

wattnow

THE OFFICIAL PUBLICATION OF THE SOUTH AFRICAN INSTITUTE OF ELECTRICAL ENGINEERS



MOTORS & DRIVES

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Dear **wattnow** Reader,

Welcome to the June issue of **wattnow** magazine, where we explore the crucial world of motors and drives, with a special emphasis on rotating machinery. As we address the challenges and innovations within our industry, this edition highlights the remarkable advancements and key players transforming the landscape.

Our first feature article, located on page 26, discusses the importance of balancing motors and drives—not just maintenance—for ensuring longevity.

Vibrations in rotating equipment can indicate potential failure; therefore, their analysis is essential for safe operation. Our second feature article on page 28 highlights key indicators that may suggest a looming failure.

On page 32, we present a timeline and roadmap for Autonomous Vehicles. While early deployments of these vehicles are already on our roads, it has become evident that large-scale rollouts will occur more slowly than previously anticipated.

The July issue will focus on Power, and the deadline for contributions is 13 June. Please send any submissions to minx@saiee.org.za.

Herewith the June issue - enjoy the read!

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Veer Ramnarain
2025/6 SAIEE President

The first calendar month as President of the South African Institute of Electrical Engineers (SAIEE) is almost over. My message at the inauguration was, 'The relevance of our institute will only be appreciated if our members and partners see themselves as growing and contributing to the development of South Africa.'



[E: president@saiee.org.za](mailto:president@saiee.org.za)

Reflecting on My First Month as President of SAIEE: A Journey of Growth and Inspiration!

I spent the first month ensuring the relevance of the SAIEE was felt in various quarters. This will be the task for the next eleven months. As engineering practitioners, we have long been waiting for legislation to empower us to have a voice heard in Executive Boardrooms. Finally, this has become a reality with the introduction of Identification of Engineering Work (IDoEW). The Council for Built Environment (CBE) has implemented the IDoEW, which now gives us the ticket to ensure qualified engineers make engineering decisions. It is now illegal for a non-registered person to lead infrastructure projects. This will positively impact the delivery of projects within scope, budget, and planned timelines, but most importantly, to acceptable quality. This will improve the performance of infrastructure projects in the public sector and reduce fruitless and wasteful expenditures. There is a dual responsibility between the employer and the registered person to ensure that the person appointed to lead infrastructure projects maintains professional registration for the project's duration. With SAIEE being a

recognised Voluntary Association by the Engineering Council of South Africa (ECSA), we must support IDoEW and the position taken by CBE in ensuring that projects are delivered to acceptable engineering standards so that South Africa prosper in the engineering space. It was a proud moment when four members of SAIEE were appointed by the Minister of Public Enterprises to serve on the ECSA 7th Term Council. These members are Thandi Sishi, James Motladiile, Ian McKechnie and TC Madikane - who were elected as the new ECSA President. This new council will serve from 2025 to 2029 and represents a diverse group of Registered Persons, government representatives, public members, Recognised Voluntary Associations, and Higher Education Institutions.

The week spent at Enlit Africa 2025 was hectic but very productive. Much of my involvement in special discussions and as a panellist was in my capacity as the SAIEE President. The participation at these events created the opportunity to showcase how SAIEE can contribute

to the broader energy transformation of South Africa. The interview by ESI Power and Energy journal covered the topics of innovative revenue models for utilities, climate change mitigation and readiness for the digital transition. Being invited as a panellist on municipal challenges created a robust discussion on reengineering the municipal electricity revenue models for sustainability. This session addressed the critical challenge of transforming the electricity business model to enhance municipal finances and achieve a positive balance. There was a special invite to discuss Smart Mobility. I believe SAIEE can play a significant role in designing the Smart Mobility for Electric Vehicles (EVs) in South Africa. Just like in 1909, when the SAIEE played an essential role in developing the railways in South Africa, we now need to play this role in creating this new form of transportation. This will make our members and partners see themselves contributing to South Africa's development. Being invited to a closed session on building trust in municipal-Eskom collaboration allowed SAIEE to have a robust discussion

on this sensitive subject with Eskom executives. It cemented the role of SAIEE and why Eskom must support SAIEE membership. One of the event's highlights was the discussions with various corporate partners and potential corporate partners.

The week concluded with the Presidential visit to the Western Cape Centre, the University of Cape Town (UCT), and CSIR. Discussions with the UCT academic staff allowed us to identify how we can support the university directly or via corporate partners.

We are on our way to reinforcing SAIEE's relevance in South Africa's development. **Wn**



*Veer N. RAMNARAIN - Pr Eng
2025 SAIEE PRESIDENT
BSc Electrical Eng, GCC, Dip EBM, MBA, MFMP*

SAIEE Free State Centre hosted its inaugural meeting



The SAIEE Free State Centre held its inaugural meeting following the SAIEE AGM in April 2025. This meeting was organised to plan events for 2025/2026, including initiatives for its CUT and Moteo Student Chapters. The Free State Central University of Technology generously provided the venue, with Acting Chairman Mr. Motoloki Lephoi and Secretary Ms. Reitumetse Leeuw welcoming the attendees.

The meeting focused on team building, stakeholder relations, and project planning. Key points included the need for collaboration among various colleges and departments, specifically mentioning Goldfields College, Maluti, and Flavius Mareka Campus. Attendees discussed the importance of identifying corporate partners and sponsors, especially within the Department of Education.

Membership applications were a topic of discussion, and a proposal was made to streamline the process through online applications and video tutorials. The chapter also addressed college registrations, the recruitment of new committee members, and upcoming

events, including trimester student registrations and industrial visits to Coca-Cola and other companies.

The importance of utilising social media for public relations was emphasised, along with the value of industry visits for gaining practical experience. Additionally, the need for marketing materials was noted. The meeting concluded with a proposal to increase the frequency of gatherings to enhance networking and problem-solving initiatives.

We eagerly await the next actions of the Free State Centre, which may position them favourably to win the Centre of the Year Award again, as they did in 2023. **wn**



Khanyi Kumalo's EWSETA and AWEaP Journey

- EMPOWERING WOMEN IN ENERGY FOR ECONOMIC GROWTH



South Africa's energy future is being shaped by a new wave of skilled professionals and entrepreneurs, supported by the Energy and Water Sector Education and Training Authority (EWSETA), in collaboration with African Women in Energy and Power (AWEaP) and Wits Business School (WBS). Among these emerging leaders is Khanyi Kumalo, Founder of Green Products Consulting and a graduate of the AWEaP Entrepreneur Master Class, who is driving change by integrating innovative solutions across industries to foster a sustainable energy landscape.

Through the EWSETA-supported programme, Kumalo has refined her business strategy and broadened her vision across various sectors within the green economy. Initially focused on renewable energy and green hydrogen, Kumalo's business has now evolved to incorporate opportunities in waste-to-energy, hydro, gas, and even coal. "This programme pushed me beyond a linear way of thinking. I've learned how to apply my knowledge more broadly and strategically," she says.

One of her key insights came from recognising the potential within the waste sector, an area she had previously overlooked. Inspired by innovators and experts in the programme, Kumalo is preparing to launch a pilot project that will convert organic waste into bioenergy. The initiative is set to be developed in collaboration with municipalities and community stakeholders. The Master Class also introduced her to financial modelling and market analysis, which enabled her to assess new opportunities with greater precision. More than simply technical knowledge, Kumalo credits the programme with providing her the confidence to reimagine the scope and impact of her enterprise.

The AWEaP Entrepreneur Master Class is part of the broader JET Skills Development Programme, which has already supported 60 entrepreneurs. "Khanyi's journey highlights how targeted skills development fosters innovation and economic opportunities," says Mpho Mookapele, CEO of EWSETA.



Khanyi Kumalo

By empowering women like Kumalo, EWSETA and its partners are responding to President Cyril Ramaphosa's call for accelerated energy solutions that create meaningful opportunities for youth and emerging professionals. **Wn**

South Africa's Carbon Tax Overhaul:

UNLOCKING RENEWABLE ENERGY INVESTMENT



South Africa's revamped carbon tax policy, coming into effect in 2026, signals a decisive shift in the country's climate and energy landscape. With stricter emissions thresholds and an expanded scope for carbon offsets, the revised framework is expected to drive significant investment in renewable energy while reshaping how businesses source their electricity.

Alberto Gambacorta, Executive Vice-President for Sub-Saharan Africa at renewable energy firm Scatec, outlines how this policy evolution opens new doors—despite notable hurdles.

A FINANCIAL INCENTIVE FOR CLEANER ENERGY

By making fossil-fuel-based electricity more costly, the updated carbon tax incentivises companies to shift towards cleaner alternatives. "For businesses tied to coal-intensive energy supply chains, investing in renewables is becoming a financial necessity," Gambacorta explains. This economic pressure is increasing the competitiveness of solar, wind, and battery storage technologies, particularly for industrial users.

MAKING USE OF CARBON OFFSETS

The revised policy allows for greater use of carbon offsets, particularly for projects under South Africa's REIPPP (Renewable Energy Independent Power Producer Procurement Programme). However, projects must meet the principle of additionality—demonstrating they would not be viable without the offset mechanism. "That's becoming harder to prove in South Africa, and it gets technical very quickly," Gambacorta cautions.

CONFRONTING GRID CONSTRAINTS

Despite growing demand for clean energy, grid infrastructure remains a major bottleneck. Several REIPPP rounds have faltered due to limited transmission capacity. Yet, there are signs of progress. The government's Independent Transmission Programme

invites private-sector involvement in building 14,000 kilometres of high-voltage lines and hundreds of transformers nationwide.

Storage solutions, particularly battery systems, also present an opportunity. These technologies help balance the grid by storing excess energy generated during peak sunlight hours and releasing it when demand and capacity align.

CORPORATE PROCUREMENT UNDER PRESSURE

The evolving carbon tax is expected to fuel corporate demand for Power Purchase Agreements (PPAs), as companies look to cut emissions and reduce energy costs. This pressure is amplified by international regulations, notably the EU's Carbon Border Adjustment Mechanism (CBAM). "Manufacturers exporting to Europe face punitive tariffs if they rely on coal-based electricity," Gambacorta notes. "Procuring renewable energy is no longer just about sustainability—it's about survival in global markets."

POSITIONING FOR A GREEN HYDROGEN FUTURE

The policy shift also presents a long-term opportunity: green hydrogen. With abundant renewable energy resources and rising global demand, South Africa could become a key player in this emerging sector. Still, Gambacorta warns that competitiveness will depend on overcoming infrastructure and export limitations. "You must be able to produce at the right cost—and have the means to move your product to market."

TURNING POLICY INTO PROGRESS

Instead of introducing further regulation, the focus should be on fully implementing existing frameworks—such as the Electricity Regulation Act and wheeling mechanisms. A national curtailment framework could also allow renewables to be traded more flexibly.

Moreover, municipalities must be better equipped to procure and distribute clean energy. “Only a few are currently capable of acting as effective off-takers,” says Gambacorta.

A CALL FOR COLLABORATION

To unlock the full potential of South Africa’s energy transition, cooperation between government and the private sector is essential. Forums for public-private dialogue are already active, but real progress hinges on translating discussions into delivery—expanding grid capacity, accelerating project execution, and supporting municipal readiness.

“With the right collaboration,” Gambacorta concludes, “South Africa can meet its energy goals and build a more sustainable, inclusive economy.” **wn**



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Cape Town's Solar Youth Project celebrates new graduates – and calls on industry to step up



A new generation of solar professionals is rising in Cape Town. The second cohort of the Solar Youth Project has just completed their intensive 8-week training and is ready to take on the next stage: 10 months of work experience. Meanwhile, the first group of trainees has returned for their final round of assessments, bringing their year-long solar training journey full circle.

Now, the pressure is on to find host companies in the solar industry who are willing to take these ambitious young interns under their wing - and, ideally, into long-term employment.

Developed in partnership between Life Choices and GREEN Solar Academy, the Solar Youth Project is a groundbreaking programme designed to close the gap between South Africa's youth unemployment crisis and the country's desperate need for skilled solar technicians.

"The need for trained talent in the solar sector is enormous - and we're providing it," says Amanda Dzivhani, COO of GREEN Solar Academy. "But unless these young people are absorbed into the workforce, we're only winning half the battle."

Youth training backed by industry excellence

The Solar Youth Project is not a government programme. It's a privately driven initiative - founded on over 20 years of experience in technical education and youth development. The training model is simple but effective: eight weeks of blended technical and soft skills training, followed by a 10-month structured internship with a solar company. The programme culminates in a final round of training and assessment to consolidate the learning and prepare the interns for permanent employment.

Participants, aged 22 to 28, all hold N4-N6 electrical engineering qualifications from TVET colleges and have undergone training aligned with SAIEE (South

African Institute of Electrical Engineers), SAPVIA (South African Photovoltaic Industry) and DGS (Deutsche Gesellschaft für Sonnenenergie) standards. The technical content is built on GREEN Solar Academy's internationally-accredited curriculum.

"These young people have the qualifications, the hands-on training, and the drive," says Vuyo Ntlangu, Impact Pathways Manager at Life Choices. "What they need now is the opportunity to show what they're capable of."

Holistic support for workplace success
What makes the programme unique is its strong emphasis on personal and professional development training and the wrap-around support provided to the youth in the internship phase. Life Choices, a seasoned youth empowerment organisation that operates from its Lansdowne campus, runs this part of the programme, providing youth with the knowledge, tools and resources to be successful in the workplace.

"We're not just creating interns - we're producing well-rounded, work-ready junior solar technicians," says Ryan Geel, Campus Director at Life Choices. "And we're looking for forward-thinking companies to help us turn that training into careers."

A WORKING MODEL IN ACTION

In a country where youth development is often more slogan than solution, the Solar Youth Project stands out as a rare example of action over promises.



"Everyone's talking about youth training - we're doing it," says Antje Klauss-Vorreiter, CEO of GREEN Solar Academy. "And it's happening in Cape Town, at Life Choices' Academy in Lansdowne, where professionals and youth train under the same roof, with the same high standards."

That's a key differentiator. Life Choices Academy in Cape Town is also the implementing partner of GREEN Solar Academy's professional training, one of 13 GREEN academies across Africa. The co-location means that the same trainers who teach professional installers also lead the technical training for the youth, ensuring quality, relevance and consistency.

This academy is also open to professionals looking to upskill through short, accredited courses in PV system design, installation, and compliance.

And it is this same expertise that equips professional installers which is now being channelled into preparing the next generation. This isn't a side project - it's the academy's existing excellence applied with purpose to youth development.

CALL TO THE INDUSTRY: HELP US HIRE THEM

With over 40 youth now trained or in training, the programme's success hinges on one last step: industry absorption. Host companies are asked to offer 10-month internships, provide mentorship, and, ideally, retain interns as full-time employees thereafter.

Interns are already placed in some businesses through the GREENetwork - GREEN's continent-wide alumni and partner platform - but more placements are urgently needed.

Companies interested in participating receive full support from Life Choices and GREEN, including HR templates, mentorship resources, monthly check-ins and PR promotion. Stipends are subsidised by an external donor.

"These young people are skilled, work-ready and excited to prove their worth. What's missing is the bridge to employment. That's where host companies and long-term partnerships can make all the difference," concludes Mignon Hardie, Managing Director at Life Choices. **wn**



Transforming pulp and paper with automation and digitalisation



The pulp and paper industry in South Africa is undergoing a significant transformation from traditional manual processes to embracing automation technologies. Industrial automation systems have evolved over the years, integrating software to measure key metrics that contribute significantly to the pulp and paper manufacturing industry.

*By Arvin Ramjee
Account Manager, ABB Pulp and Paper,
South Africa*

Digital technologies are seamlessly integrated into traditional automation systems, propelling the pulp and paper industry towards autonomous operations. Automation in pulp and paper mills seeks to enhance various production stages, from raw material preparation to the creation of the final product. Employing automation technologies guarantees precision and consistency throughout these processes.

We have observed a shift in the paper industry, characterised by reduced demand for newsprint and graphic paper. However, this has been supplanted by an increase in demand for renewable packaging and tissue. Additionally, there has been a rise in demand for kraft paper, driven by its downstream use as a solution to address sustainability challenges.

The level of automation employed in the pulp and paper industry is quite advanced compared to other key industries. Therefore, the next phase involves exploring digitalisation solutions to enhance the existing automation products and systems, ultimately extracting more value by improving manufacturing efficiency.

