

wattnow

THE OFFICIAL PUBLICATION OF THE SOUTH AFRICAN INSTITUTE OF ELECTRICAL ENGINEERS

LIGHTING SYSTEMS

- 6 Industry News
- 18 Student News
- 28 Tertiary Education Facilities in South Africa
- 30 **Eco-friendly Lighting Solutions in South Africa**
Lighting Solutions that makes you do your bit for a greener world
- 32 **Using LEDs with Onboard Thermistors**
Calibrating systems with a thermal feedback mechanism
- 44 SAIEE Load Research Chapter
Past and Future
- 50 Legal Matters: Engineering in the Age of POPIA
- 52 Opinion
- 56 SAIEE Membership
- 58 SAIEE Council
- 60 SAIEE Centres
- 61 SAIEE Events Calendar



Dear **wattnow** reader

After a well-deserved break, we are back on the hamster wheel and have hit the road running.

Our first issue for the year features Lighting Systems - a carefully planned system to provide proper lighting in a building or environment.

Our first feature article, on page [30](#), discusses "Eco-friendly Lighting Solutions in South Africa. The scramble for creative power solutions is driving green tech development that could offer significant sustainability gains in the long run.

Luminus offers a range of high-power LED packages with built-in thermistors, which act as temperature sensors within the package. These thermistors are crucial for providing feedback to control the power delivered to the LED. Read this article on page [32](#), "Using LEDs with Onboard Thermistors"

The SAIEE is gearing up for its highly anticipated Annual Awards on 14 March at The Focus Rooms in Johannesburg. Join us for an evening of celebration and be entertained by the prolific Riaad Moosa! Please ensure you book your tables or tickets by no later than 28 February, as we cannot accommodate anyone after that date. [Click here](#) for more information.

Please check out the Events Calendar on page [61](#) for upcoming significant events. We encourage you to participate and be part of our vibrant community. Ensure you don't miss out!

The March issue features Energy Efficiency, and the deadline is 14 February 2025. Please email any contributions to minx@saiee.org.za.

Herewith is the February issue; we appreciate your continued support and hope you enjoy the read!

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Pascal Motsoasele
2024/5 SAIEE President

Dear SAIEE Members, Council, and Staff,

As we commence the year 2025, I extend a warm welcome back to each of you. I trust that the festive season provided you with rest and rejuvenation and that you are as eager as I am to embark on the opportunities and challenges that 2025 holds.

The past year has been marked by significant milestones, thanks to the unwavering dedication and hard work of our Council, Committees, Centres, Sections, Chapters, and staff. I am particularly pleased with the number of our members who have put their hand up for nomination into boards, councils, and various government and public organisation structures; this is how we shall help shape the engineering narrative in this country!

There have also been challenges. I'm comfortable to have received notes of outrage expressed by some members on some of our positions on matters related to public discourse, notably the matter around Eskom's MYPD6 application. Some have even threatened to relinquish their membership and actively campaign against the Institute. As a 6000-strong membership institute, we may not all agree on some standpoints, but this is expected. Safe to say, open and frank communication remains the cornerstone of our progress. Instead of threatening to divorce the Institute,

I invite you to continue to share your insights, suggestions, and feedback. Let us maintain an open dialogue and participate in the debates; walking away is never the solution.

As we enter 2025, I encourage each member to participate actively in the Institute's initiatives. Your involvement is pivotal in driving innovation, fostering professional growth, and contributing to the broader engineering landscape and discourse in South Africa. Let us collaborate, share knowledge, and support one another in our pursuit of excellence. Your collective efforts have substantially elevated the SAIEE's brand and prestige, and for that, I express my deepest gratitude.

One of the highlights of our calendar is the SAIEE Annual Awards (***see invitation on the right***), scheduled for the 14th of March 2025. This event is an opportunity to honour outstanding contributions in our field. I urge you to nominate deserving colleagues with exceptional skill, leadership, and innovation. Nominations are currently open; detailed information can be found on our website. In addition to submitting nominations, I encourage you to attend the Awards Dinner. It promises to be an evening of recognition, networking, and inspiration. Bookings for seats and tables are now available. Please secure your spot and invite peers from across the engineering industry to join us in this celebration of excellence.



