICATIONS

INDUSTRIAL ROBOTS

Material handling, welding, spray painting, assembling, and inspection are among the production tasks performed by these kinds of robots [5]. Robots are now essential components of the current industrial ecology, having radically changed modern production systems and service delivery [6].

Industry has always been the main source of innovation in this field, and the robotics revolution has not only changed industrial paradigms but also propels technical growth throughout industries.



To improve operational competitiveness, modern manufacturing companies are progressively implementing information and communication technology. The increasing use of verified sensors and machine vision systems that allow for safe human-robot cooperation is one example of this development. These technology solutions mark a substantial shift from conventional methods that rigidly separated robots and human operators, addressing difficult automation challenges in situations where human expertise is still crucial [7].

ROBOTS IN THE HEALTHCARE SECTOR

Robotics adoption in healthcare is a revolutionary development that will have a significant impact on medical practice. The three main facets of healthcare that these intelligent systems are transforming are clinical applications, operational effectiveness, and patient care improvement. Rehabilitation robots offer reliable, data-driven treatment in clinical settings, while surgical robots allow for sub-millimeter accuracy in intricate procedures. Hospital-acquired infection rates are declining thanks in large part to disinfection robots. Operationally, AI-assisted diagnostic robots improve image analysis, automated logistics systems expedite the delivery of medications and supplies, and robotic process automation streamlines administrative operations [3].

Most astonishing of all, robots are improving patient care directly through a variety of uses. Social robots allow for remote specialist consultations, exoskeletons help disabled people regain their movement, and interactive robots provide company for elderly patients. Robotic-assisted operations have been proven to reduce procedure durations by 40% [8], and 67% of US hospitals currently use some kind of robotics service [9], demonstrating the already substantial impact.

ROBOTS IN THE SERVICE SECTOR

Automation and robotics integration is causing a major shift in the service sector, affecting sectors including retail, hotels, and customer service. Robots are no longer limited to manufacturing floors; they are now frequently seen in routine customer service encounters [3]. Automating duties ranging from high-risk military operations to delicate social relations is just one example of how modern robots go far beyond industrial uses. Even though the automobile industry is still at the forefront of industrial robotics, robotic innovation has been further fueled by developments in artificial intelligence (AI), computing, and networked systems. Robotics, by utilizing the current ICT infrastructure, has successfully given the digital world "senses, hands, and feet," resulting in interdependent systems that depend on ongoing technical advancement [11].

Understanding how next-generation robotics are rooted in networked IT ecosystems, such as cloud-based and IoT frameworks, is essential to evaluating both their promise and limitations. In domains like data storage, computing speed, and doing risky tasks, service robots already outperform humans. They nevertheless have limitations in higher-

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order cognitive abilities, especially in intuition and emotional intelligence, as well as mechanical flexibility and analytical depth [9]. Most service robots still function at basic intelligence levels, lacking the sophistication necessary for complicated decision-making, even though their applications grew throughout the pandemic.

THE GLOBAL IMPACT OF STANDARDIZATION

By establishing consistent standards for quality, safety, and interoperability, standardization shapes industries, trade, and technology, and it is a vital pillar of contemporary society. Its extensive impact promotes creativity, increases efficiency, and makes cross-domain international cooperation possible. worldwide trade obstacles are effectively reduced, and worldwide interchange is facilitated by standards such as ISO 9001 for quality management and IEC standards for electrical safety, which guarantee that products fulfill universal requirements. Standardized procedures like GS1 barcodes simplify logistics and reduce operational expenses and delays, which further improves supply chain efficiency [11].

Technology and innovation are significantly supported by standardization; for example, Wi-Fi (IEEE 802.11) and 5G (3GPP) standards allow for smooth international communication. Emerging technologies like artificial intelligence and the Internet of Things require ethical development, and frameworks like IEEE P7000 for AI ethics offer crucial principles. In terms of sustainability and safety, standards are essential for protecting public health. For example, ISO 14001 encourages ecologically conscious corporate practices, whereas ISO 13485 applies to medical devices [12].

Through processes like ISO/IEC 27001, which improves data security and digital privacy, and CE marking and UL certification, which guarantee product dependability, standardization also increases consumer trust [13]. As demonstrated by unified construction regulations like ISO 19650 that enhance urban resilience, the adoption of international standards in emerging economies speeds up technological advancement by facilitating knowledge transfer and promoting infrastructure development [14]. Notwithstanding its advantages, standardization has drawbacks, such as the requirement to strike a balance between innovation and regulation, especially in rapidly emerging domains like artificial intelligence and quantum computing, and to guarantee inclusivity so that poor countries can actively participate in standard-setting procedures. Furthermore, standards must be continuously adjusted to accommodate new paradigms like generative AI due to the speed at which technology is developing.

ROBOTIC TECHNOLOGY ADOPTION AND STANDARDIZATION IN SOUTH AFRICA

Significant opportunities for economic growth and enhancements in the standard of living are presented by the integration of robotic technologies in South Africa's manufacturing, healthcare, and service sectors. It becomes crucial to create thorough standards and stringent conformance evaluation procedures to fully reap these benefits while reducing risks. These frameworks fulfill three essential purposes:

- Safety Assurance: Establishing minimum safety requirements for human-robot interaction and operational parameters performance.
- Validation: Ensuring systems meet specified reliability and effectiveness benchmarks Interoperability.
- Compliance: Facilitating seamless integration with existing infrastructure and technologies. Proper standardization not only safeguards users and maintains service quality but also builds public trust in robotic solutions, a crucial factor for widespread adoption. For South Africa specifically, tailored standards that consider local infrastructure conditions and workforce capabilities will be particularly valuable in maximizing the technology's positive impact while minimizing implementation challenges.