Paper manufacturing is one of the most complex industrial processes in existence today. Ensuring visibility of product properties is crucial for minimising rejects and enhancing both repeatability and runnability. By continuously implementing counteractive changes to dynamic process movements and

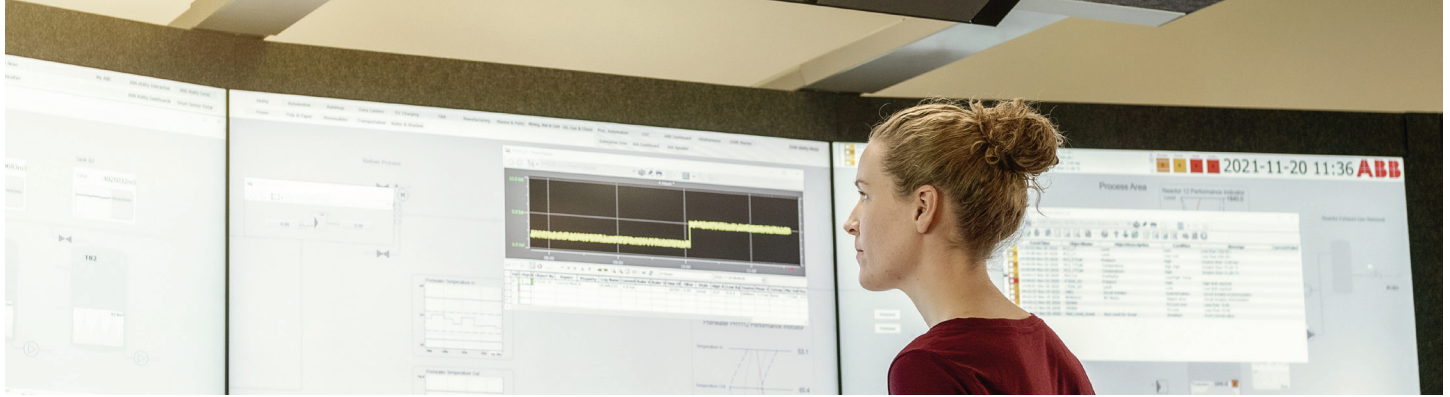
disturbances, quality control systems (QCS) achieve reduced variability and prompt responses to setpoint changes, thus avoiding production losses, lowering emissions, and improving product consistency.

Instead of merely reducing variability, modern QCS facilitate automatic controls to optimise production processes and energy consumption, thereby minimising waste and costs – all while ensuring that the final product meets both internal and external standards.

The pulp and paper industry in South Africa is actively seeking to transition to renewable energy sources in order to reduce reliance on fossil fuels and decrease greenhouse gas emissions. We have observed strategic investments directed towards integrating renewable energy sources into existing manufacturing processes, with a key focus on energy and water, chemical, and carbon management.

Achieving these goals requires innovative technology that increases efficiency within the process while minimising wastage. Automation systems provide enhanced control over energy usage by optimising equipment performance and adjusting processes in response to real-time energy demand.

As a global technology provider with decades of experience in quality control and automation, ABB continues to pioneer its pulp and paper products and solutions, serving as a catalyst for change and addressing sustainability



without compromising process quality and performance.

ABB provides a comprehensive and integrated automation portfolio of products and solutions to support the pulp and paper industry throughout the entire manufacturing process. This includes power distribution and electrification, paper machine drives, distributed control systems (DCS), paper machine QCS, manufacturing execution systems (MES), and ABB Ability™ Collaborative Operations to leverage the industrial Internet of Things (IIoT) and deliver digital solutions to customers.

Paper mills that employ ABB products and solutions can minimise rejects by maintaining product properties within a target range throughout the papermaking process. This is achieved through the ABB Ability™ QMS, which offers measurement and control to decrease variability and consequently production waste. When combined with ABB Ability™ Expert Optimizer for Pulp, operators can further enhance process efficiency and raw material consumption to produce on-spec products, economically and efficiently.

Over time, adaptive APC (Advanced Process Control), together with MPC (Model Predictive Control), simultaneously adjusts multiple variables to achieve the desired output and ideal target range at the wet end of the machine. Staying within this range minimises costs in energy, fibres, and even water and chemicals during the process. Refining is a crucial area where

APC realises savings by reducing energy and fibre costs, also leading to improved properties of the end paper sheet while ensuring low raw material usage.

Latest advances include ABB's tailored MES for pulp and paper, a system that connects and automates processes while providing visibility from shopfloor to enterprise. The idea here is to move one's operations from conventional connectivity towards fully autonomous operations, which can be recognised as smart manufacturing. ABB's process automation portfolio includes updated QCS products to achieve higher resolution for various critical measurements that have a direct impact on product quality.

ABB Ability™ EMS (Energy Management Solution) is an integrated solution incorporating forecasting and optimisation to address the various process demands. It maximises sustainability performance and energy cost-savings by an iterative process of auditing, monitoring, forecasting and optimising energy consumption and supply for the entire manufacturing facility. EMS is helping process industries and manufacturing organisations make data-driven decisions about environmental, financial, and operational cost/benefit trade-offs while working toward achieving carbon neutrality.

Where the pulp and paper industry in South Africa was once facing the challenge of limited availability of expert resources, ABB leverages on the digitally connected world to alleviate

this challenge with its ABB Ability™ Collaborative Operations solution to provide customers access to a global resource pool of subject matter experts who can support operations remotely 24/7.

To address the shortage of expertise, ABB has introduced Visual Remote Support using augmented reality. Having this solution in place opens our customers to a global pool of engineering resources that not only can assist customers on an emergency basis but also assists in commissioning critical projects remotely.

In terms of artificial intelligence (AI) and digitalisation, ABB Ability™ Genix combines industrial analytics and AI in an enterprise-grade digital platform and suite. Genix unlocks the value of contextualised data through IIoT to enhance industrial productivity and operational excellence.

Industrial AI and analytics, combined with IIoT, bring together AI algorithms, machine learning models, and advanced analytics tools to extract actionable insights from massive amounts of industrial data, optimising production and manufacturing processes.

ABB'S END-TO-END SOLUTIONS

for pulp and paper manufacturing support the entire value chain – from the woodyard to shipment and from the mill to the enterprise. Having a comprehensive and integrated portfolio of products and solutions, together with deep industry knowledge that supports the entire pulp and paper process. **wn**

SEW-EURODRIVE Champions Energy Efficiency Across Sectors



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

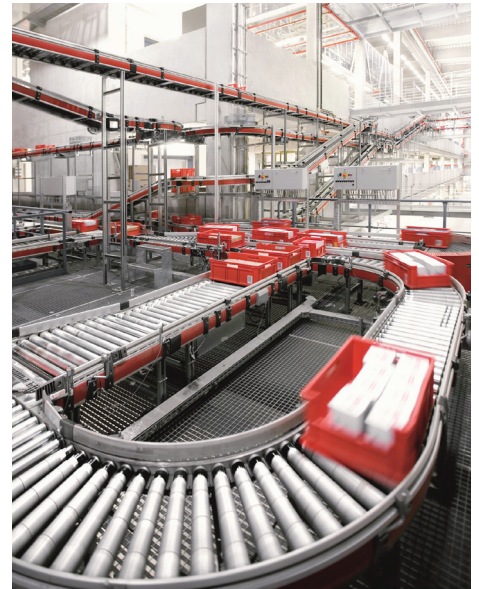
South Africa's adoption of Minimum Energy Performance Standards (MEPS) mandates that all newly imported electric motors meet IE3 premium efficiency levels. SEW-EURODRIVE, however, has long been ahead of this curve, having standardised on IE3 motors more than eight years ago. The company's commitment to sustainability ensured that its customers transitioned to the advanced technology without bearing additional costs.

Willem Strydom, Business Development Electronics Manager at SEW-EURODRIVE South Africa, highlights that several industry sectors have been proactive in shifting towards energy efficiency. Rising electricity prices have driven industry to adopt IE3 motors, with SEW-EURODRIVE estimating that these motors consume 7% to 8% less energy compared to IE1 models. Strydom says that when paired with Variable Speed Drives (VSDs), energy savings can reach up to 15%.

"Energy efficiency not only reduces operational costs but also aligns with companies' decarbonisation goals," says Strydom. "As most electricity in South Africa still comes from coal, reducing consumption directly lowers carbon footprints."

SEW-EURODRIVE supports its customers by conducting on-site energy assessments and product population surveys at no cost. "These evaluations identify inefficiencies, helping companies to plan their transition to IE3 motors strategically and cost-effectively," he says. "The data collected also provides early warnings about potential equipment failures, reducing downtime risks."

To further ease the shift, SEW-EURODRIVE advises customers to prioritise upgrades in motor classes with lower stock levels and balance replacements between larger and smaller motors for maximum impact. VSDs are often recommended to manage peak energy demands, reducing penalties and extending motor lifespans.



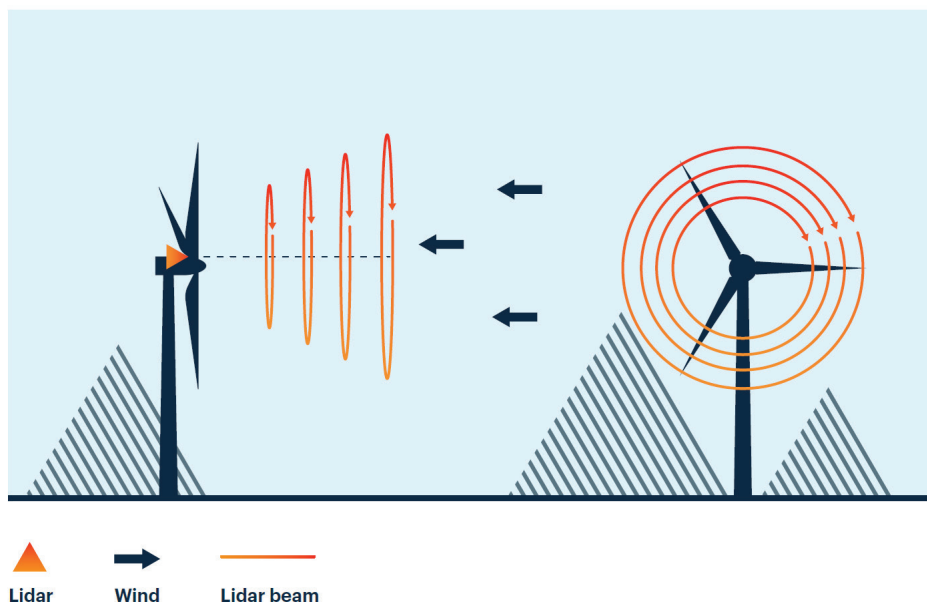
Looking ahead, Strydom believes MEPS will accelerate the adoption of even higher efficiency standards, paving the way for IE4 and IE5 motors.

SEW-EURODRIVE is already leading this innovation with its IE5 synchronous motors, which feature integrated permanent magnet technology and deliver up to 50% lower energy losses compared to IE3 models.

"SEW-EURODRIVE's commitment to advancing energy efficiency is backed by our 300-strong global research and development team," he says. "We are already pioneering IE6 technology, setting new benchmarks in sustainability and performance."

With its forward-thinking approach and robust customer support, SEW-EURODRIVE continues to drive energy efficiency advancements in South Africa, helping industries meet sustainability and cost-saving goals. **wn**

ZX Lidars deploys ZX TM in South Africa, supporting wind farm optimisation



ZX Lidars and Globeleq South Africa Management Services are excited to announce the deployment of a ZX TM wind Lidar at the Klipheuwel Wind Farm in South Africa. This installation aims to provide critical insights into the complex wind conditions that affect turbine performance and maintenance.

The ZX TM wind Lidar will assess approaching wind flow patterns, helping to understand factors that contribute to component degradation. Additionally, the technology will be used for power curve verification and yaw misalignment checks, supporting enhanced operational efficiency and asset longevity.

Chris Slinger, Senior Scientist at ZX Lidars, has been working closely with the local team at Globeleq. Commenting on the project, Chris said: "Our technology delivers precise wind data in real-time, informing optimisations to yield improved performance, reduced component stress, and greater

reliability. The data collected to date has been invaluable, and we look forward to working together with the team as the project progresses."

Nico Lombard, Asset Manager at Globeleq South Africa Management Services, added: "The ZX TM wind Lidar has been operational on this complex site for several months to date, and we are delighted to have already identified some areas for improvement. The ZX TM helps analyse wind shear, turbulence intensity, and directional changes, providing a deeper understanding of wind behaviour at the site. This information is crucial for optimising turbine performance and minimising mechanical stress." **WIN**



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Marthinusen & Coutts rewinding of a 75MVA synchronous generator stator motor

Marthinusen & Coutts (M&C), a division of ACTOM (Pty) Ltd, is BEE accredited and offers full on- and off-site electromechanical services and repairs of power generation equipment, medium and low voltage AC and DC motors, transformers, and coil manufacture, as well as the full range of engineering, testing, diagnostics, balancing, and maintenance services.

In July 2024, M&C completed a one-year project for Sasol to rewind the stator of a 75MVA BBC synchronous generator. According to Dominik Krob, Project Manager at M&C, "This type of generator, especially the generator windings, eventually reaches the end of life and needs to be rewound, which is where we come in.

So instead of replacing the entire machine with a new one, the customer decided to rewind this particular stator." This generator is a critical component of SASOL's power generation system.

"There are several industrial manufacturing plants in South Africa, and the manufacturing industry has suffered severe losses during the load

shedding period in our country. So, many of these manufacturers generate their power in-house to be independent of the grid," Krob added.

With M&C having close working relations with crucial parts suppliers, National Electric Coil, based in the United States, was the likely partner to assist in achieving the tight deadlines on this project.

NEC developed a unique system with individually vacuum-pressure-impregnated (VPI) stator bars and coils, individually wrapped with the NECCOBond-ETM proven insulation system, meeting all national and International Standards.

REPAIRS, MAINTENANCE AND CUSTOMISED MANUFACTURING OF ALL ROTATING MACHINES

COMPLEXITY

While there are numerous stator bar and coil suppliers globally, their quality is not guaranteed. Furthermore, quality issues often reveal themselves only after several years of operation, when it is too late to change suppliers or even claim damages from them.

NEC is one of the very few suppliers that can manufacture individual VPI-stator bars worldwide, and it has been doing so for decades, making it a very reliable and trustworthy technical choice.

TESTING

M&C has its own testing capabilities in their factory, but this stator size requires exceptional (expensive and large) test equipment to perform the optimum tests and guarantee product quality.

For this purpose, M&C has partnerships with specialist local high-voltage test equipment service providers.

The HV Test and its 50kV resonant high-voltage test set are among them. **Wn**

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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**



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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!

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.



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.



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UKZN Student Chapter participated in Careers Expo



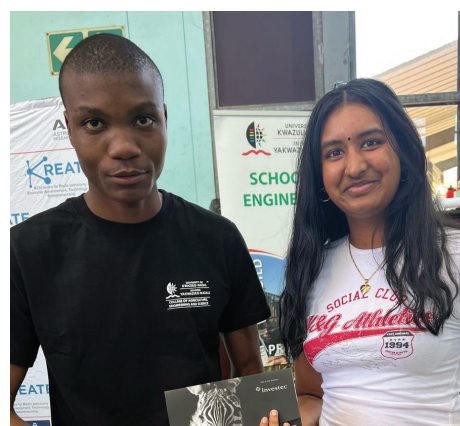
On Saturday, May 24, 2025, the SAIIEE UKZN Student Chapter proudly participated in the Careers Expo at the Nelson Mandela Community Youth Centre in Chatsworth.

Organised by the dedicated team at Dreamcatchers and sponsored by Trans-Med Shipping, the event drew a diverse group of learners, students, graduates, educators, and job seekers, all seeking new opportunities for their futures.

Our team was excited to engage with attendees and share valuable insights into the dynamic fields of electrical, electronic, and computer engineering. It was a rewarding opportunity to connect with future engineers and spark interest in STEM careers.

A highlight of the day was the prize giveaway at our stall! With generous support from Investec, we were thrilled to award gifts to 10 lucky winners who participated in our activities during the event.

Congratulations to all the recipients! Your enthusiasm and engagement helped make the day truly special. We are grateful to everyone who visited our stall and to Investec for their support of this initiative. Here's to building a future powered by knowledge, innovation, and opportunity! **Wn**



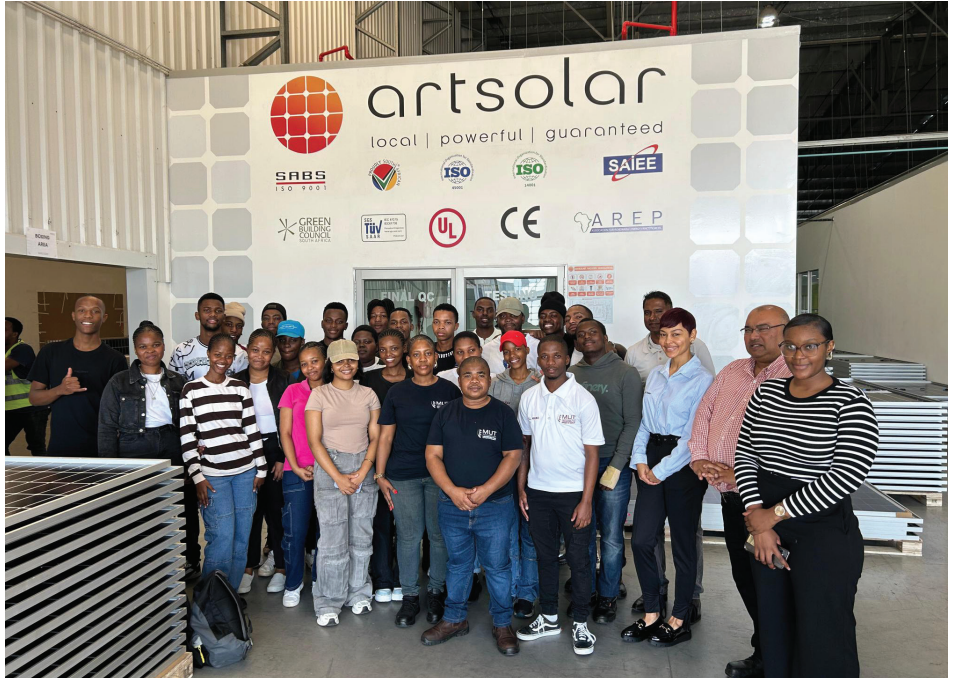
KZN Centre hosted UKZN Student members at ARTsolar



The KZN Centre recently hosted a site visit for SAIEE UKZN student members at ARTsolar, an SAIEE Corporate Partner, in KwaZulu-Natal.