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

SAIEE ANNUAL GENERAL MEETING (AGM)

The SAIEE Annual General Meeting will be held on the 27th of March, 2025, at the SAIEE Head Office in Observatory, Johannesburg. At this meeting, I will conclude my term as President, and my successor will be inaugurated. Your participation in the AGM is vital as we continue to shape the future of our Institute together.

CELEBRATING LEADERSHIP IN AFRICAN ENGINEERING

With great pride, we acknowledge our fellow SAIEE member, Eng. Refilwe Buthelezi PrEng, on her election as the 6th President of the Federation of African Engineering Organisations (FAEO). We extend our heartfelt congratulations and assure her of the SAIEE's unwavering support in her mission to create "The Africa We Want."

LOOKING AHEAD

As we navigate the year ahead, let us continue to collaborate, innovate, and uphold the standards of excellence that define the SAIEE. Together, we can achieve remarkable advancements in the engineering sector locally and across the African continent. **wn**



Pascal Motsoasele
SAIEE President

SAIEE ANNUAL AWARDS

IN COLLABORATION WITH REVIVE ELECTRICAL TRANSFORMERS



SAIEE President Pascal Motsoasele invites all members, affiliates, and students to the SAIEE Annual Awards. Join us in celebrating success and enjoy a performance by the acclaimed comedian, actor, and doctor Riaad Moosa. Book your tickets now!

Date 14 March 2025 **Time** 17h30 for 18h00

Price R500/p* | R800/couple* | R4 000 /table of 10*

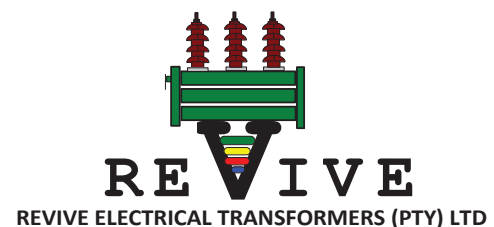
Venue The Focus Rooms, JHB | **Dress Code** Formal

Cash Bar **Book now** | Gerda Geyer **by** | 28 February 2025



* All price are excluding VAT

OUR SPONSORS



SAIEE KZN Centre Annual Awards



The SAIEE KZN Centre Annual Awards Gala Dinner 2024 was a night to remember, filled with inspiration, camaraderie, and heartfelt celebration. Hosted in grand style, this remarkable evening recognized the exceptional achievements of individuals and teams in the engineering field, celebrating their contributions to innovation and progress.



The highlight of the evening was the recognition of excellence across various categories:

- Best Student - University of KwaZulu-Natal: Jesheran Levien Yengopal
- Best Student - University of Zululand: Sifundo Hlophe
- Best Student - MUT: Luyanda Busane
- Significant Project Award: Zutari – Mr. Richard Ahlschlager
- Young Achiever Award: Ms. Viroshnee Gounden
- Women in Engineering Award: Mrs. Themesha Khan

These awards are a testament to the power of perseverance, innovation, and leadership in shaping the future of engineering.

The phenomenal Conrad Koch, a world-renowned ventriloquist, joined by his famous puppet, Chester Missing, added a spark of humour and light-heartedness to the evening. Their sharp wit, engaging banter, and clever commentary brought waves of laughter and joy, making the event truly unforgettable.

The success of the gala was made possible by the unwavering support of our sponsors, whose generosity underscores their commitment to fostering excellence in engineering:

- Aberdare Cables
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- Siemens
- Smartlock
- Switchboard Group
- Zutari

The night's seamless execution was a result of the tireless efforts of the planning committee: Krystle Annamalai Nageshar, Maveshini Govender, Luendran Govender, Umeshan Pillay, and Omaira Jajbhay. Their dedication, creativity, and attention to detail ensured every aspect of the event reflected excellence.

The SAIEE KZN Centre Annual Awards Gala Dinner 2024 was more than just an event—it was a celebration of brilliance, innovation, and the limitless potential of engineering.

As we honour these remarkable achievements, we look forward to a future filled with groundbreaking advancements and impactful contributions. **wn**





From left: Richard Ahlschlager, Shepher Nkosi, Pascal Motsuasele (SAIEE President), Krystle Nageshar (KZN Chairperson), Jay Kalichuran and Veer Ramnarain (SAIEE Deputy President).