In South Africa, the use of robotic technology is expanding significantly in several important economic sectors. Manufacturing holds the top spot, with industrial robots making up 38% of installations across the country [15], while healthcare robotics is growing at a 15% yearly rate, mostly through surgical systems and disinfection robots in private institutions[16]. Industry estimates indicate that, as implementation costs decline, service sector use, which is currently at 5% penetration, might triple by 2027 [17].

Three essential standardization pillars need to be given top priority to sustain this growth while controlling related risks. First, safety procedures need to be in line with international standards like IEC 80601 for medical devices and ISO 10218 for industrial robots. Second, SANS/ISO 9283 should be incorporated into performance benchmarks to assess robotic systems in local operating environments. Third, sector-specific frameworks must be developed, such as regulations for agricultural drones through Department of Agriculture, Forestry and Fisheries (DAFF) initiatives and mining robotics through the South African National Roads Agency Limited (SANRAL) collaborations [18].

Standardization directly addresses key adoption barriers, with 42% of manufacturers identifying unclear safety standards as a primary deployment concern [15]. Conversely, healthcare providers experience 30% faster regulatory approval for CE/ISO-certified robotic solutions (SAHPRA data). The economic potential is substantial, robust standardization frameworks could deliver 40% faster ROI in manufacturing and unlock R2.1 billion in service robotics revenue by 2025 [18], positioning South Africa for sustainable technological advancement.

THE ESSENTIAL ROLE OF STANDARDIZATION IN THE ROBOTICS INDUSTRY

To ensure safety, dependability, and interoperability, standardization and conformity assessment have become crucial due to the rapid progress of robotics across several sectors. By addressing several important aspects of technology deployment, these frameworks form the foundation of appropriate robotics integration. Above all, standardization is essential for safety and risk reduction, especially as more and more robots coexist in workspaces alongside human operators. Well-known standards like ISO 13482 for service robots and ISO 10218 for industrial robots offer thorough instructions for human-robot cooperation, including essential safety precautions, emergency stop systems, and methodical risk assessment processes [18]. These precautions are essential for eliminating accidents at work and the expensive liabilities that may result from system failures or accidental operations.

The function of conformity assessments in ensuring dependability and performance is equally significant. These assessments, which employ stringent testing procedures, confirm that robotic systems satisfy precise technical requirements and can operate reliably in a range of environmental circumstances, from extremely high temperatures to large load capacities. In precision-dependent applications like surgical robotics or automotive manufacturing, where a robotic arm may execute thousands of welds with micro-level accuracy, standardized performance benchmarks guarantee that the technology fulfills its intended function while reducing downtime and maintenance needs.

The interoperability and integration of robotic systems represent another crucial area addressed by standardization. As modern robotics increasingly interact with existing industrial machinery, sophisticated software platforms, and IoT networks, standards like Open Platform Communications Unified Architecture (OPC UA) and Robot Operating Systems industrial (ROS), provide the necessary frameworks for seamless cross-platform compatibility.

This interoperability prevents vendor lock-in and enables more flexible, future-proof automation solutions. From a commercial perspective, standardization directly facilitates market adoption and regulatory compliance. Certification requirements such as CE marking Europe, FCC certification in the United States of America, and NRCS approval in South Africa serve as gatekeepers to global markets. The absence of such certifications can significantly delay or even prevent market entry, as exemplified by medical robots that cannot achieve commercialization without IEC 60601 compliance.

Standardization fosters long-term innovation and scalability by offering a solid basis for research and development, in addition to these immediate advantages. Standards let businesses concentrate their resources on developing advanced capabilities like machine vision and artificial intelligence instead of rewriting basic frameworks by creating uniform safety and performance baselines. This strategy also makes it possible to scale internationally more effectively because standardized solutions may be more readily modified for other markets without requiring significant redesign. The standardization environment does, however, still face several challenges, such as the need to set ethical rules for delicate applications like law enforcement and eldercare, integrate various international standards to lower trade barriers, and keep up with AI-driven robotics innovations.

HOW STANDARDIZATION CAN ACCELERATE SOUTH AFRICA'S ROBOTICS INDUSTRY

The robotics sector in South Africa is at a pivotal point in its development, with enormous potential to boost productivity, stimulate economic expansion, and solve socioeconomic issues. However, scaling up adoption requires a robust standards framework to overcome key barriers. Here's how standardization can catalyze growth while ensuring safety, interoperability, and performance:

Safety: Building Trust in Human-Robot Collaboration

In safety-critical sectors like mining and agriculture, the adoption of international standards such as ISO 10218 for industrial robots and ISO/TS 15066 for collaborative robots must be complemented by localized SANS adaptations addressing unique environmental factors like dust, water exposure, and rugged terrain. Mandating risk assessments aligned with South Africa's Occupational Health and Safety

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Act will build essential trust in human-robot collaboration while reducing workplace injuries.