The purpose of this visit was to expose students to advanced photovoltaic (PV) manufacturing technologies and quality control processes within the solar energy sector.

This experience aimed to reinforce the theoretical knowledge gained in courses on renewable energy systems and industrial engineering.



The SAIEE UKZN Student Members waiting in anticipation to learn more from local manufacturer, ARTsolar.

ARTsolar is a 100% South African-owned solar panel manufacturer located in Durban, KwaZulu-Natal. Established in 2010, it is one of the pioneers in the country's photovoltaic industry and the only local manufacturer specialising in high-volume production for utility-scale photovoltaic (PV) farms. Their facility is fully equipped for laminating, testing, and framing PV modules, ensuring comprehensive manufacturing capabilities.

During the visit, students toured ARTsolar's ISO 9001-certified facility and observed the entire solar PV panel production process from start to finish. They also engaged in discussions with plant engineers about local manufacturing challenges, quality standards (including TÜV, UL, and CE certifications), and the potential of South Africa's renewable energy market.

The visit to ARTsolar provided valuable exposure to industry-grade solar technology and quality assurance systems, effectively linking academic theory with practical engineering application. The MUT Department of Electrical Engineering extends its sincere gratitude to KZN SAIEE for organising this enlightening site visit for our students. Their initiative and support were crucial in facilitating this essential industry-academic engagement.

We also thank the team at ARTsolar for their professionalism and hospitality during the visit. **Wn**



IEC Young Professionals Competition

Stand a chance to win an exciting trip to New Delhi, India, and also an opportunity to win a bursary worth R50,000 to pursue a postgraduate degree related to development, application standards, and conformity assessment.



Two Young Professionals have the opportunity to attend the IEC Young Professionals Workshop to be held in conjunction with the IEC General Meeting in New Delhi, India : 15 - 19 September 2025.

INVITATION

South African young professionals, Engineers, Technologists from the Electrotechnical discipline are invited to participate in the 2025 IEC Young Professionals Workshop by writing an essay on the following topic.

TOPIC

"The integration of robots in sectors like manufacturing, healthcare, and service industries in South Africa has the potential to drive significant economic growth and improve the quality of life. However, to ensure that robots are safe, reliable, and effective, clear standards and conformity assessments are crucial. These measures help maintain the quality and reliability of robotic technology, ensuring it meets safety requirements and operates as intended.

What should be the Role of Standards in Scaling-up the Robotics Industry in South Africa: Ensuring Safety, Interoperability, and Performance?"

GUIDELINES

1. Essays must be typed using (Arial,11 point) and should consist of +/- 3500 words (5 - 6 pages excluding the cover sheet provided).
2. Essays must be original and unpublished; plagiarized entries will be rejected.
3. Essays must be written by the entrant; co-authored essays will not be accepted.
4. Copyright of the essay entered will be assigned to the South African Bureau of Standards.

ARE YOU

- A young and dynamic manager, engineer or technician aged between 20 – 35?
- Are you interested in working with or developing standards or conformity assessment schemes?
- Working for a company, business, industry or studying at an institution that uses or benefits from IEC International Standards or conformity assessment systems?
- Wanting to become more involved in IEC-related activities?

WHY ATTEND

- Participate in the only annual workshop dedicated to the next generation of experts and leaders on IEC standardization and conformity assessment activities
- Experience the IEC General Meeting: a key annual event that brings together the IEC technical and management community
- See how international standards are managed and developed by having the opportunity to attend management and technical meetings
- Benefit from increased opportunities to get involved in IEC work after the workshop

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- Exceptional networking opportunities with more than 2 500 international key players
- Build knowledge and expand professional networks
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- Gain prominence and influence in the industry

BENEFITS FOR YOUR COMPANY

- Be ahead of the technological developments in your field
- Help to ensure technology transfer
- Foster a culture of innovation
- Access to world-class experts
- Cultivate long-term involvement in the international arena
- Gain a global perspective on industry challenges and opportunities

ENTRY REQUIREMENTS

1. This competition is only open to South Africans citizens aged between 20 – 35
2. All essay entries must be submitted to iec@sabs.co.za no later than 10th June 2025

FOR MORE INFORMATION

Please contact Mr Johnson Marema at: johnson.marema@sabs.co.za



Universities in South Africa



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Corporate Partners are invited to monthly forum meetings to discuss and brainstorm critical issues in South Africa and find solutions.

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- Assisted Corporate Social Responsibility
- Mentorship
- Offering SAIEE Students Workbased Integrated Learning (WIL)



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 Company Profile](#)

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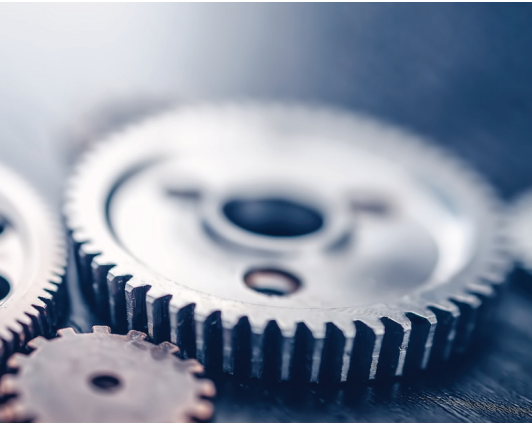
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More than maintenance

- THE CRITICAL ROLE OF BALANCING IN ROTATING EQUIPMENT



Rotating machines—turbines, pumps, fans, and motors—form the backbone of modern industry, driving processes across energy generation, aerospace, pharmaceuticals, and automotive manufacturing.

In an era where precision, efficiency, and reliability define industrial success, the performance of rotating equipment is non-negotiable.

Balancing is more than just a method for controlling vibrations; it is a crucial aspect of rotating machinery maintenance that allows equipment to function optimally. As industries continue to adopt predictive maintenance technologies—such as vibration analysis, real-time condition monitoring, IoT integration, and digital twins—balancing becomes essential for maximising the benefits of these innovations.

UNLOCKING THE BENEFITS WITH BALANCED MACHINERY

Enhanced performance and efficiency
The operation of balanced rotating machinery is characterised by smoother performance, which directly correlates with increased efficiency and productivity. Imbalances in rotating components can induce vibrations that disrupt the machine's functionality, diminishing its overall effectiveness. By ensuring that all components are correctly balanced, one can optimise machinery performance, resulting in improved output and more reliable results.

REDUCED WEAR AND TEAR

Imbalances in rotating machinery generate vibrations that can accelerate the wear and tear of critical components. Elements such as bearings, seals, and other mechanical parts are subject to increased degradation due to continuous stress and movement. By

implementing balancing techniques, one can mitigate vibrations and, in turn, reduce mechanical strain on these components.

LOWER MAINTENANCE COSTS

Balanced machinery is associated with a reduced incidence of mechanical failures, which results in lower maintenance costs. Unbalanced machines typically require more frequent inspections and repairs, thereby elevating operational expenses. By committing to regular balancing practices, organisations can reduce both the frequency and severity of maintenance interventions, resulting in significant cost savings over time.

IMPROVED SAFETY

Safety is a paramount concern in any industrial setting. Unbalanced rotating machines can pose serious safety risks to personnel and equipment. Excessive vibrations can lead to structural damage, potential machine failure, and even catastrophic accidents. By ensuring that your machines are balanced, you enhance the overall safety of your work environment, protecting both your employees and your investment.

ENERGY SAVINGS

Properly balanced rotating machines operate with greater energy efficiency. Unbalanced machines often require increased power consumption, as motors must exert additional effort to compensate for the imbalances. Balanced machines function more effectively, consuming less power and reducing energy costs.



EXTENDED EQUIPMENT LIFE

Maintenance practices heavily influence the longevity of rotating machinery. Balanced machines experience reduced stress and strain, leading to a longer operational lifespan. This maximises the return on investment and ensures that the equipment remains functional for an extended period before it requires replacement.

ENHANCED PRODUCT QUALITY

Balanced rotating machines are crucial for achieving superior product quality in sectors that require precision and consistency, such as manufacturing and food processing. Balanced machinery fosters a stable and reliable production environment, producing higher-quality products.

REDUCED NOISE LEVELS

Imbalances within rotating machinery often result in elevated noise levels, which can negatively impact the work environment. Excessive noise causes discomfort and can also contribute to hearing impairment among employees. Balanced machines operate more quietly, contributing to a more conducive and safer workplace atmosphere.

DRIVING THE FUTURE: BALANCING AS A STRATEGIC ENABLER FOR OPERATIONAL EFFICIENCY

Advanced technologies, including predictive maintenance and digital twins, rely heavily on the accuracy of data collected from machinery and equipment. However, when these systems are imbalanced, the data can become skewed, resulting in inaccurate

insights. Ensuring balance across machinery is essential, as it serves as the foundation for organisations to implement and reap the benefits of advanced technology.

As energy costs continue to rise and concerns about environmental sustainability become more pressing, the importance of balancing becomes even more pronounced. Effective balancing optimises operational efficiency, enabling companies to reduce energy consumption and minimise waste, thereby contributing to their sustainability goals. By adopting these practices, businesses can not only improve their bottom line but also demonstrate their commitment to environmental responsibility.

CONCLUSION

Balancing your rotating machines is not just a maintenance task but an investment in your equipment's efficiency, safety, and longevity. The benefits of balanced machinery are multifaceted, impacting performance, cost, safety, and overall productivity. As industries increasingly embrace predictive maintenance technologies and digital innovations, balancing emerges as a foundational practice to unlock the full potential of these advancements.

By integrating balancing into core maintenance practices, organisations can achieve long-term operational excellence, create safer workplaces, and stay ahead in periods of accelerated disruption. **wn**

Vibrations in rotating equipment

- A KEY INDICATOR OF POTENTIAL FAILURES



Vibrations in rotating equipment can be a sign of impending failure; their analysis is significant for safe operation.

Machine vibration is a fundamental aspect of rotating equipment operation. To understand it in depth, it is necessary to go beyond simple definitions and explore the underlying dynamics, causes, effects, and diagnostic techniques associated with these vibrations.

In the context of rotating equipment, such as turbines, pumps, and engines, vibration arises due to the dynamic forces generated as these machines operate. These forces can cause components to move back and forth or oscillate around their equilibrium positions. The complexity of this motion can vary; it can be a simple, repetitive motion or more chaotic, involving multiple frequencies and directions.

WHAT ARE VIBRATIONS IN ROTATING EQUIPMENT?

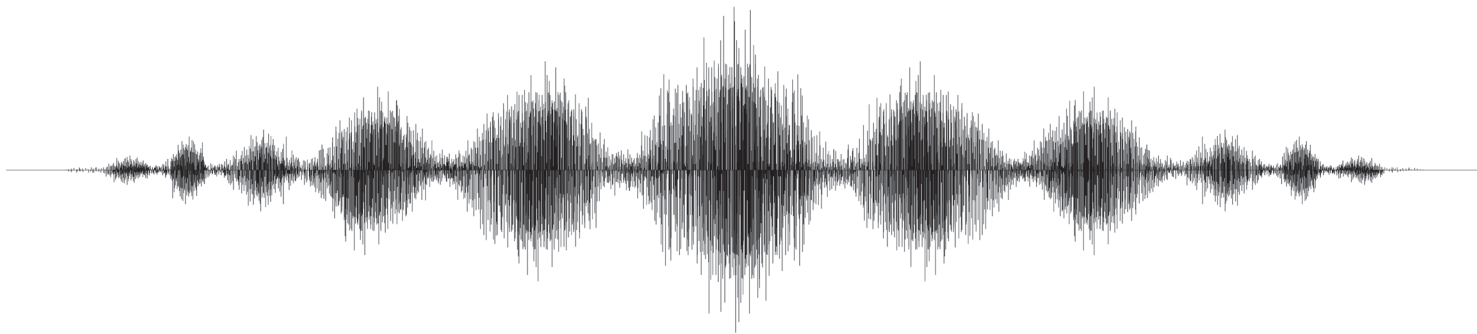
Machine vibration refers to the oscillatory motion of machine components. This phenomenon can manifest in various ways, depending on the nature of the equipment and the forces at play. This vibration can be intentional and serve specific purposes, as in vibratory conveyors, where controlled vibrations facilitate the handling or compaction of materials. More commonly, however, vibration in machines is unintentional and undesirable, often indicating underlying mechanical problems that, if left unchecked, can lead to significant damage or even catastrophic failure.

FUNDAMENTAL CONCEPTS OF VIBRATION:

Resonance, damping, and harmonics

To fully understand the implications of vibration in rotating equipment, it is essential to explore the concepts of resonance, damping, and harmonics. Resonance occurs when the frequency of an external force matches the natural frequency of the machine or its components, leading to a significant increase in vibration amplitude. This can be particularly hazardous in rotating equipment, where resonance can lead to rapid wear or even structural failure. Damping, on the other hand, is the process by which vibratory energy is dissipated, usually through friction or material deformation, which reduces the amplitude of vibrations and protects the machine from damage. Harmonic vibrations are oscillatory movements around an equilibrium point, subjected to a force proportional to the distance from that point, resulting in simple harmonic vibratory motion. A spring that is made to vibrate by a force that moves it away from equilibrium is a good example of harmonic vibration.

Machine vibration can be characterised by several key parameters: amplitude, frequency, and phase. Amplitude refers to the magnitude of the vibration, which can indicate the severity of the problem. Frequency is related to the speed of oscillation and can help identify specific sources of vibration, such as unbalance or misalignment in rotating components. Phase, which describes when the vibration occurs relative to a reference point, is crucial for diagnosing problems related to the interaction between different machine parts.



WHAT IS VIBRATION ANALYSIS?

Vibration analysis is a technique used to monitor and evaluate the condition of machinery and rotating equipment by analysing the data collected from each piece of observed and monitored rotating equipment.

It involves measuring and analysing vibrations to detect anomalies, failures, or signs of wear in machinery components. By examining vibration patterns and frequencies, maintenance professionals gather information about the equipment's condition.

CAUSES OF VIBRATION IN ROTATING EQUIPMENT

The most common causes of vibration in rotating machinery include:

- **Unbalance:** occurs when the centre of mass of a rotating component is not aligned with its axis of rotation, resulting in centrifugal forces and vibration. Unbalance can be due

to manufacturing defects, material buildup, or wear over time.

- **Misalignment:** This occurs when the rotational axes of the connected components are not correctly aligned. Misalignment can be parallel, angular, or a combination of both, resulting in significant vibration and increased wear.
- **Loose or worn parts:** Components such as belts, chains, couplings, or bolts that are loose or worn can cause vibration and noise.
- **Bearing problems:** Bearing problems, including misalignment, lubrication problems or wear, can cause excessive vibration.

UNDERSTANDING VIBRATION ANALYSIS IN ROTATING EQUIPMENT

Vibration analysis is a sophisticated and essential technique in the field of mechanical engineering, particularly when dealing with the complexities of rotating equipment. The term

“vibration” refers to the oscillatory motion experienced by mechanical components during operation. These vibrations can be both a symptom and a cause of various mechanical problems.

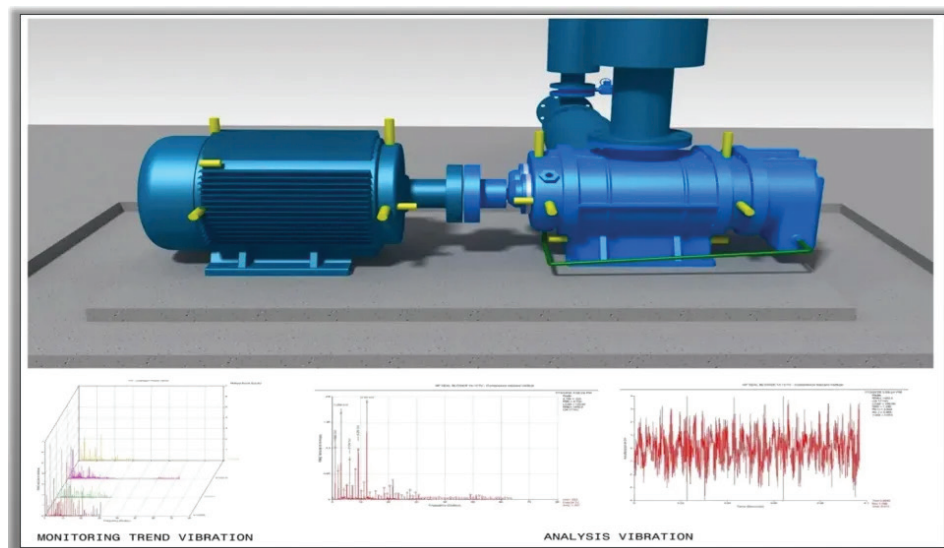
Therefore, studying and analysing these vibrations enables engineers to monitor the mechanical integrity and performance of systems in a non-invasive manner, ensuring they perform as expected.