*Best Student - University of KwaZulu-Natal:
Jesharan Levien Yengopal*



Best Student - MUT: Luyanda Busane



*Best Student - University of Zululand:
Sifundo Hlophe*



*Women in Engineering Award:
Mrs. Themesha Khan*



Young Achiever Award: Ms. Viroshnee Gounden



*Significant Project Award:
Zutari – Mr. Richard Ahlschlager*



*Entertainer: Conrad Koch with his famous puppet,
Chester Missing*

Staying ahead of the automation, AI and machine learning curve



*Muhammad Ali
Managing Director, WWISE.*

SA businesses should act sooner rather than later before many practical, easy-to-implement tools become redundant and ineffective.

Over 60% of South African workers use generative AI tools regularly, and 21% integrate them into their daily duties.

This is one of the critical findings of a study released by the Oliver Wyman Forum this year. This platform strives to bring together business, public policy and social enterprise leaders to help solve the world's most challenging problems.

According to the study, which surveyed employees from various nations, South Africa's genAI adoption rate is even higher than countries like France (41%) and the US (46%).

However, the survey also found that 70% of respondents are concerned that technology will make their jobs redundant. "They shouldn't be," says Muhammad Ali, managing director of South African ISO specialist World Wide Industrial & Systems Engineers (WWISE).

He points out that countries like Singapore, a global leader in AI adoption, continue to boast an unemployment rate of less than 3% despite widespread use of the technology.

"AI can assist with marketing, creating content and understanding your audience. AI also processes large amounts of data into structured and relevant pillars of information. If prompted correctly, the uses are endless, from documenting policies, processes and procedures to finding solutions that address common problems," he says.

For example, WWISE relies on the AI tool Claude 3.5 Sonnet to create accurate prompts that can drive efficiency and reduce errors in business processes.

Gundo Mukwevho, a full-stack developer at WWISE, says businesses can streamline workflows, enhance customer service, and improve decision-making by leveraging AI tools like ChatGPT, Power Automate, UI-Path, and Claude AI.

"This combination of tools enables cost-effective automation of routine tasks, faster data-driven insights and scalable support solutions, allowing teams to focus on strategic work while enhancing operational efficiency and customer satisfaction."

Ali is unequivocal that companies that continue to use outdated systems to manage operations risk making their confidential information public in an increasingly digital world that relies on AI.

Furthermore, he says that not embracing AI and machine learning will inevitably leave companies behind.

Technology is advancing at an unprecedented rate, and even existing AI tools are quickly becoming redundant. This means organisations must constantly stay one step ahead while fully utilising the currently available tools to save time and money.

Ali recommends that businesses implement AI and machine learning

PV CIRCUIT PERFORMANCE BEST PRACTICES

SOLAR POWER - MEASURING AND ANALYSING PV CIRCUIT PERFORMANCE
WITH [FLUKE SOLMETRIC PVA 1500 IV CURVE TRACER](#)

tools methodically and use International Organisation for Standardisation (ISO) standards like ISO 42001:2023 Information Technology—Artificial Intelligence to ensure an effective rollout.

“This standard offers many benefits. It improves AI applications’ quality, security, traceability, transparency and reliability.

It also offers better regulatory compliance through specific controls, audit schemes and guidance consistent with emerging laws and regulations. These aspects all contribute to the ethical and responsible use of AI.”

ISO/IEC 27001:2022, which covers Information Security, Cyber Security, and Privacy, remains the most common standard for organisations using AI.

It manages risks within the entity and determines the correct measure of control when using or developing AI.

ISO standards in automation and AI help ensure long-term effectiveness and adaptability by:

- Creating a management system to govern the use and development of AI using international best practices.
- Implementing policies, processes, and procedures ensures the risks are understood, and mitigations are acknowledged and planned for before utilisation or development.
- Assisting organisations to effectively use AI without disclosing confidential information. **wn**



Regardless of the test method, you must know the plane of array irradiance and cell temperature to evaluate PV circuit performance. Pay attention to environmental conditions to ensure you can interpret your I-V curves accurately, as rapid changes in the irradiance or cell temperature can introduce errors to your I-V curve tests. Proper sensor types and test methods, like the [Fluke Solmetric PVA 15i-V](#) curve tracer, should be used for reliable results.