Interoperability: Breaking Down Silos

The interoperability challenge posed by fragmented systems across mining, automotive, and healthcare sectors requires implementation of Open Platform Communications Unified Architecture (OPC UA) standards for industrial robotics integration and promotion of Robot Operating System (ROS), Industrial in academic Research and Development (R&D) to nurture local innovation. Alignment with IEEE 2660 for AI ethics will further ensure global compatibility, decreasing integration costs and attracting multinational investments.

Performance: Ensuring Reliability in Local Conditions

For reliable performance under South Africa's challenging conditions, including load-shedding and extreme heat, developing SANS performance benchmarks for power resilience and environmental tolerance is crucial, along with Department of Agriculture, Forestry and Fisheries certification for agricultural drones. These measures will enhance Return on Investment (ROI) through reduced maintenance costs and improved durability.

REGULATORY COMPLIANCE

Streamlining regulatory compliance through fast-tracked National Regulator for compulsory specifications (NRCS) approvals for medical (IEC 60601) and service robots (ISO 18646), additionally establishing more local SANAS-accredited testing labs, will accelerate market access, particularly benefiting Small Medium Enterprises (SMEs).

INCLUSIVE GROWTH

Addressing workforce concerns requires integrating robotics standards into TVET curriculums and certifying technicians through Quality Council for Trades and Occupations (QCTO), using ISO 29993 guidelines, transforming job displacement fears into skills development opportunities.

THE IMPACT OF STANDARDIZATION IN THE ROBOTICS SECTOR ON THE SOUTH AFRICAN ECONOMY

In South Africa, industrial efficiency, economic growth, and worldwide competitiveness are all significantly influenced by robotics standardization. Standardization positions South Africa as a leader in Industry 4.0 innovation throughout Africa by providing precise technical and safety the requirements that facilitate the faster, safer, and more economical adoption of robotics by local industry. The main financial advantages of standardizing robotics are as follows:

Boosts Manufacturing Competitiveness

Significant financial benefits are provided by the deployment of standardized robotics systems throughout South Africa's industrial environment. Manufacturers can increase assembly line speeds by 20–40% [19] and obtain significant productivity gains by implementing locally tailored SANS specifications and internationally recognized standards like ISO 10218 [18]. As demonstrated by the 15% reduction in rework costs achieved by major automakers like BMW and VW South Africa using compliant robotic systems, this efficiency gain is accompanied by notable quality improvements [19]. Most significantly, standardization promotes homegrown technical advancement, lowering dependency on costly imports and promoting local manufacturing of robotic solutions like Automated Guided Vehicles (AGVs), which are built in South Africa.

Enhance Export Potential

Global market access is made possible by standardization, which also enables South African robotic devices to satisfy strict ISO, IEC, and EU regulations. As evidenced by a Cape Town robotics company that secured R50 million in European contracts after certifying their collaborative robots under ISO 13482 [20], this compliance competence directly transfers into commercial success.

Attracts Foreign Direct Investment

With international companies such as ABB and Siemens exhibiting greater trust in South African businesses that adhere to strict safety requirements, the economic benefit is further amplified through the attraction of foreign direct investment. In Special Economic Zones like the Tshwane Automotive Hub, where SANS-compliant robotic systems have contributed to the attraction of R3.2 billion in foreign direct investment, this effect is especially noticeable [21].

Creates Jobs & Upskills Workforce

In addition to alleviating South Africa's skills shortfall, the workforce revolution brought about by robotics standardization generates significant job prospects. With programs like MERSETA's training programs qualifying over 5,000 individuals annually in robotics maintenance, the increasing use of standardized systems creates a demand for automation engineers and robot technicians who are QCTO-certified. In addition to creating jobs, standardization lowers costs across businesses in quantifiable ways [22].

Reduces Costs & Risks

While energy efficiency standards like SANS 204 assist manufacturers in reducing robotic power consumption by 10-15%, mining firms that use SANS-certified drones claim 30% savings on liability insurance premiums [23], offering vital respite despite South Africa's energy woes. These advantages put robotics standardization in a strong position to stimulate economic expansion and industrial innovation [24].

CONCLUSION

In summary, an invisible framework supporting safety, technical harmony, and globalization is formed through standardization. Collaborative standards will be essential as sectors develop further in tackling common global issues, such as climate action and the moral application of AI, guaranteeing a more interconnected and sustainable future.

Standards and conformity assessments are more than just administrative impediments; they are effective enablers of trust, productivity, and robotics innovation. Strategic standardization is becoming more and more important as industry develops at a staggering rate in order to develop automation solutions that are safe, scalable, and economically viable, ultimately unlocking robots' revolutionary potential on a global scale.

To fully utilize Industry 4.0 in South Africa, standards must be viewed and applied differently, moving from being optional suggestions to becoming essential forces for advancement. Through strict enforcement of standards centered on safety procedures, smooth interoperability, and performance tailored to regional operating conditions, South Africa has the potential to unleash revolutionary technological and economic advantages.

The International Data Corporation (IDC) estimates that by 2030, this standards-driven strategy may make over R8.5 billion in robotics revenue and position the country as Africa's leading center for robotic innovation [25]. Crucially, by limiting the concentration of gains and minimizing potential disruptions, such standardization guarantees that the benefits of adopting new technologies, from higher productivity to the creation of new jobs, are dispersed fairly throughout all facets of society.