Modern vibration analysis relies heavily on sensors, which are meticulously integrated into machinery to capture real-time data on the operational status of the equipment. These sensors, often accelerometers, are strategically placed to detect even the slightest vibrations, which are then analysed to identify potential anomalies.

The ability to collect, analyse, and interpret data in real time is what makes vibration analysis such a powerful tool. It enables the detection of problems that may not be visible to the naked eye but can cause significant damage if left unchecked.

THE CRITICAL NEED FOR EARLY DETECTION

One of the primary objectives of vibration analysis on rotating equipment is to detect mechanical problems early. In rotating equipment, anomalies such as unbalance, misalignment, or bearing and bearing failures manifest themselves as changes in vibration patterns. By continuously monitoring



Spectrum of a vibrational analysis on rotating equipment.

these patterns, engineers can identify difficulties long before they cause severe damage or equipment failure. This proactive approach not only helps reduce maintenance costs but also plays a crucial role in ensuring the safety and quality of end products.

ONLINE VIBRATION MONITORING

Online [vibration monitoring](#) has become increasingly crucial in industrial environments, driven by the growing emphasis on predictive maintenance and operational efficiency. One of the most significant trends is the integration of Industry 4.0 principles and Internet of Things (IoT) technologies into vibration monitoring systems (smart sensors).

This integration enables the collection of real-time data from industrial machinery, which is then analysed using advanced algorithms to detect patterns and potential problems before they lead to failures.

COMPUTER-AIDED DESIGN AND SIMULATION

One of the most significant advances in this area is the use of computer-aided design and simulation. With these tools, engineers can create detailed models of machinery and simulate their behaviour under various operating conditions. This simulation process includes dynamic analysis, in which the vibrational characteristics of the design are tested in real-world situations.

For example, [finite element analysis](#) (FEA) is widely used to predict how components will respond to operational stresses, including vibrations. FEA breaks down the structure into small elements, allowing engineers to understand how each part contributes to the overall vibration profile.

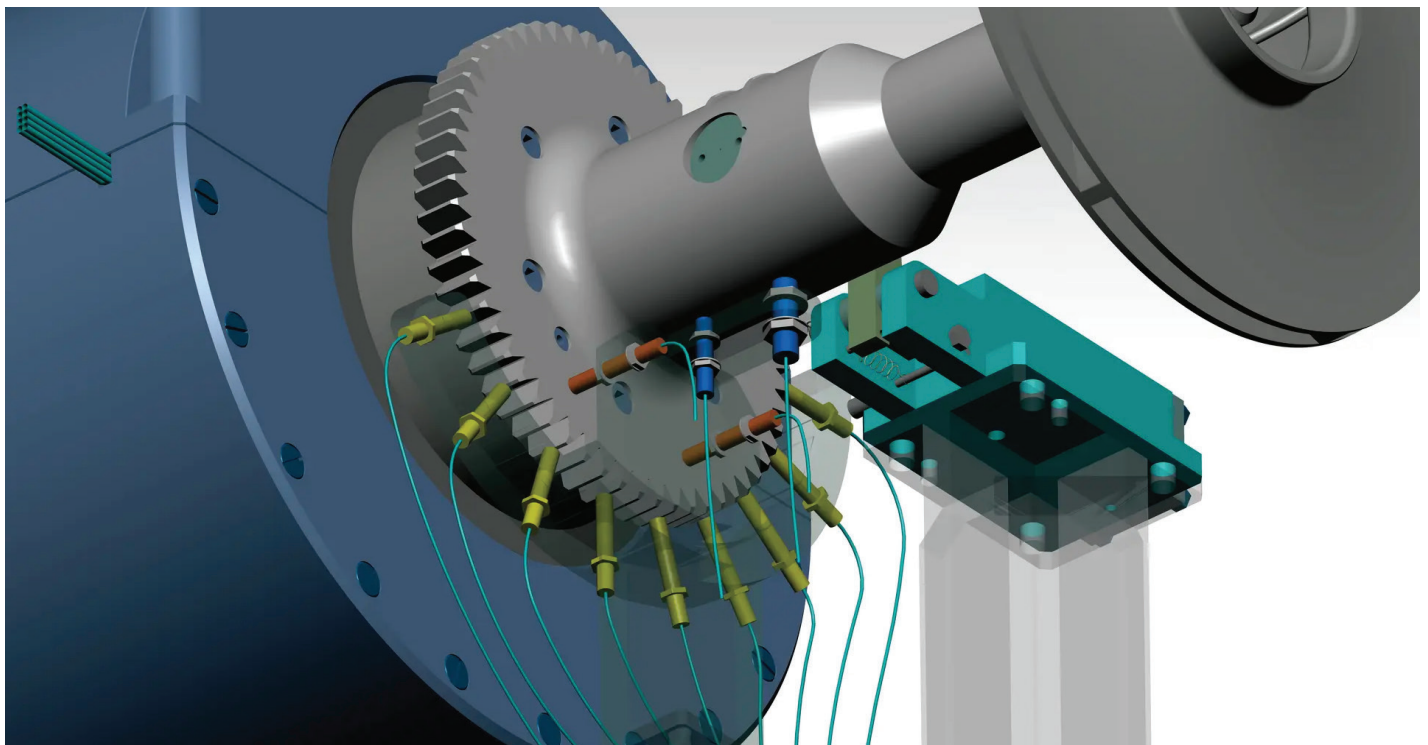
Another key innovation is topological optimisation, which involves designing structures that are inherently more resistant to vibration while meeting

their functional requirements. Topological optimisation algorithms can suggest material distributions within a given design space that minimise vibration while maintaining strength. For example, in rotating machinery, where weight and balance are crucial, topological optimisation can ensure that components are both lightweight and vibration-resistant.

VIBRATION ISOLATION SOLUTIONS

In the past, addressing vibration problems was often a reactive process, with engineers responding to problems after they occurred. However, advances in design techniques and technologies have shifted this paradigm to a more preventative approach. Computer-aided design (CAD) and simulation tools now allow engineers to predict and mitigate vibration problems during the design phase itself.

One of the most significant contributions to vibration mitigation comes from



Turbine with vibration detection system.

materials science. Traditional materials, which have been the backbone of manufacturing for decades, are increasingly being replaced or supplemented by advanced composites and metamaterials.

Advanced composites: these materials are designed by combining two or more constituent materials with different physical or chemical properties. The resulting composite material often exhibits superior vibration-damping characteristics compared to traditional metals or plastics. For example, carbon fibre composites, widely used in the aerospace and automotive industries, offer a high strength-to-weight ratio and excellent vibration absorption properties.

Metamaterials: Taking innovation a step further, metamaterials are artificially structured materials designed to exhibit properties not found in natural substances. These materials can be designed to manipulate waves, including mechanical vibrations, in particular ways. For example, a metamaterial could be designed to redirect vibrational energy away from sensitive components, effectively isolating them from the source of vibration. This specific approach allows unprecedented control over how vibrations propagate through machinery.

VIBRATION ISOLATION SYSTEMS: A STRATEGIC APPROACH

Instead of attempting the often-impossible task of eliminating vibrations, modern engineering has shifted its focus to isolating sensitive components from these vibrations. This strategy is implemented through advanced vibration isolation systems, which can be passive or active.

Passive isolation systems: these systems generally involve the use of damping materials that absorb the

vibrational energy. For example, rubber mounts or specialised damping pads can be placed between the vibrating component of a machine and the rest of the equipment to prevent vibration transmission.

Active control systems are more sophisticated than passive systems, as they utilise sensors and actuators to counteract vibrations in real time. Sensors detect unwanted vibrations, and actuators generate opposing forces to cancel them, similar to noise-cancelling headphones. In extreme cases, technologies such as magnetic or electrostatic levitation can be employed to completely isolate a component from any physical contact with vibrating surfaces.

THE INNOVATION OF ADDITIVE MANUFACTURING

Additive manufacturing, commonly known as 3D printing, has introduced a novel approach to equipment design, particularly in the context of vibration mitigation. Traditional manufacturing techniques often impose significant limitations on the complexity of internal structures within components. However, additive manufacturing breaks these limitations, allowing engineers to design and produce complex internal geometries that were previously impossible.

THE HOLISTIC APPROACH TO VIBRATION MITIGATION

While each of these techniques (advanced materials, isolation systems, and additive manufacturing) offers significant benefits, the most effective vibration mitigation strategies are often holistic in nature. This means that engineers do not rely on a single technique but rather integrate multiple approaches customised to the specific

needs of the equipment and its operating environment.

The old practice, when engineers addressed vibration problems reactively, often after the equipment was already in use. This could involve making post-production modifications or operational adjustments, which could be costly and less effective.

However, with the advent of these advanced design techniques and materials, engineers can now address potential vibration issues during the design phase. This proactive approach not only leads to better-performing equipment but also extends its operational life and reduces the need for maintenance.

CONCLUSIONS

In conclusion, the study of mechanical vibration in rotating equipment is not just about identifying problems; it is about understanding the underlying mechanics that drive these vibrations and using this knowledge to design better, more reliable machinery. As technology continues to evolve, the tools and techniques available to engineers for vibration analysis and mitigation will become increasingly sophisticated, making this an exciting and constantly changing field of study.

Recent advances in materials science, isolation systems, and manufacturing technologies have fundamentally transformed the way engineers approach vibration mitigation in manufacturing equipment.

By addressing these issues at the root during the design phase, we can now produce machinery that is not only more stable and accurate but also more durable and requires less maintenance.

Autonomous Vehicles

- TIMELINE AND ROADMAP AHEAD



Early deployments of autonomous vehicles are already on the roads. However, it is becoming apparent that large-scale rollout will be slower than once anticipated.

While previous and even some current forecasts state that autonomous vehicles will be widely adopted during the 2020s, the analyses of this white paper suggest mainstream deployment will be slower than that given the many challenges and inherent technological, regulatory and economic complexities.

Despite this, the rationale for AV adoption remains compelling, driven by substantial potential benefits including enhanced safety, improved efficiency and lower costs. This white paper provides a refined forecast for deployment and identifies key remaining gaps and actions for accelerating that deployment safely. It explores three main use cases: personal vehicles, robotaxis and autonomous trucks. The key insights on each of these are as follows:

- While personal vehicles will progressively transition toward higher levels of automation, L2 and L2+ systems will dominate this use case for the next decade due to their cost-effectiveness and regulatory readiness. L3 adoption will remain limited due to safety risks, liability concerns and high costs, and L4 deployment will be niche during this timeframe: only around 4% of new personal cars sold by 2035 are expected to feature L4 capabilities. China is forecast to adopt L2+ and L3/L4 vehicles most quickly, driven by strong consumer demand, a regulatory push and an ecosystem that encourages innovation. (See Box 1 for an explanation of the levels of automation.)
- Robotaxis have already demonstrated technological feasibility, with large-scale deployments running in selected US and Chinese cities. However, the high costs of software development, infrastructure set-up and scaling continue to slow deployment. By 2035, robotaxis are likely to be present in large numbers across

40 to 80 cities globally, mostly in China and the United States. Until at least 2030, Europe is expected to remain cautious about the rollout of robotaxis. Europe is likely to prioritize small, controlled pilots and focus on integrating roboshuttles with public transport systems instead. Large-scale robotaxi (and roboshuttle) deployments will lead to modal shifts, affecting not only taxi and traditional ride-hailing but also personal car and public transport use.

- Autonomous trucking presents a strong case for autonomy. Compared to traditional trucking, it introduces a new value proposition that goes beyond advantages in efficiency and total cost of ownership. Several companies have started commercial operations, and 2025 is expected to be an important year for autonomous trucking deployments. Among the different use-cases, hub-to-hub trucking has the most promise for automation. The United States is expected to lead adoption for this use case: it is projected that autonomous trucks will account for up to 30% of new truck sales in the US by 2035. In Europe, international borders pose challenges for long-haul applications, and China's weaker cost benefits may limit deployment unless policy interventions accelerate progress.

The forecasts in this white paper aim to account for expected developments. However, technological breakthroughs, such as the successful deployment



of map-free and vision-only L3/L4 systems, or massive additional funding injections could significantly accelerate adoption beyond these projections.

To further speed up the deployment of vehicle autonomy, the industry needs to keep working on five different fronts. First, bring the public on board by communicating consistent messages and building consumer trust. Second, continue leveraging advances in technology, including AI and cybersecurity breakthroughs, to tackle the current shortcoming surrounding safety, usability and scalability. Third, develop sustainable business models that foster long-term viability. Fourth, co-create regulations to help policymakers better understand the progress and readiness of vehicle automation technology. And, finally, collaborate within and across industries to better facilitate large-scale deployments.

INTRODUCTION

Autonomous vehicles move beyond initial hype and disillusionment towards real-world deployment.

Until very recently, forecasts stated that autonomous vehicles would be everywhere in the 2020s. However, it is now evident that technological, regulatory and economic challenges mean adoption will happen more gradually.

Despite the difficulties, the rationale for AVs remains strong, driven by potential safety and efficiency benefits, among others. Road safety remains one of the most pressing concerns in global transport, and advanced driver assistance and autonomous driving (ADAS/AD) could help reduce the 1.2 million road fatalities that occur each year. The many efficiency gains include achieving higher vehicle utilization rates through reduced idle time and maximized vehicle loads. These advantages apply to both passenger transport, through ride pooling, and goods transport, through optimized freight movement. Better transport options may also spur a shift away from personal vehicle dependence, leading to a more sustainable mobility system.

This white paper aims to shed light on the evolving vehicle autonomy timeline between now and 2035 across three key use cases: personal vehicles, robotaxis and autonomous trucks (see Figure 1). Special-purpose vehicles operating in enclosed facilities, such as those for mining or agriculture, are also highly suited for automation but fall outside of the scope of this white paper.

The forecasts developed here are based on analysis grounded in five key dimensions:

1. Consumer trust and interest
2. Projected ADAS/AD prices and

- consumers' willingness to pay
3. Technological obstacles and the timeframe for overcoming them
4. Current regulatory status and anticipated regulatory developments
5. Ecosystem developments to support scaling

While the first two dimensions help determine the potential demand, the last three concern the potential supply. These dimensions also form the basis of the actions outlined in this paper to safely scale vehicle autonomy.

The forecasts in this white paper aim to account for expected progress. However, technological breakthroughs, such as the successful deployment of map-free and vision-only L3/L4 systems, or massive additional funding injections could significantly accelerate adoption beyond these projections. See Figure 1.

ASSISTED, AUTOMATED AND AUTONOMOUS PERSONAL VEHICLES

Personal vehicles represent the largest AV market segment by volume. This means that automation advances in this area are crucial for improving road safety and enhancing travel convenience. However, vehicle automation in personal vehicles is an incremental evolution rather than a disruptive revolution. While many projections have long stated driverless vehicles are imminent, this white paper finds that, over the next

	Focus of this whitepaper			
	 Personal vehicles	 Robotaxis and roboshuttles	 Autonomous trucks	 Special purpose autonomous vehicles
Expected benefits	– Increase road safety by reducing human error – Enhance convenience during travel	– Enhance the flexibility of public transport – Reduce operational costs and improve accessibility	– Address critical driver shortages – Increase efficiency and flexibility with 24/7 uptime	– Improve safety in hazardous environments – Enhance efficiency for specialized tasks
Ownership	Privately owned or leased	Fleet providers own and operate	Fleet providers own and operate	Specialist firms own and operate
Tech level*	Gradual development from ADAS (L0-L2+) to AD (L3/L4)	Autonomy-first system development (L4)	Autonomy-first system development (L4)	Autonomy-first system development (L4)
Domain	Highway, suburban and urban	Suburban and urban	Highway and suburban	Special environments

FIGURE 1: Comparative overview of the four main vehicle autonomy segments.

decade, personal vehicles will benefit primarily from advanced assistance features rather than autonomy. Detailed expectations for the uptake of each level between 2023 and 2035 are shown in Figure 2. As well as personal cars, Figure 2 also shows the share of L4 robotaxis.

FORECASTS FOR THE UPTAKE OF EACH AUTOMATION LEVEL

Assisted driving technologies, particularly at L2 and L2+ levels, are expected to be the most dominant technologies in new cars sold in 2030 and beyond. This is due to broad market availability, low regulatory hurdles and lower system costs than for L3/L4. As a result, drivers of most new cars will still be required to keep their hands on the steering wheel and their eyes on the road long after 2035. The transition from L2 to L2+ will also be gradual, with L2 systems staying more popular during the upcoming decade. This is primarily due to cost constraints: while L2 systems are currently available for less than \$700, L2+ systems can cost up to \$3,000.

L3 vehicles – where liability moves from the driver to the system, yet the driver

still needs to be able to regain control in a short timeframe if required – will remain a transitional offering rather than a long-term solution (aside from specific use cases such as valet parking or traffic jams).