ENVIRONMENTAL CONDITIONS FOR TESTING

Optimal performance tests are conducted under stable weather conditions with irradiance above 700 W/m². This is particularly crucial when establishing a performance baseline at commissioning or recommissioning and relevant for troubleshooting.

The standard test condition irradiance is 1000 W/m², and the closer the field test conditions are to standard test conditions, the more accurate the interpretation of I-V curves will be. Good test conditions will most likely occur during the 4-hour window around solar noon.

IRRADIANCE MEASUREMENTS AND THEIR IMPACT

Irradiance measurement errors can significantly affect photovoltaic performance testing.

For instance, a small error margin in irradiance can overshadow the accuracy of even high-quality I-V curve tracers like the Fluke Solmetric PVA -1500. Fast-moving clouds near the sun and high-elevation cirrus clouds are particularly problematic. One of the benefits of using I-V curve tracers for performance test measurements is that you can save critical environmental data along with the I-V data.

TEMPERATURE MEASUREMENTS IN PHOTOVOLTAIC SYSTEMS

While PV module performance is less sensitive to temperature variations than irradiance, it's still a significant factor. Light-gauge thermocouples are preferred for measuring cell temperature under varying conditions. **wn**

For more information, contact COMTEST on sales@comtest.co.za or visit www.comtest.co.za.

SAIEE FINANCIAL CHAPTER LAUNCH

- DEDICATED TO EMPOWERING OUR MEMBERS



Misheck Mdala
Chairman | SAIEE Financial Chapter

The South African Institute of Electrical Engineering (SAIEE), formed in 1909, is excited to launch the SAIEE Financial Chapter, sponsored by Old Mutual Financial Services, for all SAIEE Members and Corporate Partners nationwide.



Old Mutual, founded in 1845, aims to assist customers in achieving their lifelong financial goals while investing their funds in ways that will foster a positive future for themselves, their families, their communities, and society.

THE IMPORTANCE OF FINANCIAL LITERACY

Financial literacy is an essential skill for navigating the complexities of modern life. It is crucial for securing a stable and prosperous future, from managing personal finances to making informed investments and retirement planning decisions. Without a solid understanding of fundamental financial concepts such as budgeting, saving, and investing, individuals may struggle to make ends meet or fall victim to predatory financial practices.

By prioritising education in financial literacy, individuals can empower themselves to make well-informed decisions and achieve financial independence.

The SAIEE Financial Chapter is dedicated to empowering students, engineering professionals, and corporate leaders with essential knowledge for achieving financial well-being. Join us in transforming your understanding of finance and securing a prosperous future.

The SAIEE Financial Chapter will launch via webinar on March 20, 2025, at 11 a.m. SAST.

[Click here](#) to register; it is free to attend!

ABOUT MISHECK MDALA

Misheck Mdala is a seasoned financial advisor at Old Mutual, boasting 33 years of experience providing expert financial planning and intermediary services. As a Certified Wealth Planner and Fit and Proper Financial Advisor, Misheck is dedicated to helping clients – both individuals and corporations – create and protect their wealth.

Misheck's expertise spans risk mitigation solutions, estate planning, investments, and SME opportunities. He works closely with clients to build and maintain their wealth while coordinating financial education programs for communities, including employees, managers, employers, and directors.

Throughout his illustrious career, Misheck has received numerous accolades, including:

- Top Advisor Prize for delivering quality business and best persistence (national)
- Area Top Advisor Prize (consistent for 5 years)
- Gauteng Regional Top 25 Advisor Prize (consistent for 5 years)
- Trip prize to London to watch the Rugby World Cup (2015)
- National Top 50 Advisors Prize to tour the Namib Desert (2016)
- The current holder of the Area Prize for Corporate Relationships

Misheck holds a Certificate in Financial Planning and is committed to making a meaningful difference in his clients' lives.