This strategic emphasis on robust, inclusive standards frameworks will be crucial in securing South Africa's competitive position in the Fourth Industrial. wn

REFERENCES

Getting back on track

- RESTORING RELIABILITY IN GAUTENG'S RAIL NETWORK TAKES INFRASTRUCTURE AND WORKFORCE INVESTMENT

Gauteng's rail network has the potential to transform how people move across the province. Reliable passenger rail can connect communities, unlock economic opportunities and make daily commuting faster, safer and more predictable. Restoring the rail system will create a foundation for sustainable urban mobility, reducing congestion and emissions, and supporting long-term growth for the region. However, achieving this vision requires skilled workers that are essential to operating, maintaining, and managing the network effectively.

By Jacques Maritz
National Sales & Service Manager
Quyn International Outsourcing

Here, Temporary Employment Service (TES) providers can be key partners on the workforce frontline, ready to provide access to trained and vetted personnel who can be rapidly deployed for critical projects while supporting ongoing skills development. Only by embedding workforce development into the rail revitalisation programme, can Gauteng ensure that every infrastructure improvement delivers lasting value for the region.

TRACKING THE DECLINE OF PASSENGER RAIL IN GAUTENG

Passenger rail in Gauteng has faced significant challenges over the past ten years. The Gautrain carried approximately 13.9 million passengers in 2019/20, but by 2023/24 ridership had dropped to 7.9 million, a loss of 5 million commuters. Metrorail Gauteng has also seen steep declines, with daily train usage for work trips falling from 12.9% in 2013 to 3.2% in 2020.

Infrastructure failures, theft, and vandalism contributed to the loss of 574 million passenger journeys since 2019, while nationally PRASA lost around 80% of its commuter base between 2011 and 2021. This decline has placed strain on road infrastructure, increased commuting costs, and limited access to reliable transport. Restoring Gauteng's rail network is an urgent priority with far-reaching benefits for commuters and the wider economy.

THE NEXT CHAPTER FOR GAUTENG RAIL

PRASA is behind a bold programme to restore and modernise Gauteng's rail network. Key initiatives include repairing damaged lines and substations, upgrading signalling and telecommunications, renewing rolling stock, and implementing advanced safety systems such as C4ISTAR.

Projects will focus on critical corridors, including the Pretoria–Johannesburg line, while flagship stations will be upgraded and better connected to other transport options to make commuting easier.

This revitalisation programme aims to boost passenger trips, grow commercial revenue to R1.2 billion, and position South Africa as a train manufacturing hub through the Gibela factory. These investments will only succeed if skilled professionals are available to operate, maintain, and manage the network. Workforce development is therefore just as important as rebuilding the infrastructure.

FAST-TRACKING SKILLS FOR RAIL RESTORATION

Rebuilding Gauteng's rail network requires both skilled workers and strategic workforce support. TES providers can meet this need by sourcing talent from adjacent industries: electrical technicians can pivot to rail electrification, steelworkers bring welding and fabrication skills, and construction professionals assist with civil projects.

Short-term bridging programmes can help these workers transition their skills quickly, while recruitment campaigns can highlight rail as a long-term career path.

On the workforce enablement side, TES providers give the rail operator direct access to trained personnel on demand, scale teams to meet project timelines, and drive knowledge transfer across staff. By managing these aspects, TES providers reduce the operator's administrative load, minimise delays, and maintain consistent operational capacity.

Combined with competitive compensation, mentorship, and flexible work arrangements, this approach ensures Gauteng has the skilled, adaptable workforce needed to support a modern rail system.

BUILDING A FUTURE RAIL NETWORK

The success of Gauteng's rail system hinges on preparing the workforce for tomorrow. Emerging technologies like smart signalling, automation, and real-time monitoring demand skills in digital literacy, data analysis, and problem-solving.

By partnering with universities and TVET colleges, establishing clear career pathways, and investing in continuous learning, Gauteng can build a sustainable talent pipeline.

Restoring the rail network offers an opportunity to transform public transport in the City of Gold. With PRASA's infrastructure programme and a strategic focus on workforce development,

Gauteng can create a system that is safe, reliable, and future-ready; all while creating jobs, reducing road congestion, increasing commuter confidence, and driving long-term economic growth. wn

OPINION

Data Centres Face a Cooling Crisis as AI Demand Surges

Artificial intelligence is advancing not only industries but also the physical infrastructure that powers the digital economy.

By: Dean Wolson
General Manager - Africa - Lenovo Infrastructure

According to the International Energy Agency (IEA), inside a modern data centre, electricity is consumed across four main areas: storage systems (5%), networking equipment (5%), uninterruptible power supplies and backup generation (minimal, but critical for reliability), and cooling systems. It's that last category that stands out. Depending on efficiency, cooling alone can consume anywhere from 7% in advanced hyperscale sites to over 30% in smaller or less-optimised enterprise facilities.

As AI workloads drive unprecedented power densities, with racks drawing 20–100kW or more, cooling shifts from a supporting role to a frontline constraint. For South Africa and much of Africa, this is magnified by high ambient temperatures, a historically unstable grid, and rapid growth in cloud and AI infrastructure. While the continent's per-capita data centre electricity use remains below 1 kWh per person today, it is projected to double by the end of the decade, with South Africa leading the surge in demand as the hub for hyperscalers and sovereign AI projects.