There are four key constraints limiting the widespread adoption of L3 vehicles that are also beyond the timeline considered in this whitepaper:

- 1. Safety risks:** at L3, drivers are required to retake control within around 10 seconds, creating potential safety concerns in real-world conditions.
- 2. Liability concerns:** the shift from driver responsibility to OEM liability, with the related issue of determining who was driving, makes manufacturers hesitant to scale L3 in public environments.
- 3. High costs:** L3 requires a similar tech stack to L4, leading to nearly identical system costs that typically range from \$7,000 to \$10,000.
- 4. Limited value:** consumers might expect full autonomy, but they are not allowed to fully disengage as they may be required to take over quickly.

For these reasons, many OEMs continue to prioritize L2/L2+ advancements over L3, meaning that by 2035 and potentially beyond, L3 vehicles will still constitute only a small fraction of sales.

For personal vehicles, L4 autonomy remains significantly constrained by both technical and regulatory barriers. At L4, if the vehicle operates within its defined ODD, the driver is entirely uninvolved, and the vehicle can bring itself to a safe stop if required. Only 4% of vehicles sold in 2035 are expected to feature L4 capabilities, reflecting the slow and selective deployment of true autonomous technology in this arena. In addition, given the additional operational challenges in urban settings, some of these capabilities will only be available for highway environments. Furthermore, in urban settings, fleet-based models, such as robotaxi services, may prevail over private ownership in the longer term.

Finally, there are still expected to be a significant number of new vehicles with L0 and L1 technologies by 2035. The features of these technologies are also

becoming increasingly commoditized, with many countries mandating basic safety features, such as lane-keeping assistance and automatic emergency braking. L1 systems, however, struggle to deliver a compelling value proposition: they are a similar cost to L2 systems but offer significantly less functionality. As such, much of the L0 market share is

projected to shift directly to L2 over time, bypassing L1 systems altogether.

Supplementing the data represented in Figure 2, Figure 3 summarizes the sensitivity analysis carried out across the five key dimensions underlying the forecast. Technological progress, driven by possible breakthroughs in AI, sensors

and computing power, offers the strongest potential for accelerating the rollout of AVs. Yet even if this technology leap was fully realized, L4 technologies would still only be present in a modest 7.5% of new car sales by 2035. In terms of the limits to uptake, the risk of unfavourable regulation is likely to be the biggest barrier. Such regulations could

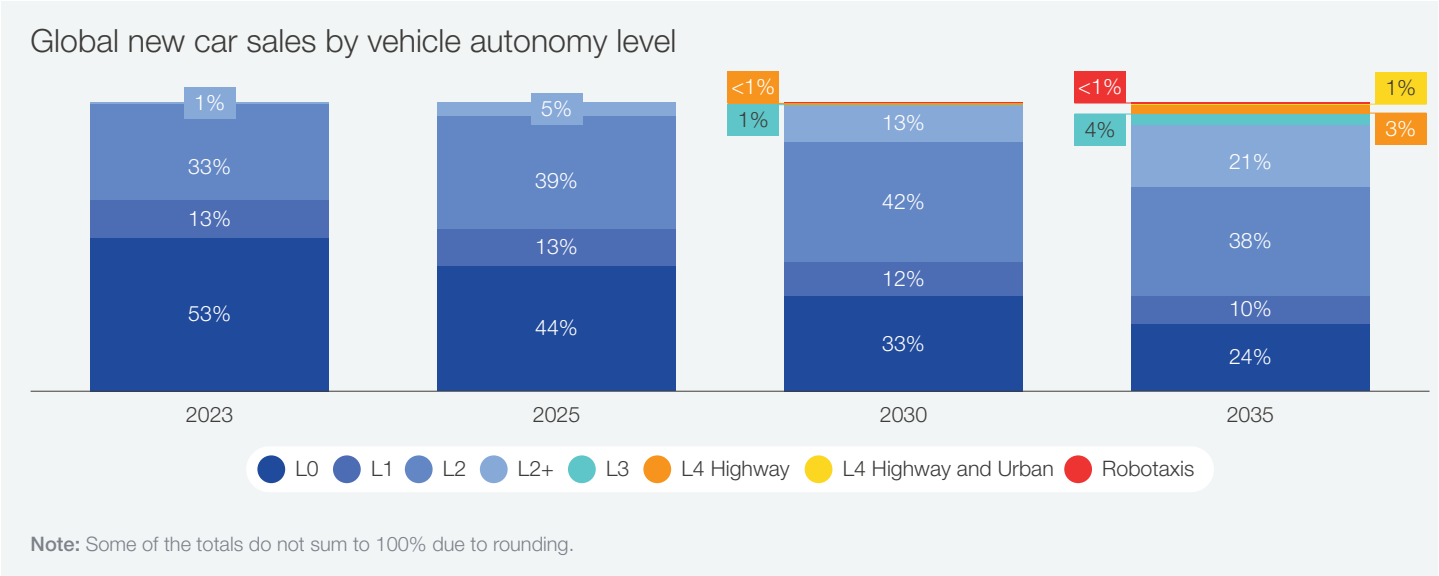


FIGURE 2: Passenger car ADAS/AD forecast.

	Dimension	Major factors that could influence L4 car sales by 2035	Percentage point change of L4 new car sales by 2035 from the base scenario of 4% (see Figure 2)	
Demand	Consumer trust and interest	⌌ Easy-to-use deployments with positive media coverage increase demand ⌌ High-profile accidents negatively impact public trust	-2.0	+1.0
	Pricing and willingness to pay	⌌ Intense competition (incl. price wars) drives availability of cost-efficient solutions ⌌ Prices remain high due to component shortages and non-scalable solutions	-1.0	+0.5
Supply	Technological maturity	⌌ Technological breakthroughs enable earlier, more scalable L4 deployments ⌌ Key ODDs remain unresolved, and scalability continues to be limited	-3.0	+3.5
	Regulatory developments	⌌ Governments support AVs for technological leadership, safety and efficiency ⌌ Regulators limit deployment due to major incidents	-3.5	+1.5
	Ecosystem readiness	⌌ AV solutions scale globally across automakers, standardizing tech ⌌ Poor coordination and weak business cases hinder progress	-2.0	+2.0

FIGURE 3: Sensitivity analysis of the passenger car forecast.

New car sales by vehicle autonomy level

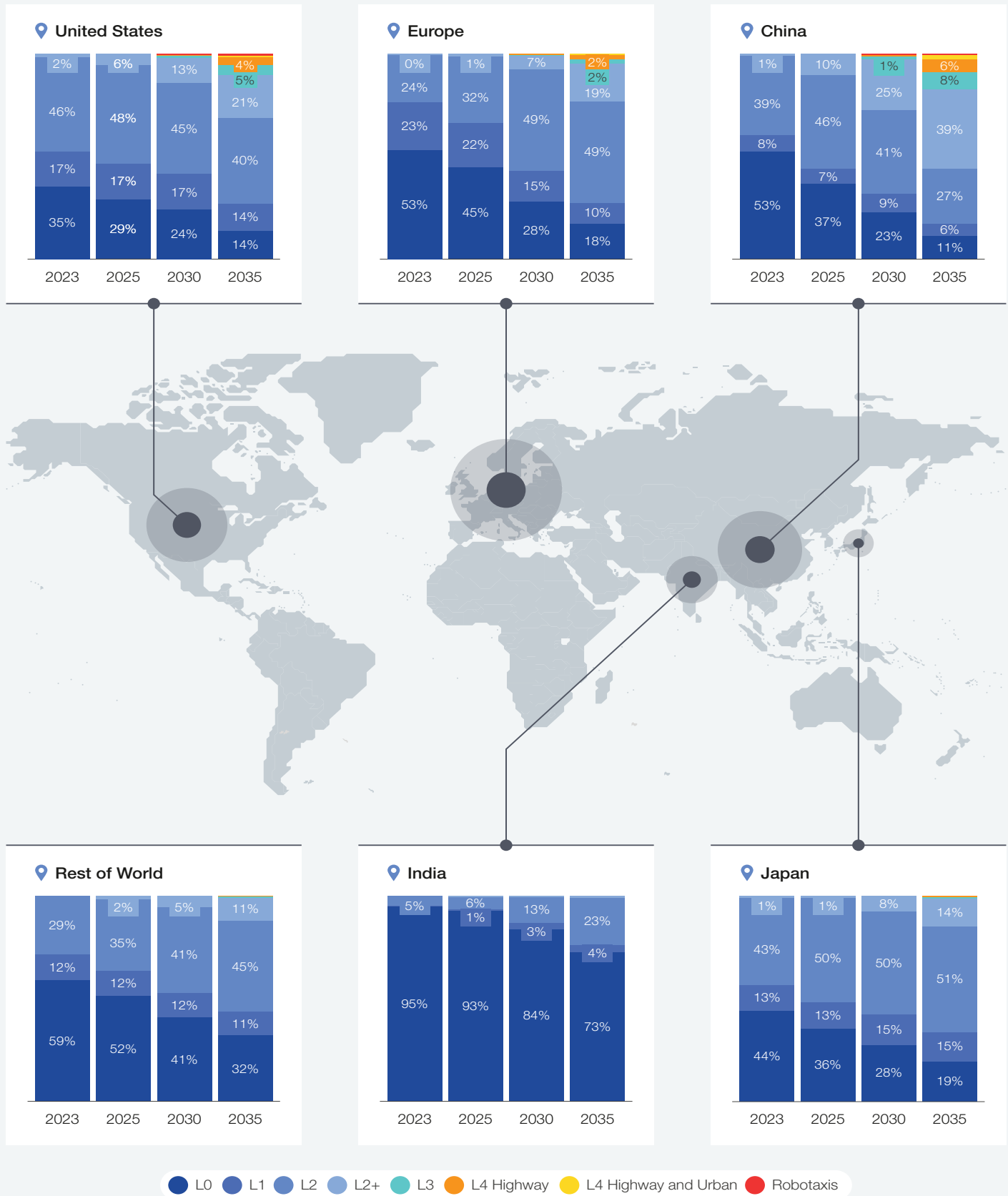


FIGURE 4: Passenger car ADAS/AD forecast by region.

be enacted if major, negative incidents involving L4 technologies occurred, thereby underlining the importance of industry collaboration to ensure the safety of these technologies.

ROBOTAXIS AND ROBOSHUTTLES

Robotaxis and roboshuttles have the potential to revolutionize urban mobility. The ongoing large-scale deployments of autonomous taxis have proved self-driving fleets to be technologically feasible: in the United States, robotaxi firms have completed millions of paid rides without safety drivers, and Chinese firms have deployed hundreds of robotaxis in cities such as Wuhan. However, scaling these operations remains a significant challenge due to city-specific regulatory approvals, variations in driving environments and other operational complexities.

In addition, the investment and operations required are fundamentally different from personal vehicle ADAS/AD, prompting several leading OEMs to exit the space and refocus on ADAS/AD exclusively.

While both robotaxis and roboshuttles share many of the previously discussed benefits and challenges, the forecasts in this white paper focus solely on robotaxis as they are expected to be more widely deployed over the coming decade.

Taking into account the array of potential outcomes and adoption speeds, fleets of robotaxis are expected to operate at large scale in 40 to 80 cities by 2035 (see Figure 5). Entering and expanding a city market requires such substantial time and investment that it will constrain supply until at least 2030.

The high cost of technology is another major barrier. Developing the right AI algorithms demands billions in R&D, while mapping and adapting software for each city's unique driving environment adds complexity. Ensuring safety and reliability through the use of expensive systems such as lidar (light detection and ranging) sensors ratchets up the costs even further. Scaling fleets also demands extensive physical infrastructure, including depots, maintenance hubs and high-speed

connectivity. Operators must establish systems to clean, maintain and charge hundreds or thousands of vehicles daily, all of which build out the expenditure and slow down the speed to market.

Expansion is expected to vary considerably across regions. Based on current trajectories, it is no surprise that China and the United States are forecasted to dominate the deployment of robotaxis in cities. Europe is expected to be the next biggest market, but these deployments are likely to have a stronger focus on roboshuttles that complement public transport networks. The Middle East is also emerging as an early adopter, but the number of cities suitable for mass deployment remains limited at present.

Introducing robotaxis to urban areas may significantly impact citizens' choice of transportation. Modal shifts are likely to go beyond changes in the use of traditional taxi and ride-hailing services to also impact public transport and private car use. This may have a knock-on effect for private vehicle

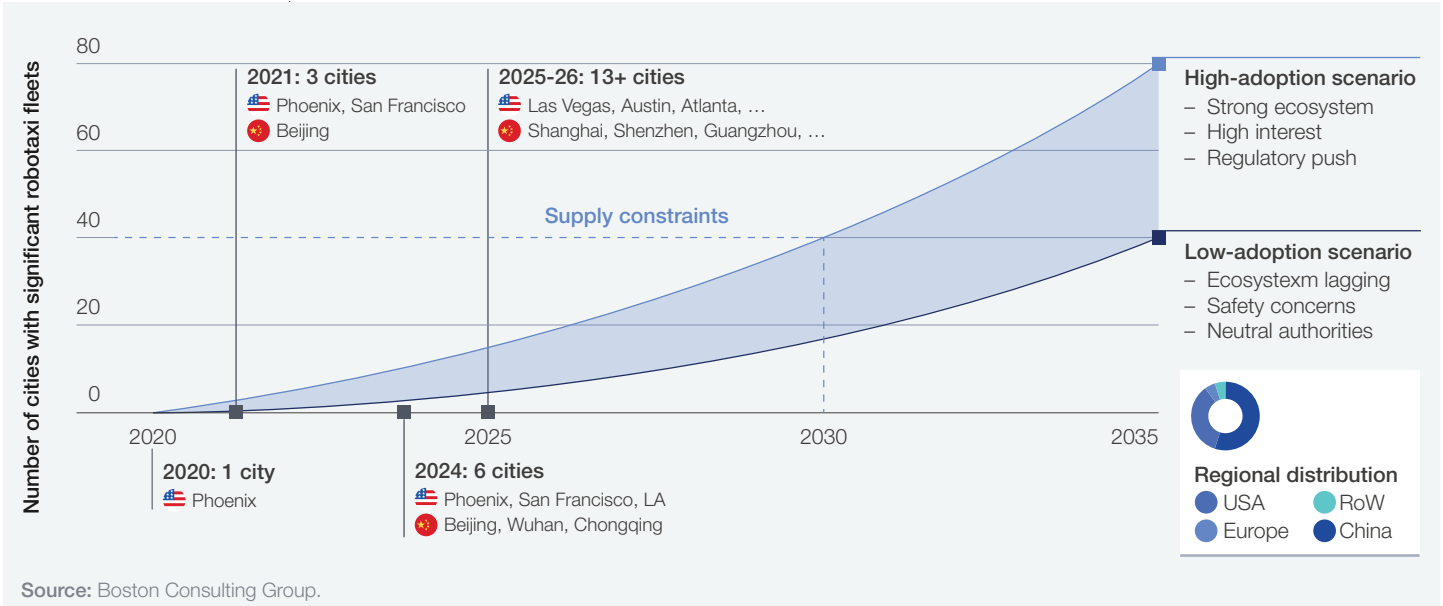


FIGURE 5: Robotaxi forecast showing number of cities with large-scale operations.

ownership. Robotaxis' overall impact on transportation capacity will depend heavily on whether they are used for shared or private rides. If they primarily serve single riders, empty miles will increase, lowering vehicle utilization and contributing to congestion. In turn, this would reduce overall transportation efficiency. If robotaxis are not properly integrated with existing public transport, the effect will deepen as they will begin to 'cannibalize' the public network – a previous World Economic Forum publication already showed this by modelling the potential impact for the US city of Boston.

Currently, most robotaxi operators do not incorporate shared rides into their business models. This underscores the need for thoughtful policy measures that align autonomous mobility with cities' transportation and sustainability goals. Without proactive regulatory frameworks, the widespread deployment of robotaxis could lead to increased congestion and inefficient fleet utilization, undermining some of the major benefits autonomous mobility aims to deliver.

ECOSYSTEM READINESS

Scaling robotaxis requires more than simply manufacturing greater numbers of autonomous vehicles. Success depends on a complex ecosystem of stakeholders, spanning production, operations and usage. The main tasks – some of which remain as-yet substantially unfulfilled – for the various stakeholders are outlined in Table 1.

The first set of stakeholders identified are the OEMs and autonomous driving tech companies producing autonomous robotaxis. OEMs must provide vehicles tailored for robotaxi use, and this requires transforming software-defined

vehicles with new electrical/electronic (E/E) architectures. Meanwhile, AD tech companies must ensure reliable safety across ODDs and regions while also making their technology both scalable and affordable.

For the enabling stakeholders, the successful deployment of robotaxis requires strong availability of funding for R&D, regulatory alignment across geographies, and insurance models. Insurance companies play a crucial role here, and they will need to redefine their risk assessment models and liability frameworks – a highly complex task hindered by scarce data and the potential for many unknown risks.