14-15 MAY 2025

**MARRIOTT HOTEL MELROSE ARCH
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ADVANCING INFRASTRUCTURE DEVELOPMENT AND ACCELERATING PROJECTS THAT DRIVE AFRICA'S ECONOMIC GROWTH AND PROSPERITY

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Enabling Africa's solar potential

– lighting the way with technology



As the global population continues to grow, energy demand also rises.

As the global population continues to grow, energy demand also rises. To meet this increasing demand, it is crucial to integrate renewable sources into the energy mix. Solar power is vital in building a more sustainable future with lower emissions among these renewable sources.

By Joyce Moganedi

Solutions Sales Manager - ABB Energy Industries

According to Statista, the global solar power sector is expected to grow by 7.3 per cent annually between 2024 and 2029. The study also explains that among developing countries, Africa and the sub-Saharan region will see an exponential increase in energy demand in the coming years. With many households still needing electricity, scaling up solar power projects using automation and digital solutions from partners like ABB can help bridge the gap.

However, balancing renewable power supply with end-user demand is challenging as the share of renewables grows.

SOLAR POWER AND AFRICA

With evolution and technological innovation, the first photovoltaic (PV) or solar cell, which converts light energy to electricity, was invented in 1954.

Today, PV panels and concentrated solar power plants (CSPs) generate electricity in the clean energy transition. CSPs utilise mirrors or lenses to concentrate sunlight, heating a fluid that drives turbines and solar home systems (SHS) and providing electricity to households.

According to a 2023 UN Trade and Development report, 53 per cent of Africa's population still needs electricity. Tapping into the region's vast resources and opportunities in solar power will help secure its future. However, utilising these resources requires investment in solar power projects and building infrastructure, including robust grid systems that help transmit electricity

to consumers. According to the International Renewable Energy Agency, only two per cent of global renewable energy investments have been made in Africa in the past two decades.

ABB has supported the solar power sector since the 1990s with automation, electrification, and digitalisation solutions. It exhibits technology expertise in harnessing, controlling, and storing solar energy and efficiently converting it into a reliable power source ready for transfer into the local grid. Let us delve deeper into how ABB is enabling solar power projects in Africa.

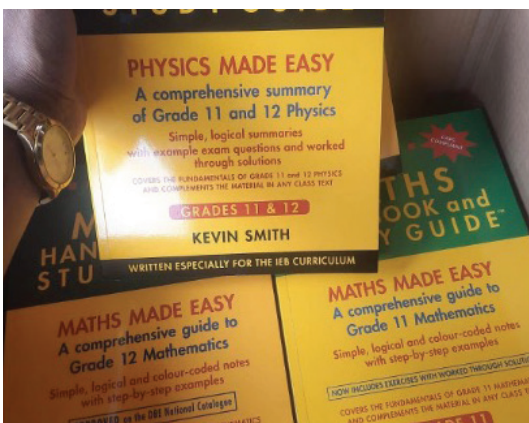
SUPPORTING THE SOLAR REVOLUTION

ABB's extensive portfolio of products, systems, and solutions for the solar power industry caters to industrial and home use. Photovoltaic applications focus on delivering continuous operation, higher reliability, and return on investments.

ABB has supported several solar power projects in Africa as the automation and electrical solutions provider. ABB has supplied the state-of-the-art ABB Ability™ Symphony® Plus SCADA automation platform, which is open, flexible, and scalable and serves as a reliable and secure platform for solar applications.

Solar power is a bright spot in Africa's energy landscape, promising to illuminate many more lives. ABB's design, engineering, and commissioning capabilities will help harness this untapped clean energy and secure the region's future. **wn**

Book donation drive in partnership with Girls4Girls (G4G) and National Transmission Company South Africa (NTCSA) EWAP



SAIEE CGC, in collaboration with G4G, NTCSA Eskom Women Advancement Programme, and Cigre Southern Africa Women, embarked on a book donation drive project to restore the recently burned-down library of Zitiken High School. Zitiken High School is situated in Tembisa, the largest township to the north of Kempton Park on the East Rand.



The drive collected more than 1500 books, which were handed to Zitiken High School on November 7, 2024. SAIEE CGC additionally donated Mathematics and Science study guides to top grade 11 learners, which will help provide support tools to enable learners to master all areas of mathematics and Science.