This is the thermal tipping point: air cooling, once good enough, can no longer scale to handle the energy intensity of AI's future, particularly in Africa's climate and grid context.

AIR COOLING HAS REACHED ITS LIMIT

Air cooling has been the industry default for decades because it's simple and cheap at low power densities. But when rack power draw jumps into the tens or hundreds of kilowatts, as AI-optimised racks do, air becomes inefficient: the temperature delta required gets larger, fans and CRAC units consume more power, and thermal throttling risks increase. Research and market analysis across 2023–2025 show an industry pivot toward liquid cooling, direct-to-chip or immersion, because liquid moves heat far more efficiently than air and reduces total facility PUE (power usage effectiveness).

Air-cooled systems can support up to approximately 70 kilowatts per rack in the data centre, but hit a physical limit when it comes to removing heat, known as 'specific heat capacity.' Beyond this, operators need to look at alternative cooling methods.

Adding to the complexity is the rise in demand for AI workloads across every industry, requiring five times the amount of power. The industry is now seeing a shift from chips operating at 120 watts to 600 watts or more.

Africa and South Africa: A Smaller footprint today, but fast growth ahead
Per-capita data centre electricity consumption in Africa remains low today, the IEA notes. Africa had less than 1 kWh per person of data centre electricity consumption in 2024, but is expected to roughly double toward the end of the decade as cloud adoption, hyperscaler investments, and sovereign AI projects scale up. Market research firms place Africa data centre power and cooling markets as high-growth segments in 2024–2025, signalling rapid investment but also rising on-site power demand.

South Africa is the regional leader in capacity and the obvious hub for hyperscaler and local large-scale deployments. Yet its grid has long operational constraints: coal still supplies the majority of electricity, and historically unstable supply (load-shedding) and rising peak demand have been persistent issues, though there were signals of improvement in 2024–2025; the structural challenges remain.

This combination of rising local demand from data centres, heat-intensified cooling loads, and a constrained, carbon-intensive grid is why the cooling question is particularly acute in South Africa.

THE CLIMATE: HOTTER AMBIENT TEMPERATURES REDUCE AIR COOLING EFFECTIVENESS

Higher ambient temperatures mean air cooling must work harder. In warm climates common across much of sub-Saharan Africa, the capacity margin available to dissipate high-density AI heat loads using air is much smaller than in temperate zones.

That raises two problems. Higher operational costs, which means more fan and compressor energy, and a higher probability of hitting physical thermal limits that force performance throttling or prevent deployments altogether. Ember's 2024–2025 electricity reviews show heatwaves already boosting residential A/C demand, meaning data centre cooling will compete more directly with other priority electricity uses.

WHAT SCALABLE ALTERNATIVES AND MITIGATIONS LOOK LIKE

To avoid hitting the thermal tipping point, Africa's data centre industry will need a mix of innovations and policy support. The first is liquid cooling adoption, whether direct-to-chip or immersion, which has been proven to reduce cooling energy and enable far higher rack densities, essential for AI-heavy facilities. Second, operators must embrace on-site generation and co-located renewables, especially solar plus battery systems, which can ease peak grid loads and provide resilience against outages, a strategy that aligns with Africa's accelerating solar boom.

A third opportunity is waste-heat reuse and district heating, which captures and exports server heat to improve overall efficiency, though practical deployment depends on local infrastructure. Fourth, governments should prioritise regulatory and power-market reforms: predictable tariffs, streamlined permits for on-site generation, and demand-response mechanisms can lower risk and unlock investment, as highlighted in OECD policy reviews.

Finally, Africa may need a hybrid edge vs. centralised model, distributing smaller edge sites for latency-sensitive services while building a few high-capacity, liquid-cooled hubs in locations with abundant low-carbon power, stronger grid capacity, or naturally cooler climates.

RISKS IF NOTHING CHANGES

If the industry continues to rely on air cooling while AI workloads densify, three outcomes are likely to occur. Data centre PUEs will rise sharply in hot regions, making Africa a higher-cost location; projects may face repeated curtailments or throttling during heatwaves and peak grid stress; and lastly, the continent may miss economic opportunities tied to AI infrastructure.

Think cloud revenue, developer ecosystems, and skills development. Research warns that while Africa's absolute consumption is small today, its growth rate is what will stress local systems over the next 3–7 years.

PRACTICAL NEXT STEPS FOR SOUTH AFRICA AND AFRICAN STAKEHOLDERS

For South Africa and the wider continent, the practical next steps are clear. Policymakers and industry should incentivise pilot liquid-cooled AI hubs through grants or targeted tax measures to de-risk early adopters, while also accelerating approvals for hybrid power-plus-storage systems so data centres can integrate dedicated solar and battery solutions.

Building partnerships between data centres and utilities will be key to securing firm capacity agreements and co-investing in grid reinforcement around strategic hubs. At the same time, regulators should publish transparent energy and water benchmarks for data centre projects, enabling evidence-based planning and accountability.

Taken together, these actions will help ensure that the "thermal tipping point" does not become a ceiling on Africa's digital ambitions. wn

OPINION

As EV adoption turbocharges, is our grid ready?