A number of stakeholders must collaborate closely for robotaxi operations to be implemented smoothly. Cities and utilities can contribute by providing dedicated charging stations, pick-up/ drop-off zones and easily accessible maintenance depots. These efforts should be coordinated with fleet management firms, many of which are still in the early stages of development. The role of fleet control becomes increasingly important for a safe operating environment. Fleet operators must establish advanced control centres to monitor and optimize vehicle uptime, safety and performance.

Many of the tasks for fleet management and control are still being defined, creating opportunities for ambitious new players to enter the ecosystem.

Finally, the role of the end user as a key stakeholder cannot be underplayed. The long-term success of robotaxis hinges on user adoption and, ideally, integration into public transit networks for more efficient and sustainable usage. Large-scale education campaigns on the

capabilities and limitations of robotaxis are crucial for building public trust and increasing road safety.

AUTONOMOUS TRUCKS

The development of autonomous trucks is at a pivotal point, with extensive testing and early commercial deployments underway in the United States and China. These vehicles promise to transform logistics. The economic case for them is strong, driven by efficiency gains from 24/7 operations, lower total cost of ownership and their ability to resolve driver shortage problems.

However, challenges remain before they can be widely adopted. These include ensuring the technology is reliable in all road conditions, securing funding to scale operations, navigating complex regulations and integrating the trucks into existing supply chains.

Autonomous truck deployments on public roads can be categorized according to five distinct use cases, each at different stages of technological, regulatory and infrastructural readiness:

1. Long-haul hub-to-hub
2. Mid-distance hub-to-hub
3. Mid-distance point-to-point
4. Intra-city distribution
5. Operations in closed environments

These use cases and their suitability for vehicle autonomy are described in Figure 6.

For operations on public roads, the fixed routes of hub-to-hub operations are strong candidates for autonomous truck deployments. At the other end of the spectrum, intra-city distribution remains a far bigger challenge as the driver needs to take care of many related tasks, such as loading and unloading, that cannot be easily automated. The key difference



Role/Stakeholders		Tasks	At current trajectory, what is missing for scaling by 2030?
● Limited gaps ● Major gaps			
Production	 Vehicles Original equipment manufacturers (OEMs)	Develop and produce vehicles tailored for robotaxi usage	– Successful transformation to software-defined vehicles (SDVs) including new electrical/electronic (E/E) architecture
	 AD tech Hardware and software suppliers	Develop AD software and hardware customized to local needs	– Reliable safety performance across ODDs and regions – Easily scalable and affordable software
Enablers	 Funding Venture capitalists, strategic investors, public-private partnerships	Provide funding for R&D and scaling	– Secured funding for improving tech and scaling operations
	 Regulation Governments, authorities	Set regulation and homologation standards, provide licences, set zones	– Harmonized regulation across cities and countries
	 Insurance Insurance, risk analytics, reinsurance	Develop risk assessment models and policies	– Large-scale data availability for robust risk models and policies
Operations	 Infrastructure Utilities, cities	Provide charging, vehicle-to-everything (V2X) communication, pick-up zones; integrate in-traffic control	– Dedicated inner-city robotaxi infrastructure (lanes, kerb spaces) – Integration in traffic management systems
	 Fleet management OEMs, suppliers, ride-hailing, fleet management	Handle fleets and maintenance, determine service areas	– Defined task distribution among OEMs, platforms, fleet management – Scalable fleet management frameworks
	 Fleet control OEMs, suppliers, ride-hailing, fleet management	Manage safety backup drivers, monitor fleet performance	– Defined task distribution among OEMs, platforms, fleet management – Dedicated fleet control centres with specialized staff
	 Platform Ride-hailing and Mobility as a Service (MaaS) platforms	Integrate robotaxis into platforms, ensure smooth interactions and support	– Defined customer journey and smooth processes – Integration with fleet management and control providers
Usage	 Education Public groups, media, universities	Educate on safety and benefits, advocate for equitable access	– Large-scale education on capabilities and limitations – Analysis of societal benefit of large-scale fleets
	 Customer B2B and B2C end users	Use robotaxis, engage in feedback loops	– Trust to share streets with robotaxis as well as use them

TABLE 1: Robotaxi ecosystem stakeholder mapping and remaining gaps.

between long-haul and mid-distance hub- to-hub use cases is the greater need for additional infrastructure, such as charging stations, in the former. If autonomous trucks continue using internal combustion engines, long-haul deployment could outpace mid-distance in the coming years.

Closed-environment operations, such as those in construction sites, mines, farms or ports, are best suited to autonomous truck deployments because of their controlled conditions and repetitive tasks. They are also less impacted by regulatory and ecosystem constraints. However, this white paper focuses on use cases on public roads, so this scenario is not considered further here.

As shown by Figure 7, the US is expected to lead the adoption of autonomous vehicle deployments on public roads, particularly with regard to long-haul and mid-distance hub-to-hub routes. This leadership is driven by strong total cost of ownership (TCO) benefits and a pressing need to address driver shortages. These routes will experience the highest growth, with autonomous trucks expected to make up nearly 30% of new truck sales for mid-distance hub-to-hub routes by 2035, driven by fixed highway routes that enable autonomous driving.

Europe will also reap strong TCO benefits from long-haul and mid-distance hub-to-hub use cases. However, estimates suggest slower adoption in Europe due to cross-border regulatory hurdles and more complex operational environments. A pan-European approach is key if the continent is to rapidly scale these long-haul operations. However, mid-distance hub-to-hub autonomous trucks could make up around 26% of new truck sales by 2035.

China is projected to follow a slower adoption pathway, mainly due to lower TCO benefits and higher upfront investment compared to conventional options. Government support could speed up the Chinese trajectory, enabling deployment to match or even outpace Western growth rates.

ECOSYSTEM READINESS

As with robotaxis, the entire ecosystem – not only OEMs and AD tech companies – must prepare for large-scale autonomous truck deployments. Table 2 presents the main roles and tasks that are required to enable this by 2030.

There are clear parallels between the production and enabling roles for both autonomous trucking and robotaxis. However, trucking benefits from lower operational complexity (especially in hub-to-hub use cases) and a clearer return on investment.

Mass deployment still relies on OEMs and tech providers developing dedicated E/E architectures, ensuring reliable safety across ODDs and providing scalable, cost-effective software, but strong investor commitment, harmonized regulations and robust insurance models are essential, too.

Operationally, autonomous trucking will introduce new stakeholders and redefine traditional roles, requiring coordinated efforts across the value chain to ensure adoption is seamless and efficient. For example, fleet management firms need to set up remote monitoring and emergency response mechanisms as existing legal requirements, such as placing a warning triangle behind a broken-down truck, pose challenges for fully autonomous operations. Transport operators will also need to upgrade warehouse yards and upskill their

workforces to integrate autonomous trucks effectively.

Digital platforms will also need to evolve as multiple stakeholders enter the market. These platforms must provide unified solutions that support multi-OEM fleets and define roles clearly. Additionally, infrastructure investment will play a part in scaling autonomous trucks even though these vehicles are not strictly dependent on dedicated infrastructure.

From a customer perspective, the transition to autonomous freight transport presents clear TCO advantages and eliminates many operational inefficiencies. Strong demand is expected as soon as the technical and regulatory frameworks are established.

AN OVERARCHING INDUSTRY AGENDA

To overcome the main roadblocks and ramp up adoption of autonomous vehicles, the industry must focus on both ensuring safer roads and fostering the continuous innovation that will increase commercial value for stakeholders.

This chapter details five key industry actions that can deliver on these requirements. They address each of the five dimensions that form the basis of this white paper: consumer trust and interest, projected ADAS/AD system prices and consumers' willingness to pay, remaining technological obstacles and timeframe to overcome them, current regulatory status and anticipated regulatory developments, and ecosystem developments to support scaling.

COMMUNICATE CONSISTENT MESSAGING AND BUILD CONSUMER TRUST

Consistent messaging is particularly important for partially automated

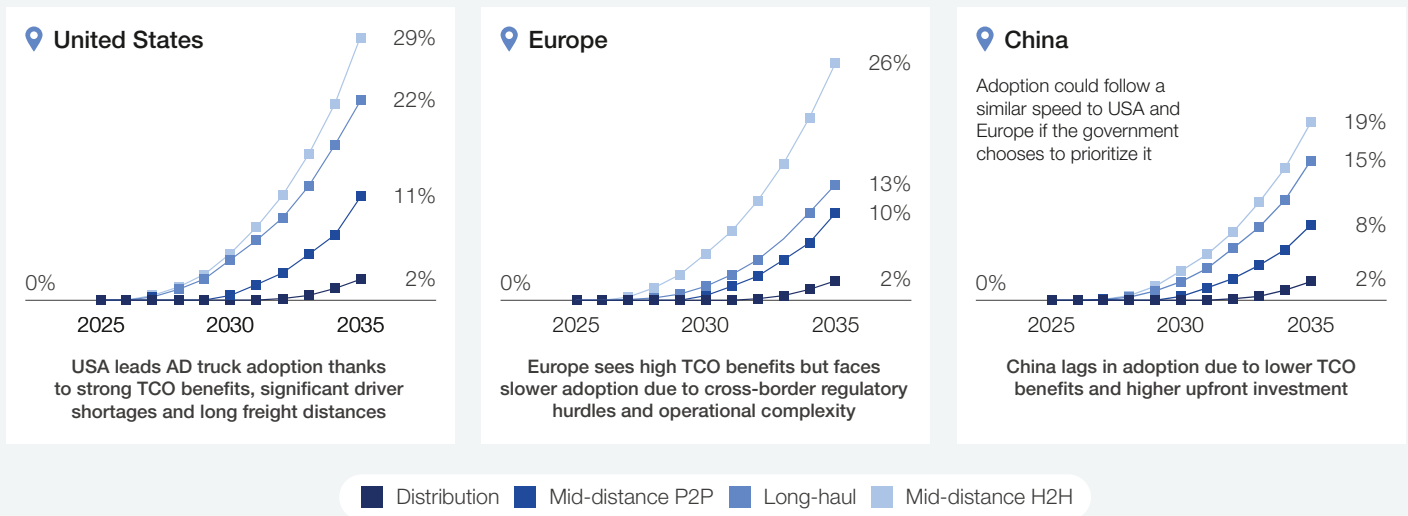
Anticipated readiness by 2035

Use cases	Technology	Regulation	Infrastructure	Rationale
Long-haul hub-to-hub				- Fixed routes along highways align with L4 strengths - Regulation is focused on main highway routes - High-volume corridors need to be upgraded to enable AV operations
Mid-distance hub-to-hub				- Less infrastructure needed than for long-haul (when transitioning away from internal combustion engines in line with sustainability objectives) - Shorter routes are easier to regulate and equip for AD
Mid-distance point-to-point				- Route variability strongly increases technological complexity - Similar regulatory needs as for mid-distance hub-to-hub use case - Infrastructure upgrades are more demanding than for hub-to-hub
Intra-city distribution				- Tech readiness is largely dependent on progress of light vehicles - Likelihood of risk of failure causing human harm will slow regulation - Complex environments with many road users challenge developments
Closed environment				- Autonomy is best suited to controlled environments and repetitive tasks - Limited potential for human harm reduces the demand for regulation - The operating area is restricted, widely mapped and monitored

Deployable without limitations
 Partially deployable
 Deployment not possible

FIGURE 6: Autonomous trucking use cases.

Expected share of autonomous trucks in new sales for 2025-2035 by region and use case



Source: Boston Consulting Group.

FIGURE 7: Autonomous trucking deployment forecast for the four use cases operating on public roads.

Role/Stakeholders		Tasks	At current trajectory, what is missing for scaling by 2030?
● Ready to scale ● Limited gaps ● Major gaps			
Production	 Vehicles OEMs	Develop and produce vehicles tailored for autonomous usage	– Autonomous trucks with respective E/E architecture
	 AD tech Hardware and software suppliers	Develop AD software and hardware customized to local needs	– Reliable safety performance across ODDs and regions – Easily scalable and affordable software
Enablers	 Funding Venture capitalists, strategic investors	Provide funding for R&D	– Strong commitment across investors to investment case
	 Regulation Governments, authorities	Set regulation and homologation standards, provide licences, set zones	– Harmonized regulation across cities and countries
	 Insurance Insurance, risk analytics, reinsurance	Develop risk assessment models and policies	– Large-scale data availability for robust risk models and policies
Operations	 Infrastructure Utilities, cities	Charging, V2X, integration in traffic control	– Dedicated infrastructure for charging and V2X communication – Integration in traffic management systems
	 Asset ownership OEMs, leasing firms, 3PLs*, fleet operators, cargo owners	Own trucks, leasing to operators or self-operate	– Defined role and sales model (price/km, price/kg, etc.) – Ensured 24/7 uptime to leverage TCO benefits
	 Fleet management OEMs, AD suppliers, fleet operators, 3PLs	Control tower, (remote) maintenance, repairs	– Establish control tower (alerts, remote driving, etc.) processes – Facilities and staff along routes for emergency response
	 Transport operator Fleet operators, 3PLs, cargo owners	Warehouse network, unloading/loading, load pre-check	– Widely upgraded warehouse yards and loading docks – Upskilled workforce and processes for handling autonomous trucks
	 Digital platform Freight platforms, AD suppliers, TMS firms**	Load matching, route optimization, fleet management, TMS integration	– Clear task distribution as multiple stakeholders strive for this role – Unified platform supporting multi-OEM fleets
Usage	 Customer Cargo owners	Book trucking services	– n/a – TCO benefits lead to high interest in autonomous trucks

*3PL = 3rd party logistics (e.g., DHL, Schenker, FedEx). **TMS = transport management system.

TABLE 2: Autonomous trucks ecosystem stakeholder mapping and remaining gaps.

driving (L2+/L3), where both driver and machine play active roles. It is imperative that drivers understand the system's capabilities and their own role at all times, especially during transitions between automation levels, such as regaining control in L3 systems.

Clear communication requires driving schools, manufacturers, dealerships and regulators, among others, to collaborate, ensuring transparent advertising and structured onboarding processes for the system.

Consumer trust hinges on transparency and demonstrable performance. Through openly shared safety data and key performance indicators, buyers can validate the reliability of driverless systems and overcome their scepticism. Public education campaigns, third-



MANUFACTURING



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party validation and visible, real-world deployments make autonomous technology more tangible, boosting understanding and trust.

LEVERAGE TECHNOLOGY TO INCREASE SAFETY, USABILITY AND SCALABILITY

Continued progress that leverages technology is key to surmounting several of the sector's remaining challenges. There are four main dimensions across which the industry can make the most of technology to improve safety, usability and scalability:

1. Enhance understanding about the capabilities and limitations of vehicle automation technologies and discouraging incorrect and improper use. This means improving HMI and DMS. A seamless and intuitive HMI also makes it easier and more attractive for dealers to integrate ADAS/AD education into the vehicle purchasing journey.
2. Ensure reliable performance. Standardized validation metrics and safety testing protocols help reinforce trust and increase comparability across different automated and autonomous systems. Useful metrics could include activation time, hard braking events, disengagement rates and broader performance benchmarks.
3. Keep autonomous systems secure. Autonomous systems require robust protection against cyber threats to prevent unauthorized access, system manipulation and potential safety breaches. Strong cybersecurity frameworks and compliance measures will need to evolve alongside the technology to ensure system integrity.
4. Develop scalability. A central challenge for autonomous driving, scalability requires continuous progress in AI and system architecture. End-to-

end AI-driven tech stacks can help improve reasoning capabilities, enhance perception and decision-making and enable vehicles to adapt better to complex environments.

OPTIMIZE BUSINESS MODELS FOR ECONOMIC VIABILITY

Sustainable business models are vital for encouraging the long-term success of autonomous vehicles. For personal vehicles, the strategies for achieving this will depend on the level of automation. L0 to L2 capabilities are becoming increasingly commoditized, requiring automakers to integrate these costs into standard vehicle pricing. L2+ is expected to provide the highest potential for differentiation over the coming years. For the levels beyond this, high costs and other limiting factors will restrict the market to the premium segment only until at least 2035.

In commercial applications, autonomous trucks and robotaxis are expected to provide strong long-term returns on investment, but substantial initial capital expenditure remains a barrier.

Moreover, the companies developing the technology are not necessarily the ones reaping the rewards, making investment decisions more complex. Investors must be prepared to take a long-term perspective, recognizing that their returns will depend on selecting the right business models and establishing efficient operations.

CO-CREATE REGULATION TO ENABLE DEPLOYMENTS

Regulatory alignment is essential for ensuring safety and reliability while accelerating the deployment of autonomous vehicles. Active collaboration between regulators and industry is essential, especially given the

fast pace and technological complexity of the sector's innovation.

Autonomous vehicle deployments will also benefit from comprehensive policy packages. Important industrial policies might incorporate factors such as incentives or encouragement for urban planning integration.

Table 3 summarizes current policy and regulatory efforts in China, the US and the EU across seven different domains. While progress is being made across all areas, the rate of change varies.

ENGAGE PARTNERS AND RELATED PILOT PROJECTS

As depicted in Tables 1 and 2, industries to scale up operations collaboration with related industries is crucial for success. This includes not only cooperation across the tech stack to streamline development and avoid a robust and collaborative ecosystem is crucial for duplication but also partnerships with industries, scaling autonomous vehicle deployments beyond such as insurance and urban planning.