SAIEE CGC believes that reading plays a pivotal role in breaking the cycles of poverty and promoting sustainable development.

We look forward to participating in the development of such initiatives, which will help create a more informed, compassionate, and empowered society, reflecting the ideals that Madiba stood for throughout his life. **wn**



Take a girl/boy child to work at Eskom NTCSA National Control Centre



SAIEE CGC, in collaboration with NTCSA Eskom Women Advancement Programme and Cigre Southern Africa Women in Energy, hosted grade 11 school learners from Phateng High School at Eskom NTCSA National Control Centre. Phateng High School is situated in Mamelodi, a township northeast of Pretoria.

The goal of the initiative was to deepen the thinking of the girl/boy child about their infinite roles in society, enhance their self-esteem, and motivate and inspire them to reach their full potential and consider STEM-related careers.

The learners had an opportunity to visit the National Control Centre, the nerve centre of the Power sector, where the entire power generation and its transmission to the load centres are controlled and coordinated.

This was followed by addresses from Phokoane Moshodi, Senior Manager Grid Code Management, Maite Mailula Sako-Chief Engineer Grid Code Management, Correen Gertzen-Chief Engineer Operations Performance, Neo Mapapanyane -Chief Engineer Cigre Southern Africa Women in Engineering Chairperson, Christinah Mohloki-Senior Technologist and Rose Bonolo- UJ student both are SAIEE CGC Committee members and the NTCSA EWAP Coordinator and SAIEE CGC Chairperson- Mantsie Hlakudi.

It was a beautiful event filled with open conversations and a shared commitment to create an environment that inspires girls/boys to dream, believe and achieve.

With four organizations joining hands, we demonstrated the Power of unity in making a difference.

Thank you, ECSA, for your support with the gift bags for the learners and for standing with us in this vital cause. Together, let us continue to make a difference. **wn**



SAIEE CGC played a crucial role at the 2024 International Science Fair



On Wednesday, 25th September 2024, Emperor's Palace Hall buzzed with youthful energy as Eskom hosted its 2024 International Science Fair of the Eskom Expo for young scientists.

This event witnessed remarkable participation from students across the country as it aimed to attract learners to science, technology, engineering, and mathematics (STEM) fields and open up their imagination to scientific concepts beyond what is taught at school.

The SAIEE committee members played an essential role as judges, and that included Thabiso Motau, Education and Training Lead, and the SAIEE CGC chairperson, Mantsie Hlakudi. The participation involved scrutinising and selecting energy projects that met international standards and whose authors may represent South Africa at various international science fairs in 2025.

In the future, the SAIEE CGC hopes to expand the number of schools that take part and "adopt" a school in Gauteng to mentor and expose young learners to research in engineering.

SAIEE awarded the Best Engineering Projects one Special Award of R8 000 in cash. The Special Award winner was from the Mopani Region, Ntokozo Nkuna.

The final selections considered the novelty and scientific soundness of the projects. The groundbreaking project tackled the real-world challenge of solving load shedding using the Tesla coil's wireless power transmission.

SAIEE 's active participation and sponsorship of the special awards ceremony demonstrate the support for ensuring that the next generation of engineers and scientists are well equipped to tackle the challenges of tomorrow. **wn**

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THAT WHICH IS BUILT SOUNDLY ENDURES WELL

Studies and monitoring ensure the safe operation of nuclear power stations



SRK's work included technical studies in the fields of hydrology, geohydrology, geo- technology, and meteorology

Eskom's Koeberg nuclear power station was recently licensed to operate Unit 1 for another 20 years, with SRK Consulting updating the site investigation reports—the Site Safety Report (SSR) required by the National Nuclear Regulator (NNR).

According to Derry Holmes, principal consultant at SRK Consulting, these studies were part of a range of updates undertaken by SRK that need to be conducted every five to ten years. The work is related to Eskom's Duynefontyn site, where Koeberg is located.

"Our work for Eskom included addressing comments by the NNR on the previous version of the Duynefontyn SSR as part of the long-term operational licence application for Koeberg," said Holmes. Koeberg's Unit 1 is one of around 120 reactors worldwide that have safely continued operations beyond their initial 40-year life.