TECHNOLOGICAL, AUTOMOTIVE AND ENERGY DEVELOPMENTS ARE SPEEDING AHEAD – PERHAPS FASTER THAN ANYONE EXPECTED

South Africa's energy and mobility sectors are converging in transformative ways. Electric vehicles (EVs) have become more widely available, and CleanTechnica reported that local EV sales increased by 35% from 2023 to 2024. However, this promising growth is overshadowed by a familiar challenge: the country's fragile, overburdened national electricity grid.

By: Dr Patrick Narbel,
Chief Technology Officer at GoSolr

Can our electricity system support this electrified future? Not without assistance. The solution involves not just increasing capacity, but also rethinking it entirely. South Africa's National Development Plan 2030 aims to establish an energy sector that fosters economic growth, job creation, and environmental sustainability through a diversified energy mix. In this context, solar energy isn't merely an alternative; it is rapidly becoming central to the country's energy transformation strategy. Consequently, it is increasingly emerging not as a backup but as a viable solution for South Africa's energy future.

OUR GRID – A SYSTEM UNDER STRAIN

Our national grid is under immense pressure, and our energy crisis is widely acknowledged. Decades of underinvestment, reliance on coal, entrenched corruption, and maintenance backlogs have left the country vulnerable to widespread load shedding, load reduction, unforeseen power outages, and system inefficiencies. This has a ripple effect on industries, with energy insecurity becoming a major obstacle to economic competitiveness. According to Stats SA, the country struggles with electricity availability that rarely improves, raising concerns over energy reliability and economic stability. Figures indicate a 2.5% decline in electricity generation in early 2025 alone, highlighting the broader systemic strain.

Globally, EV sales are forecasted to surpass 20 million this year. This figure has increased by 35% year-on-year, according to the latest edition of the IEA's annual Global EV Outlook, driven by government incentives, manufacturing innovation, and declining battery prices. Locally, the potential appears equally optimistic, with the government's draft Electric Vehicles White Paper establishing a foundation for EV industrialisation and infrastructure development. It details investment objectives and policy frameworks aimed at establishing South Africa as a hub for EV manufacturing. However, it also recognises the risk of further grid instability if new approaches to energy generation and distribution are not adopted.

EVs require electricity. Experiences from other countries show that users tend to charge their vehicles at home and at work, reserving fast charging stations for long-distance journeys. At home, a user can charge a vehicle using a standard plug, which takes between 6 and 10 hours to fully charge from empty, depending on the model. A user can upgrade to a dedicated EV charger, which normally draws between 3.7 and 11 kw. For comparison, charging your car with an 11 kW charger can significantly reduce the time needed for a full charge, but it is equivalent to running 11 swimming pool pumps simultaneously.

It's easy to jump to alarmist conclusions. Imagine 100,000 EVs being plugged in as their owners arrive home from work - that's 100,000 x 11 kW, or 1.1 GW added to the evening peak. For Eskom, this means ramping up power plants faster (which is far from ideal) and dealing with higher peaks. Existing substations would also come under increased strain. It doesn't take much imagination for this kind of narrative to hit the headlines with dramatic titles like "EVs will collapse SA's electricity infrastructure" and worse.

BUT IS IT TRUE?

Although this scenario is possible, it doesn't have to unfold that way. Not all EVs will charge simultaneously. After all, we don't fill up with petrol every day, so why assume we'll charge EVs daily? Moreover, while EVs are relatively new in South Africa, the technology itself is mature and offers built-in flexibility.

The real requirement is a full battery before the next journey, not immediately upon arriving home. Most vehicles are parked for over 20 hours daily, providing ample opportunity to move charging to off-peak times when the national grid capacity is underused.

This shift doesn't raise peak demand; it helps smooth it out. By increasing off-peak usage, we can better utilise existing infrastructure and distribute fixed costs across more kilowatt-hours, eventually lowering the unit cost of electricity.

Smart tariffs are essential for promoting this behaviour. Time-of-use pricing with higher rates during peak periods and lower rates off-peak can influence EV owners to charge when it's most efficient and affordable. (In short: don't charge your EV at 6 pm if you want to avoid high costs.)

WHAT ABOUT SOLAR?

One of the main features of electric vehicles (EVs) is that they operate on electricity. In South Africa, however, our electricity grid remains heavily reliant on coal, which means charging an EV with coal-fired power could increase a user's carbon footprint. The solution? Clean electrons from renewable sources like solar PV.

International experience demonstrates that EV owners are more inclined to invest in solar installations. Charging an EV at a workplace equipped with solar PV ensures energy use aligns with solar generation, maximising the use of clean power when it's most plentiful. That's a definite advantage. At home, excess solar energy can be stored in the EV's battery for use at night or during the next day's commute.

A tech-savvy thinker might even go further, imagining a world where EVs help stabilise the grid by discharging power during peaks or local shortfalls. However, realising this requires regulatory changes to enable EVs to become part of the energy system. Smart, adaptable tariffs are also crucial, encouraging behaviours that cut system-wide costs while ensuring vulnerable users are not unfairly impacted (for example, by making time-of-use tariffs optional).

Of course, challenges will persist, especially in rural areas where local infrastructure may struggle to cope with increased demand. However, the potential is evident: with the right incentives, planning, and improvements, EVs can be part of the solution, not the problem.