CONCLUSION

Vehicle autonomy is already on our roads, and it is poised to transform mobility. Scaling this technology, however, will take time – much longer than many earlier forecasts have suggested.

Assisted (and not autonomous) systems, in particular L2 and L2+, are still expected to be the main technologies in most new personal vehicles sold in 10 years' time.

When it comes to L4 vehicles on public roads, it is robotaxis and autonomous trucks that will lead the way. Indeed, these vehicles are already deployed today in specific locations. Increased robotaxi

	What's needed	United States	Europe	China
		● Advanced progress/support ● Moderate progress/support ● Development areas		
Test frameworks 	Align on predictive and unified test frameworks across regions	Individual states provide test grounds, but no federal alignment is currently available	Small individual test programmes (e.g., HEAT project with one vehicle in Hamburg), no cross-Europe alignment	Centralized AV pilot programme with 20 cities, 32,000 km of assigned roads and 16,000 issued vehicle licences
Homologation criteria 	Define clear technical standards for AV performance and safety	Manufacturers self-certify compliance; guidelines by NHTSA but federal homologation criteria are pending	Technical standards developed by bodies such as the European Commission, implementation still country driven	A unified technical framework for performance and safety standards is under development
Incentives 	Provide incentives, such as tax breaks and pilot project funding	Limited incentives for pilot schemes by, for example, California Mobility Center and USDOT (\$60 million in 2018)	Various small funds to incentivize AV programmes, such as €290 million distributed among 70 projects in Germany	Federal subsidies for pilot schemes in, for example, Shenzhen and Guangzhou to support AV fleet deployment
Industrial policies 	Foster ecosystem with domestic manufacturing and infrastructure	CHIPS Act allocates \$52.7 billion to boost domestic semiconductor industry, yet few dedicated federal AV investments	Through Horizon Europe, European Commission invests €500 million in R&D initiatives for connected, automated mobility	Heavy investment in V2X infrastructure, HD mapping of cities and domestic manufacturing
Data regulations 	Foster purposeful data sharing and enforce cybersecurity	Transparent incident reporting in California, voluntarily reporting to NHTSA; data privacy and cybersecurity fragmented	Data privacy and cybersecurity core to regulations (e.g., UK AV Act, GDPR), but no transparent incident reporting	Mandatory reporting of incidents to MIIT but low transparency; strict data collection and storage laws (PIPL law)
Liability frameworks 	Define responsibility for system failures and during takeovers	Product liability framework covers AVs, yet legal debate about product versus operator liability ongoing	Liability governed by existing frameworks, such as product liability or Motor Insurance Directive	Liability is primarily assigned to operator; in case of a technical defect to the manufacturer
Urban planning integration 	Designate AV lanes and pick-up zones, and include AVs in ITS systems	Limited dedicated infrastructure for AVs, few localized efforts to integrate AVs in transportation systems	Some dedicated infrastructure, such as pick-up zones; EU push for integrating AVs in cooperative intelligent transport systems	Testing AV lanes, pick-up zones and extensive V2X-enabled smart transportation systems

Source: Authors, based on public information from Chinese Ministry of Public Security, California Public Utilities Commission, United States White House, EU Commission, UK Government, German BMDV and press research.

TABLE 3: Policy and regulatory efforts to advance vehicle autonomy (regional examples are not comprehensive).



adoption will depend on maturing the ecosystem and overcoming the high upfront costs. By 2035, our estimates suggest that up to 80 cities will have large-scale robotaxi services in place, most of these cities being located either in the US or China. The US is expected to lead the deployment of autonomous trucks, with Europe and China following. In the short term, autonomous trucks present the most profitable autonomous use case, driven by strong total cost of ownership advantages and efficiency gains, particularly in hub- to-hub deployments.

The forecasts in this white paper provide industry, regulators and the public with a more realistic timeline for autonomous vehicle deployments.

This insight supports informed decision-making on upcoming challenges, including developing infrastructure, reskilling workforces and encouraging public acceptance. Given the varying adoption timelines across regions, the white paper also highlights the leading geographies for each use case.

Advances in vehicle autonomy offer not only greater efficiency and convenience but, most critically, the potential to significantly reduce road accidents – a pressing global problem that claims 1.2 million lives annually. The entire industry plays a vital role in safely scaling vehicle autonomy – a scenario that can only be achieved through extensive collaboration among stakeholders.

This white paper outlines the broad ecosystem involved in this transition, detailing their roles and identifying key requirements that remain outstanding. Beyond OEMs and suppliers developing safe and reliable technology while transparently communicating its strengths and limitations, regulators must balance innovation with safety and promote harmonization across regions to avoid fragmentation.

Additionally, related industries must establish fleet operations, insurance frameworks and charging networks. Autonomy is not a short-term race but a long-term transformation requiring sustained commitment and cross-sectoral cooperation. **Wn**





LIFESTYLE DISEASES ARE A RISK TO YOUR WORKFORCE AND YOUR BUSINESS

South African businesses face an increasing but often underestimated challenge-lifestyle diseases. Rising cases of obesity, diabetes, hypertension, and heart disease are being driven by poor diet, chronic stress, and physical inactivity.

"As businesses look to create healthier, more resilient workforces, prioritising preventive healthcare with integrated health and wellness programmes can help reduce costs and improve employee engagement," says Thenjiwe Ramorotho, a qualified dietitian and Old Mutual Corporate Strategic Client Executive.

"Employers that invest in these initiatives give their employees the resources to proactively manage their health, benefiting both individuals and the organisation".

Healthier employees, stronger business performance

The financial case for workplace wellness is clear. A study published in the Journal of Occupational and Environmental Medicine found that for every dollar spent on wellness programmes, businesses save nearly three times that amount in productivity gains. "Wellness benefits are no longer just perks," says Ramorotho.

"The 2024 Remchannel survey reported that 76.14% of employers surveyed have a compulsory healthcare cover requirement, and 49% of these employers also provide their employees with gap cover policies. Businesses that invest in wellbeing see better engagement, higher morale, and are more competitive when attracting talent."

Prevention is more cost-effective than cure

Preventing lifestyle diseases requires a shift in focus toward early intervention and proactive healthcare management. Regular screenings, workplace wellness initiatives, and improved access to healthcare can help ensure that minor health concerns do not escalate into serious conditions.

"Employers can influence employee health more than they realise," says Ramorotho. "By applying Nudge Theory-a behavioural science approach that subtly encourages better choices-companies can create work environments that promote well-being without forcing change."

How Workplace Design Influences Healthier Choices

For example, a globally recognised services sector company found that providing free filtered water stations while making sugary drinks less accessible led to increased water consumption and a reduction in sugary beverage intake.

Another effective intervention was adjusting workplace layouts to encourage movement-such as placing commonly used equipment like bins and printers farther from workstations or promoting stair use over elevators.

These small nudges increased daily physical activity among employees without disrupting productivity "Employers can apply these lessons in any work environment, including factories and manufacturing settings, by making simple design changes that promote well-being. Even minor adjustments-such as providing shaded rest areas or improving the layout of break spaces-can have a meaningful impact on employee health and workplace morale.

Download the Old Mutual Health Solutions Brochure to explore affordable healthcare solutions for your employees or visit our website to learn how Old Mutual's integrated health and employee benefits solutions can support your business.
www.oldmutual.co.za/employeebenefits.

The role of health insurance in prevention

"Routine health screenings for blood pressure, blood sugar, and cholesterol levels during GP consultations help detect warning signs before they develop into serious medical issues.

Regular check-ups also ensure that employees receive the necessary follow-ups, treatment plans, and medication management to keep lifestyle diseases under control," she says.

In South Africa's challenging economic climate, however, affordability of primary healthcare remains a concern.

"Private healthcare costs continue to rise, and medical aid has become increasingly expensive, making it inaccessible to many employees. However, businesses do not have to rely solely on medical aid to provide healthcare benefits," says Ramorotho.

Health insurance offers a more affordable alternative to medical aid while still providing essential healthcare benefits. With plans starting at R310-R485 per member per month, employers can provide access to private healthcare without excessive costs.

Old Mutual Health Solutions health insurance offers businesses access to affordable private healthcare options, covering day-to-day medical needs, hospitalisation for illnesses and accidents, and private emergency services.

Medical Insurance Vs Medical Aid: What Employers Need To Know

Employers should carefully consider the difference between medical insurance and medical aid when selecting healthcare benefits.

Medical insurance provides targeted coverage for specific health events, such as accidents, short-term hospitalisation, and general practitioner visits. It does not include Prescribed Minimum Benefits, which are legally required under medical aid. Medical insurance covers defined medical events rather than a full range of treatments, it is more affordable and cost-effective for businesses seeking to provide healthcare benefits while managing expenses.

Ramorotho stresses that healthcare benefits are no longer a "nice-to-have" but a key factor in employee retention and productivity. "Employers who invest in affordable healthcare solutions do more than just support employee well-being. They reduce absenteeism, improve workplace morale, and create an environment where employees perform at their best. In a competitive job market, businesses that prioritise employee benefits will attract and retain top talent."



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AI with a conscience

- NAVIGATING THE ETHICAL CROSSROADS WITH GOVERNANCE PLATFORMS



As Artificial Intelligence (AI) permeates critical decision-making processes across industries, robust ethical governance frameworks are paramount. Agentic AI, capable of autonomous action and self-improvement, presents unique challenges. Successfully navigating this complex landscape requires careful consideration of ethical implications and the strategic deployment of AI governance platforms, often best implemented with the expertise of third-party IT providers.

*By: Sarthak Rohal
Senior Vice President
In2IT Technologies*

THE RISING INFLUENCE OF AI IN CRITICAL DECISIONS

AI's capacity to analyse vast datasets, identify patterns, and generate insights at speeds far exceeding human capabilities is transforming how organisations make decisions. From financial forecasting to medical diagnosis, AI algorithms are increasingly relied upon to inform and even automate critical processes.

This growing influence raises concerns about potential biases, lack of transparency, and the erosion of human oversight. For example, introducing AI in recruitment algorithms and programmes can inadvertently perpetuate existing societal biases, leading to discriminatory hiring practices. Similarly, AI-driven diagnostic tools in healthcare may misinterpret data, resulting in inaccurate diagnoses and treatment plans.

THE PROMISE OF AI FOR SELF-REGULATING GOVERNANCE

Paradoxically, AI itself offers a potential solution to the ethical challenges it poses. Agentic AI governance platforms help monitor AI systems continuously, detect anomalies, and enforce ethical guidelines. These platforms leverage machine learning algorithms to identify biases in data, track decision-making processes, and flag potential risks such as discriminatory practices or data misinterpretation.

Imagine an AI system that monitors loan applications, ensuring fairness and compliance with anti-discrimination laws. The system could analyse

application data, identify patterns of bias, and alert human overseers to potential violations.

Effective AI governance requires a multi-faceted approach encompassing technical, ethical, and legal considerations. Organisations must prioritise data quality, transparency, and accountability. It includes ensuring that AI systems are trained on diverse and representative datasets, that their decision-making processes are transparent and explainable, and that there are clear lines of accountability for AI-driven outcomes.

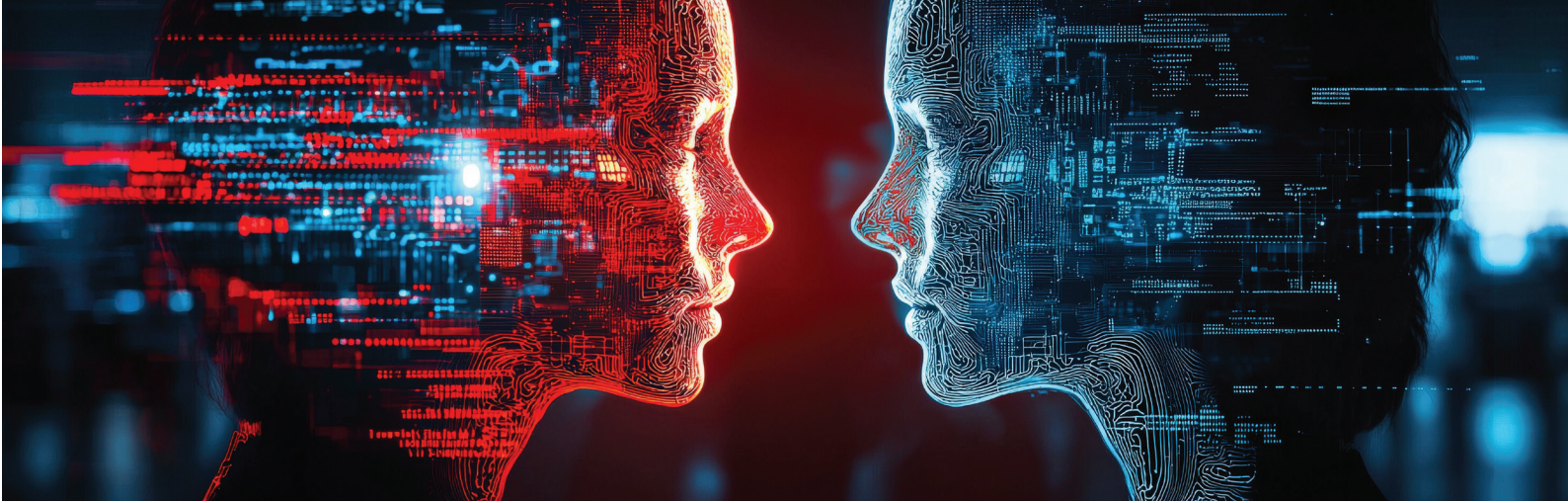
BUILDING ORGANISATIONAL READINESS AND ETHICAL CULTURE

To truly embed AI ethics into the fabric of decision-making, organisations must look beyond tools and platforms and foster a culture of responsibility. This involves establishing AI Ethics Committees, integrating cross-functional perspectives from legal, compliance, and human resources, and encouraging open discussions about the risks and trade-offs of automation.

Employees should be empowered to question algorithmic decisions and raise concerns without fear of reprisal, creating an internal system of checks and balances that complements technical oversight.

SPECIALISED EXPERTISE IN IT PROVIDERS

Implementing and managing agentic AI governance platforms requires



specialised expertise and resources that many organisations lack. IT providers play a crucial role in providing the necessary tools, technologies, and expertise to navigate the complexities of AI governance. They offer various services, including platform development and deployment, data management and bias mitigation, monitoring and auditing, training and support:

Platform development and deployment: Third-party providers can develop and deploy customised AI governance platforms tailored to an organisation's specific needs.

Data management and bias mitigation: They can help organisations identify and mitigate biases in their data, ensuring that AI systems are trained on fair and representative datasets.

Monitoring and auditing: They can provide ongoing monitoring and auditing of AI systems, detecting anomalies and ensuring compliance with ethical guidelines and regulations.

Training and support: They can train employees to use and manage AI governance platforms, fostering a culture of ethical AI development and deployment.

GLOBAL GOVERNANCE AND REGULATORY ALIGNMENT

As the global regulatory landscape rapidly evolves, staying compliant

requires proactive adaptation. Laws such as the EU's AI Act and the growing focus on responsible AI use in regions like Africa highlight the importance of aligning organisational practices with emerging legal standards. Partnering with IT providers who understand both global trends and local regulatory nuances can give organisations a strategic edge. The regulatory mitigates risks and reinforces the organisation's credibility and commitment to ethical innovation in the eyes of customers, partners, and investors.

Ultimately, integrating agentic AI into core business processes presents immense opportunities and potential pitfalls. While the promise of improved efficiency and enhanced decision-making is enticing, organisations must prioritise ethical considerations and implement robust governance frameworks.

By strategically partnering with experienced third-party IT providers, businesses can not only navigate the complexities of AI governance but also ensure that their AI initiatives are aligned with ethical principles, regulatory requirements, and societal values, leading to responsible and sustainable innovation.

The future belongs to those who embrace AI responsibly, and IT providers are critical allies in charting that course. **wn**

Fortifying the state in a time of cyber siege



In an era where borders are no longer physical, South Africa is being drawn into a new kind of conflict one fought not with tanks and missiles, but with lines of code and silent intrusions. From local municipalities to national ministries and government systems are under relentless attack. The digital battlefield is here, and cyberspace has become the next frontier of conflict.

*By Gugu Nyanda
Health & Public Service lead
Accenture, Africa*

Defending the state must start with its digital infrastructure. It's no longer enough to simply digitise government services – we must protect them with the same strategy, resources, and urgency we would devote to any vital organ of the state.

This is a call to action. Cybersecurity must be elevated to a national priority, placed firmly at the top of the public policy agenda, and backed by skilled professionals, enforceable standards, and political will. Without this, every investment in digital public services risks collapse under the weight of a single, well-executed breach.

Recent events have highlighted the growing urgency of the issue. Over the past three years, ransomware attacks have disrupted government departments and affected the delivery of some public services. In some cases, hackers stole terabytes of sensitive data. Artificial Intelligence has been used to spread misinformation and undermine state sovereignty. These are not isolated incidents. They are signs of a system under siege.

The global context only sharpens the concern. South Africa now experiences more cyberattacks than any other country in Africa. According to global cybersecurity firms, South Africa ranks among the top three countries in the world for ransomware victimisation.