STRINGENT STANDARDS

Nuclear projects are governed by stringent local and international quality and safety standards, requiring a wide variety of aspects to be monitored, analysed, and reported. SRK's work included technical studies in the fields of hydrology, geohydrology, geotechnology, and meteorology. It also looked at land, water, and sea use, ecology, demography, and water supply, as well as transport routes and nearby industrial and military facilities.

"Much of the work is conducted by our in-house professionals in specific disciplines, and other aspects are contracted out to specialist associates," he said. "Town planners, for instance, conduct the investigations on demography, land use, water use, adjacent sea use, and nearby transportation, industrial and military facilities."

Holmes said the whole life of the nuclear plant must be considered, so it is important to be able to forecast population growth and movement over this expected lifespan.

"One reason this data is relevant is the plant's potential radiological impact," he said. "For purposes of emergency planning – such as determining an appropriate transport evacuation model – planners also need to know how many people are likely to be in the area in future decades."

SAFE OPERATION

Using the concept of 'pathways to humans', the specialists must consider all the possible ways that people can be exposed to radiological impact – through proximity, the food chain, water or other channels. The regulator is then in a position to ensure that the plant will – or continues to – operate safely at that geographic location.

While this work considers the potential radiological impacts of the plant on its surroundings, the site safety investigation also considers the surroundings' impacts on the plant and its safe operation.

"These aspects include the geology and geohydrology of the ground on which the plant is built, as well as seismic risks to the integrity of the operation," he says. "This extends to identifying air traffic routes, considering the potential for aircraft-related accidents."

The big question to answer with all this data is whether the environment poses a



Eskom's Koeberg nuclear power station was recently licensed to operate its Unit 1 for another 20 years, with SRK Consulting playing a role in updating the site investigation reports – the Site Safety Report required by the National Nuclear Regulator.

risk to site safety in which the plant can operate throughout its life cycle.”

MANY MOVING PARTS

In the face of identified risks, the studies also consider whether there are any impediments to creating an effective emergency plan so that people can be evacuated from the area in the event of an incident. This includes considering not only the existing transportation infrastructure but also the likely future scenarios, taking into account economic growth and urbanisation.

“The planning of nuclear power stations requires the gathering of considerable data but also demands intensive engagement with stakeholders like local government,” he explained. “While the planners must understand the spatial development frameworks of

municipalities or metros, there must also be agreement between parties about what happens in the future.”

This is because the power station must be able to reasonably forecast where infrastructural and urban development is likely to occur in the coming decades. Consider, for example, the impact if the local government changes its plans in a way that could unexpectedly impact the power station.

SRK has been involved in site safety assessments and monitoring for possible nuclear power plants for over 18 years, said Holmes. This includes geohydrological water monitoring, where water levels and quality are checked in dedicated boreholes, as well as meteorological monitoring of factors like temperature, wind, solar radiation

and rainfall. The ecology aspects of an SSR can benefit from information originally gathered for a project’s Environmental Impact Assessment (EIA).

“While the EIA assesses how the power station might impact the ecology, the SSR assesses how the ecological environment may affect the running of the plant,” he said. **wn**



Why Engineering Students should join the SAIEE



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

ABOUT THE SAIEE

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

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

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

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

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

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

- **Jobs portal for WIL**

SAIEE Student Members receive preferential placing for their Work Integrated Learnership (WIL) with our SAIEE Corporate Partners

- **Mentorship**

The SAIEE has a cohort of mentors who are willing and eager to assist our student members with their studies and career guidance

- **Exclusive Networking Events**

StMs attend all SAIEE events for free and are exposed to industry decision-makers

- **CPD training discounts**

To maintain your continuous development, the StM receives significant CPD training discounts

- **Charge Reward Programme earnings**

As a StM, when attending SAIEE events, you earn Charge Reward Points, which can be claimed against paying for training courses, etc.