In South Africa, the National Association of Automobile Manufacturers of South Africa reports that sales of new energy vehicles, including hybrids, plug-in hybrids, and fully electric vehicles, accounted for only 1.45% of total vehicle sales in 2023, significantly below the global average of over 20% for pure electric vehicles. This slower adoption locally has been linked to high initial costs, import duties, limited charging infrastructure, and concerns about their driving range.

Yet, the tide is turning, and the complementarity with solar energy means we can look forward to the future. Long considered a supplementary power option, solar is increasingly becoming essential to infrastructure, especially in rural and remote areas of South Africa where extending the national grid is impractical. The country has long enjoyed some of the highest solar irradiance in the world, and paired with falls in battery costs, solar can be integrated with energy storage to provide a resilient, clean, and decentralised power source to keep EVs running even when the grid cannot. Furthermore,

OPINION

Why Financial Wellbeing should be part ofthe Mental Health Conversation

October brings two important reminders. It is Mental Health Awareness Month in South Africa, beginning with World Financial Planning Day on 1 October.

By Zihaad Israfil
CEO of CFI Financial Group South Africa

The link between the two cannot be ignored. Money concerns do not stay on a spreadsheet. They show up in our sleep, our relationships, and our confidence. The good news is that small, steady financial habits can restore a sense of control, which is the foundation of calmer decision-making.

"Financial stress often feels like uncertainty. You are unsure what is going out and are uncertain about what is coming in next month. Additionally, you are unsure what would happen if the car breaks down or you are faced with an unexpected medical bill. That uncertainty creates pressure. It is hard to think long-term when you are putting out fires every week. I have observed that when people regain visibility and control over their cash flow, their stress levels tend to decrease. They do not feel 'rich', but they feel more comfortable. That is the goal.

FINANCIAL SELF-CARE

"When we say 'budget', many people hear 'restriction.' I think of it as self-care. A simple plan for your money is a plan for your well-being. It protects your attention from constant worry and your future from avoidable shocks. Start with three questions: What do I earn, what do I spend, and what can I set aside every month with confidence? If those answers live only in your head, write them down.

FIVE SMALL PRACTICES THAT LOWER MONEY STRESS

1. Do a weekly money check-in. Fifteen minutes every day at the same time. Look at your balances, upcoming debits, and any unplanned spend. Close the loop quickly.
2. Track what matters for one month. You do not need a perfect system. A notes app or simple spreadsheet will do. The point is to gain awareness of your finances.
3. Set one near-term cushion. Aim for a small emergency buffer, even if it starts at a few hundred rand. Momentum matters more than size at the start.
4. Tidy your accounts. Rename an account "School Fees 2026" or "Home Deposit". Having such focus reduces the temptation of impulse purchases. Automate small transfers on the day you are paid.
5. Make a debt plan. Choose a method you can stick to, regardless of whether you pay the smallest balance first or the one with the highest interest.

WHEN YOU ARE READY TO INVEST

"Investing or trading should build on that base. It is not a shortcut, and it certainly is not a gamble. Begin by learning how markets move and how risk works. If you are curious about trading, practise first. A demo environment lets you test ideas, learn a platform, and build confidence without risking money. When you do go live, use simple rules you can stick to. For instance, risk a small, defined percentage per trade, use stop losses, and keep a written plan so emotions do not make the decisions for you.

"Tools help, but people help more. Some of the best breakthroughs I have seen happen when someone asks a

real question and gets a clear answer in plain language. That is why we put so much emphasis on education and human support. Our aim at CFI is to be a partner, not just a platform. We keep the technology intuitive and secure so it fits your level, and we back it with multilingual learning, market explainers, and specialists who can point you in the right direction when you get stuck.

"Everyone deserves the peace of mind that comes from feeling in control of their money. Removing barriers to participation is part of that. Lowering costs, reducing jargon, and offering opportunities to learn before risking capital all help first-time investors and traders find their footing. Financial literacy is not a nice-to-have but a form of care for yourself and your family.

A SIMPLE NEXT STEP

"If money has resulted in undue stress for you this year, choose one small change you can keep for the next four weeks. Do the weekly check-in. Rename one account and automate a tiny transfer.

Watch one beginner session and take notes. The aim is progress you can feel. When your money is organised, your mind has room to breathe. That is why budgeting belongs in the mental health conversation, and why steady financial habits are one of the most practical forms of self-care we have." wn

As EV adoption turbocharges, is our grid ready?

continues from page 67

EVs and solar can play a crucial role in making the current infrastructure more resilient.

This shift in solar technology is driven not only by innovation but also by necessity, offering a unique opportunity for South Africans to lessen their dependence on the grid and Eskom. By adopting solar-powered EV charging solutions, we can reduce our energy and transport costs, gain independence from fossil fuels, enhance resilience against power outages, and support a cleaner, more sustainable environment. In areas with frequent power outages—due to cable theft, loadshedding, load reduction, or a combination—smart consumers and commercial businesses have already installed future-proofed rooftop solar and home energy management systems.

The connection between EVs and solar energy is clear and developing in real time. By positioning solar as a vital enabler of electric mobility, South Africa can better manage its energy crisis, speed up EV adoption, and build a stronger energy future that supports the country's aims of economic growth, job creation, and sustainable development.