At the same time, public sector systems remain deeply vulnerable. A 2023 audit

by the Auditor-General found that 70 percent of national and provincial departments had serious cybersecurity control weaknesses. Many lacked the basics – strong access controls, regular software patching, encrypted storage. In some cases, the same vulnerabilities flagged by internal audits were later exploited by attackers.

There is a broader danger here. As South Africa's digital footprint expands from smart cities to e-health to online court systems, the potential attack surface grows. Each new online service, if not properly secured, is another entry point for hostile actors. And these actors are not always anonymous cybercriminals looking for ransom.

South Africa cannot afford to be naïve. It is a member of BRICS, a strategic player on the continent, and a country with sophisticated banking, transport, and energy infrastructure. We are a target. Yet, our current approach to cyber resilience remains fragmented. Responsibility is dispersed across multiple departments and agencies. The national cybersecurity strategy remains unpublished. And while the Cybercrimes Act of 2020 was a major milestone, its enforcement has been uneven and its reach incomplete.

What needs to change is clear. First, South Africa must finalise and implement a comprehensive National Cybersecurity Strategy, one that sets minimum security standards for every government department and entity.



Second, we need to professionalise the state's cyber capability. That means hiring, training, and retaining skilled cybersecurity personnel at all levels of government.

Third, we must modernise government IT systems, many of which still run on outdated software that is inherently vulnerable. And finally, we need a coordinated structure for cyber defence, a central body empowered to set policy, respond to incidents, and share threat intelligence in real time.

This is not only a technical project, but also a matter of national resilience. In the same way we think about water security, energy security and fiscal sustainability, we must think about digital sovereignty.

Public trust in e-government systems hinges on confidence that their data is protected, their services are uninterrupted, and their state is in control.

Accenture stands ready to support this national imperative. We bring global experience in public sector cybersecurity transformation, local insights into South Africa's unique governance landscape and innovative capability in secure digital infrastructure.

We help governments assess their cyber maturity, develop strategy, modernise systems and build resilience from the ground up. Our work ranges from designing and implementing national incident response frameworks to embedding zero-trust architecture across government entities.

We also invest heavily in talent development and training, helping clients build a sustainable internal capability.

For South Africa's public service, we believe the answer lies in creating cyber-secure ecosystems, not just point solutions and doing so with urgency, discipline, and foresight.

The window for preparation is closing. Cyber threats do not announce themselves with sirens. They enter silently, exploit the smallest crack, and often go unnoticed until damage is done.

The question for government is not whether the next major attack will come, but whether we will be ready when it does. Let us choose to be ready.

Let us fortify the state in this new theatre of conflict. In cyberspace, sovereignty is defended in code and the time to defend it is now. **wn**

Green hydrogen and automation are reshaping mining, but people still power the change



Advancements in the mining sector has led to machinery becoming more powerful and technologies becoming smarter, resulting in improved safety and efficiency in the industry. Now, green hydrogen and automation are both poised to reshape the sector once more.

*By Maureen Phiri
General Manager – Sales
Oxyon People Solutions*

Green hydrogen can help mining operations become safer and more sustainable, while automation improves human safety and allows for mining in environments that have previously been considered inaccessible or too hazardous. However, behind any advanced technology or machine are people. Skilled workers play a pivotal role in shaping the mining industry of the future, and investing in the development of the skills we need to embrace these new technologies is critical.

THE EVOLVING MINING LANDSCAPE

As mining machinery continues to evolve, it becomes increasingly complex throughout its value chain, from design to manufacturing and operation. The skills involved in mining change alongside this, and there is a growing need for everything from mechanical engineers and logistics experts to robotic specialists and software developers. As green hydrogen becomes a viable fuel source, machinery will evolve once again. We are also seeing growing levels of digitalisation across the mining sector, with smart sensors, data platforms, AI-driven maintenance tools and remotely controlled equipment becoming increasingly standard.

This shift is not just about technology – it is transforming how the work of mining is done and, subsequently, who does this work. Traditional roles that dominated mining in the past, particularly manual labour-type jobs, are rapidly giving way

to hybrid roles that blend engineering, data science, and IT. For example, as automation takes over, almost every job in the future world of mining will require an understanding of coding and programming languages. This is a fundamental redefinition of what it means to work in mining.

THE EDUCATION DISCONNECT

One of the challenges the mining sector is currently facing is a growing disconnect between what the industry needs and what our education system is producing. Too many graduates enter the workforce with degrees that are poorly aligned with the demands of a digitised mining economy. Enrolment in Science, Technology, Engineering and Mathematics (STEM) fields is low, and many engineering students struggle to complete their studies. The solution is not about upskilling people for the mining sector but about reskilling. Many current and future workers need an entirely new foundation of knowledge, particularly in digital tools and practical engineering.

This is a challenge, but it is also a unique opportunity. There is huge potential to rethink education and training from the ground up, not just at university level but starting at primary school. Schools that introduce coding, robotics, and digital literacy early are already making a difference, but this needs to be more than an afterthought. It should be embedded across the curriculum as a core skill set.



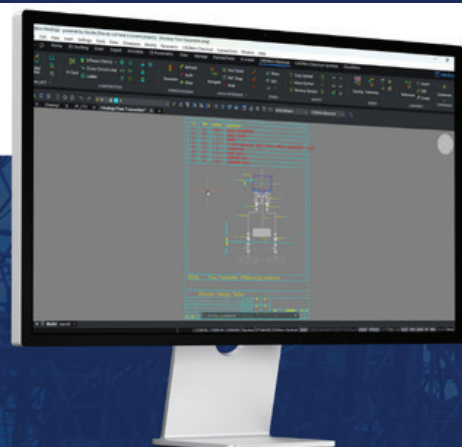
We also need to bridge the gap between theory and practice. Too many young people finish their studies without having set foot on a mine or interacted with the tools they are expected to use. Technikons and vocational colleges can help fill this gap, but they are not enough. Industry needs to take ownership of talent development by building from within and forging stronger partnerships with training providers. Co-creating programmes that are shaped by real-world needs, not just academic theory, will be key.

PREPARING FOR THE FUTURE

To develop the human capital that South Africa needs for the future of mining, government support is crucial, however,

it must go beyond policy statements. Too many initiatives exist only on paper or suffer from fragmented implementation. What is needed is bold, coordinated leadership and a shared roadmap that aligns industry, education, and government in preparing the workforce of the future.

The machinery of mining is changing, but no machine, no matter how advanced, can operate without the people who design, build, and maintain it. As we move towards greener and more automated operations, it is important to remember that people will power the industry forward, and remaining competitive in a digital world means addressing a critical skills mismatch now. **wn**



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Aligning cybersecurity with ESG creates a roadmap for sustainable security



As organisations navigate an increasingly complex digital landscape, the convergence of cybersecurity and Environmental, Social, and Governance (ESG) principles has emerged as a critical consideration.

By Ryan Boyes

*Governance, Risk, and Compliance Officer
Galix*

Beyond mere compliance, aligning cybersecurity with ESG objectives enables businesses to foster resilience, enhance stakeholder trust, and create long-term value. But how can organisations achieve this integration effectively?

The answer lies in robust risk assessment, transparent reporting, and leveraging expert partnerships to drive sustainable security strategies.

THE INTERSECTION OF CYBERSECURITY AND ESG

Traditionally, cybersecurity has been viewed as a standalone function focused on protecting digital assets. However, as ESG principles gain prominence, businesses are recognising that cybersecurity is intrinsically linked to governance and social responsibility.

Data security, privacy, and ethical technology use are now core elements of an organisation's ESG commitments.

One of the key steps in this alignment is conducting regular cybersecurity assessments and audits. These evaluations help organisations understand their security posture, identify vulnerabilities, and establish clear mitigation strategies. Importantly, this process should not be confined to internal operations but should extend to third-party relationships too, ensuring that supply chain partners also adhere to stringent security and ESG standards.

BEST PRACTICES FOR CYBERSECURITY REPORTING IN AN ESG FRAMEWORK

Transparent reporting is fundamental to both ESG and cybersecurity. Stakeholders, including investors, customers, and regulators, expect organisations to disclose their risk management strategies and demonstrate a commitment to continuous improvement.

Effective cybersecurity reporting should clearly outline existing risks, mitigation measures, and areas for improvement while aligning with multiple reporting frameworks to provide a comprehensive view of cybersecurity's role in ESG.

It should ensure unbiased risk assessment and transparent data collection processes, defining a measurable, ongoing process rather than treating security as a once-off compliance exercise. By integrating cybersecurity reporting into broader ESG disclosures, organisations can build trust and showcase their commitment to sustainable and responsible business practices.

THE EVOLVING REGULATORY LANDSCAPE

The future of cybersecurity within an ESG framework will be shaped by evolving regulations and market expectations. While the regulatory landscape varies across regions, one certainty is the increasing pressure for stricter governance, particularly in areas such as AI governance, data privacy, and third-party risk management.



For organisations operating in global markets, keeping pace with these changes is essential. ESG frameworks are gaining traction in regions like the US and Europe, and their influence is beginning to extend into other markets.

Businesses must proactively assess which frameworks align with their operational needs and prepare for potential regulatory shifts before they become mandatory.

LEVERAGING PARTNERSHIPS FOR SUSTAINABLE SECURITY

Organisations should not attempt to navigate cybersecurity and ESG alignment alone.

External expertise plays a vital role in ensuring that security strategies are robust, up to date, and aligned with best practices.

Engaging with cybersecurity specialists, third-party auditors, and ESG consultants can provide invaluable insights and help businesses build a security posture that is both resilient and sustainable.

Moreover, working with partners who prioritise ESG principles can strengthen an organisation's overall security ecosystem. Suppliers and service providers who adhere to recognised security and governance frameworks offer greater assurance, reducing the risk of third-party vulnerabilities.

BEYOND COMPLIANCE - EMBEDDING CYBERSECURITY INTO ESG STRATEGY

While ESG considerations in cybersecurity may not yet be a regulatory requirement for all businesses, they present a significant opportunity to enhance long-term security and governance. Rather than treating cybersecurity as a tick-box exercise, organisations should critically evaluate their current strategies, identifying what they are doing, what they are neglecting, and the reasons behind these choices.

They should explore how ESG-driven cybersecurity initiatives can unlock new business opportunities and consider whether they are effectively leveraging emerging technologies like AI and blockchain to enhance both security and ESG compliance. By integrating these elements into their approach, businesses can create a more resilient and sustainable security framework.

CYBERSECURITY AS A PILLAR OF ESG

Cybersecurity is no longer just about protecting data; it is an essential pillar of responsible corporate governance. By integrating cybersecurity into ESG strategies, businesses can build trust, mitigate risks, and position themselves as leaders in sustainable security. Through transparent reporting, proactive regulatory alignment, and strategic partnerships, organisations can future proof their operations and ensure that cybersecurity remains a cornerstone of their ESG commitments. **Wn**

POPIA'S 2025 "Re-Wiring" and the hidden Compliance Hazards for Engineering Firms



On 17 April 2025, the Information Regulator's amended POPIA Regulations came into force, tightening the screws on how—and how quickly—every South African business must handle personal data.

*By: Jodi Poswelletski
Fairbridges Wertheim Becker*

Engineers are squarely in the firing line: project tenders, subcontractor rosters, IoT sensor data, and employee access logs are all packed with personal information. A single misstep after these amendments could fry more than just your server room; it could spark regulatory fines or even criminal exposure.

SIX CHANGES THAT CAN SHORT-CIRCUIT AN UNPREPARED COMPANY

See Table 1.

THREE QUICK WINS TO STAY OUT OF THE ARC-FLASH ZONE

1. Wire up call recording & logging

Every help desk and site phone must capture and archive POPIA objections or deletion requests; voice counts as proof now.

2. Re-engineer your consent flows

Replace "unsubscribe if you don't want" with genuine opt-in check-boxes (or recorded verbal consent) for marketing, webinars and CPD mailers.

3. Stress-test your breach drill

Simulate a data-leak scenario and run the new portal submission to time how quickly you notify affected data subjects. Aim for hours, not days.

In a recent Business Day review, we warned that POPIA had "moved from paper promise to practical protection." That prediction is already materialising through fines and the new information regulator's e-portal. Engineering firms that regard these amendments as a tick-box exercise will find, too late, that the law now has real teeth.

The POPIA team at Fairbridges Wertheim Becker designs industry-specific POPIA programmes for engineering and technical businesses:

- Gap & risk assessments focused on project data flows, IoT ecosystems and subcontractor chains.
- Custom staff workshops that turn site managers and draughting teams into your first line of defence.
- Incident-response playbooks aligned to the eServices portal so you can report Security incident breaches without panic.

Ensure that a compliance meltdown does not overshadow your next breakthrough.

Contact Jodi Poswelletski of [Fairbridges Wertheim Becker](#) for a confidential discussion and a customised action plan. **wn**





NEW RULE	WHAT'S CHANGED	WHY COMPANIES SHOULD CARE
Right to object at any time during office hours	Data subjects may now phone in objections any time during office hours and must be helped "expediently" and free of charge.	Your data handlers and site staff will need to log, date-stamp and route objections instantly and record electronic objections received and upon request make them readily available.
Always-on correction / deletion requests	Data subjects can demand corrections or deletions to their data whenever their data is "inaccurate, out-of-date or excessive"; you, the Responsible Party have 30 days to confirm action taken.	Think of every legacy drawing archive, SCADA log or HR file: if it holds stale personal data you must be able to find it - and prove you erased or fixed it - within a month.
Consent for direct marketing is tougher	"Opt-out" is no longer valid consent. You must capture positive consent - by written form, phone or automated call - before e-mailing that new energy-audit brochure.	Your sales pipeline, Mailchimp lists and even automated tender-alerts need fresh, provable consent records.
Information Officer (IO) 2.0	The IO's duty now includes continual improvement of your compliance framework.	If your IO is "moon-lighting" as head of IT, rethink. The Regulator expects an active compliance programme that evolves with every new project spec or partner integration.
Bigger complaint net, staged fines	Anyone "with sufficient personal interest" can complain, and fines may be settled by instalment - but they're still recorded against you.	For example, disgruntled ex-employees or rejected subcontractors can trigger investigations. An instalment plan only spreads reputational damage over time.
Mandatory online security breach reporting	All security compromises must be logged on the Regulator's eServices portal.	If your incident-response playbook still emails forms, you're non-compliant the moment a laptop is stolen. Update the SOP and rehearse it.

Table 1: Six changes that can short-circuit an unprepared company



MEMBERSHIP FEES EFFECTIVE 1 DECEMBER 2024

The Council meeting held on 6 September 2024 approved subscription & entrance fees as from 01 December 2024 as per schedule indicated below.

PLEASE NOTE: In terms of Bylaw 3.2 annual subscriptions are due on 1st December 2024

MEMBERSHIP FEES CAN BE PAID IN MONTHLY RECURRING PAYMENTS

Council agreed to a discount for fees paid before 31 March 2025. Members are therefore encouraged to pay promptly to minimize increase impact.

Grade of Membership	Annual Subscriptions paid <u>before</u> 31 March 2025		Annual Subscriptions paid <u>after</u> 31 March 2025		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	1 890	1 644	2 268	1 972	2 268	1 972
Associate	1 890	1 643	2 268	1 972	2 268	1 972
Member	2 089	1 816	2 507	2 180	2 507	2 180
after 6 years	2 441	2 122	2 929	2 547	2 929	2 547
after 10 years	2 555	2 221	3 065	2 666	3 065	2 666
Senior Member	2 555	2 221	3 065	2 666	3 065	2 666
after 6yrs/age 40	2 768	2 407	3 322	2 889	3 322	2 889
Fellow	2 768	2 407	3 322	2 889	3 322	2 889
Retired Member (By-law B3.7.1)	1 174	1 021	1 409	1 225	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 R3457.00 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 2025 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 2025.

2025 SAIEE MEMBER BENEFITS



MEMBERSHIP UPGRADE DISCOUNT STRUCTURE

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



Become a member today and start earning the rewards!

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JUNE 2025

10/06/2025	Photovoltaic Solar Systems
11/06/2025	Photovoltaic Solar Systems - EAST LONDON
11/06/2025	Eastern Cape Centre's webinar: Data Centers 1 of 2
12/06/2025	SANS 10142-1 Edition 3 2020
13/06/2025	Road to Registration for Engineering Candidates
17/06/2025	Photovoltaic Solar Systems
18/06/2025	Fundamentals of Developing Renewable Energy Plants
18/06/2025	Nuclear Introduction
19/06/2025	Finance Essentials for Engineers
24/06/2025	Securing Your Future Through Estate Planning and Retirement Strategies
25/06/2025	Project Management for Engineers
25/06/2025	Eastern Cape Centre's webinar: Data Centers 2 of 2

JULY 2025

09/07/2025	High Voltage Testing and Measurement
15/07/2025	Technical Report Writing
16/07/2025	Writing Good Technical Specifications
16/07/2025	Introduction to 5G Communication Networks
17/07/2025	New Engineering Contract (NEC)
22/07/2025	Partial Discharge
23/07/2025	Anatomy of Wind Turbines
29/07/2025	Operating Regulations For HV/MV Systems - ORHVS



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