Ultimately, this concerns more than energy or transportation; it's about safeguarding South Africa's long-term prosperity. wn

OPINION

Smart infrastructure for a sustainable world

- LESSONS FROM TSHWANE'S AUTOMOTIVE CITY

The conversation around infrastructure is no longer just about bricks, steel, and concrete. It is about creating systems that embody equality, resilience, and innovation. These are the three pillars of FIDIC's 2025 theme, 'Smart Infrastructure: Equality, Resilience, and Innovation for a Sustainable World'.

By Chester Kan
Major Project Executive, Zutari

At Zutari, with a legacy of over 90 years across Africa and the Middle East, we know that smart infrastructure is not simply about building, it is about shaping living legacies that uplift communities, catalyse economies, and prepare nations for the future. A powerful example of this is the Tshwane Automotive Special Economic Zone (TASEZ), one of the largest infrastructure programmes ever undertaken in the City of Tshwane.

ENGINEERING AGAINST THE ODDS

Appointed on the eve of South Africa's March 2020 lockdown, Zutari partnered with the Coega Development Corporation (CDC) to provide civil and structural engineering services for TASEZ. The mammoth task was to deliver all enabling bulk infrastructure (Stages 1 to 6) and the first phases of the supplier facilities.

The timing could not have been more challenging. With the global pandemic disrupting traditional workflows, supply chains, and stakeholder engagement, Zutari had to adopt an agile, digitally enabled approach. Virtual collaboration across offices, regions, and organisations became the norm. The stakes were high, as Ford had to launch its new Ranger model on time, or risk moving operations elsewhere.

The project demanded speed without compromising quality. Agile engineering practices and smart digital collaboration tools allowed Zutari and its partners to bypass conventional step-by-step project gates and instead deliver solutions iteratively. This 'digital-first' approach was a watershed moment in how infrastructure could be delivered under pressure.

EQUALITY IN ACTION: LOCAL EMPOWERMENT

Beyond engineering excellence, the project was designed as a catalyst for socio-economic development. Zutari's work supported the creation of 1 131 local jobs, 908 training and development beneficiaries,106 SMMEs delivering 36% of the contract value, and R272 million worth of work packages executed by local businesses.

This was not a token effort. Project conditions required that at least 70% of labour come from neighbouring communities, with deliberate emphasis on employing women, youth, and people with disabilities. Contractors also had to prioritise local skills centres before seeking expertise elsewhere.

Training went beyond technical skills. Accredited courses included business ethics, project management, SHE (Safety, Health and Environment) compliance, and financial literacy. This broadened the impact, creating entrepreneurs, not just employees.

RESILIENCE THROUGH SKILLS AND SYSTEMS

Infrastructure resilience is not only about materials or design. It is also about ensuring that communities around projects gain the skills to thrive long after construction ends.

Through a comprehensive training programme covering trades such as bricklaying, plumbing, carpentry, electrical works, and concrete construction, participants gained marketable skills. Non-technical training in business management and contract administration prepared SMMEs for long-term success.

By embedding resilience at both the structural and socio-economic level, TASEZ exemplified how infrastructure can withstand disruption — not only physical shocks but also economic and social uncertainties.

INNOVATION IN COLLABORATION

The TASEZ project was also a case study in collaborative innovation. Nine separate FIDIC-based contracts had to be executed, with varying degrees of overlap, requiring alignment between Ford, the CDC, government stakeholders, suppliers, and contractors. Zutari's role extended beyond engineering, as we facilitated digital-first project coordination, agile workflows, and knowledge-sharing practices that are now informing other infrastructure projects across the continent.

The successful delivery of TASEZ ensured that Ford's Ranger launch remained in South Africa, securing billions in investment and positioning Tshwane as Africa's first 'Automotive City'. But the deeper legacy lies in the jobs created, skills transferred, and SMMEs uplifted.

At Zutari, we believe that smart infrastructure is not just about solving today's problems. It is about creating platforms for future growth, equity, and resilience. Whether it is a school, a bridge, a stadium, or a special economic zone, infrastructure should be both globally eminent and locally relevant.

The TASEZ project proves that when infrastructure is smart, it does not just connect roads and factories; it connects people to opportunity, communities to prosperity, and nations to possibility. wn

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04/11/2025	Finance Essentials for Engineers
06/11/2025	Block Chain and Money
07/11/2025	Road to Registration for Engineering Candidates
11/11/2025	Webinar: Unlocking Africa's Potential
11/11/2025	Fundamentals of Medium Voltage Protection
12/11/2025	Introduction to 5G Communication Networks
14/11/2025	Professional Registration with ECSA for Mature Candidates
18/11/2025	Fundamentals of Developing Renewable Energy Plants
18/11/2025	Operating Regulations For HV/MV Systems - ORHVS
19/11/2025	Constructions, Regulations from a legal perspective
26/11/2025	Cable Jointing, Termination & Testing

DECEMBER 2025

01/12/2025	2025 SPEC Conference | Wits University
02/12/2025	Anatomy of Wind Turbines
03/12/2025	An Introduction to Artificial Intelligence for Professionals
10/12/2025	Photovoltaic Solar Systems
11/12/2025	Arc Flash

JANUARY 2026

21/01/2026	Project Management for Engineers
27/01/2026	Design Thinking and Innovation for Engineering Professional
28/01/2026	Lightning Protection of Structures, Low Voltage and Signal Systems

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