- **Bursary programme**

StMs receive preferential treatment when they apply for a SAIEE Bursary

- **Publication access**

Student members have access to all SAIEE publications since its inception in 1909, which include the monthly online wattnow magazine and the peer-reviewed Africa Research Journal

- **Site visits**

SAIEE Student members are invited to site visits free of charge, which is CPD accredited, where you can learn hands-on how manufacturing facilities operate

- **SAIEE Centres**

SAIEE has nine centres nationwide, and we encourage students to get involved at their local SAIEE Centre and represent your student chapter on the Centre EXCO committee.

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



Serving Since 1909

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

Why Join Us

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

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.



Contact Us

-  SAIEE House, 18A Gill Street, Observatory, JHB
-  011 487 3003
-  www.saiee.org.za

The SAIEE FSC Unites Students in End-Year Celebration and Planning Session



The SAIEE at the Central University of Technology, Free State student chapter closed the year in grand style, hosting a vibrant end-of-year function and a collaborative meeting with their counterparts from the Motheo College student chapter. This event provided students with a well-deserved break from their rigorous academic schedules and laid the foundation for a collaborative and impactful 2025.

FORGING CONNECTIONS AND PLANNING AHEAD

The day began with a formal meeting between the SAIEECUT Student Chapter at CUT and Motheo College's Student Chapter. The discussions were centred on reflecting on 2024's achievements and setting goals for the upcoming year.

Together, the two chapters envisioned an ambitious plan for 2025, focusing on initiatives that would benefit both university and college students.

Key discussion points included:

- **Joint Events:** Creating opportunities for students from both institutions to participate in shared workshops, networking sessions, and technical competitions.
- **Knowledge Sharing:** Establishing a stronger communication channel between chapters to exchange ideas and resources.
- **Student Engagement:** Prioritising events catering to academic growth and social interaction, ensuring a balanced and enriching experience for members.

A DAY OF FUN AND RELAXATION

After the meeting, students gathered for a fun-filled celebration to unwind after a challenging exam period. The event offered a range of activities, including games, trivia sessions, and team-building exercises, providing a much-needed outlet for relaxation and social interaction.

The chairperson of the CUT chapter and their dedicated team were instrumental in organising the event. Their efforts ensured seamless communication with Motheo College's chapter, fostering a spirit of collaboration and inclusivity. The chairperson also emphasised the importance of encouraging more events and information-sharing initiatives between the two chapters.

STUDENT VOICES

"This event was exactly what we needed after such a stressful exam period," said one participant. "It was great to have a space where we could connect with fellow engineering students, not just from our university but also from Motheo College. It really felt like we were part of a larger community."

LOOKING FORWARD TO 2025

The success of this end-of-year gathering has set a strong precedent for the SAIEE's activities in 2025. With a renewed focus on collaboration, innovation, and student engagement, the organisation aims to create even more impactful experiences for its members.

Thanks to the leadership of the CUT chapter and Mr T Phali (the guardian). The SAIEE is poised to continue its legacy of empowering electrical engineering students through community, knowledge-sharing, and unforgettable events. **Wn**



Women's Campus Road Show at Motheo TVET College



The Women's Campus Road Tour successfully achieved its mission of empowering women and fostering innovation in business. The event was a motivational platform for students and professionals, showcasing real-life success stories and encouraging collaboration.

The Motheo TVET SAIEE Student Chapter's participation raised awareness about the organisation and attracted new members, strengthening its presence and mission on campus. The event concluded with a networking session where attendees connected with the speakers and other participants, fostering community and empowerment.

On October 16, the Motheo TVET SAIEE Student Chapter was invited to the Women's Campus Road Tour, a significant event to empower women to lead and innovate in business, fostering a future where female entrepreneurship thrives. The event was organised by Ms Katja, who highlighted the primary goal of encouraging women to take leadership roles in various industries and emphasised the need for business innovation.

KEYNOTE SPEAKERS AND PRESENTATIONS

Ms Katja, the Event Organiser, opened the event with a compelling speech about the event's mission: to empower women to lead and innovate in business.

Mrs Pulane Booysen, Electrical Artisan and Business Owner of PB General Trading shared her background as an electrical artisan and her transition into a successful business owner with over 50 employees. Her story of resilience and motivation during difficult times resonated with the audience, inspiring many to pursue their goals despite setbacks.

Ms Hunter Horval, Human Resources Expert, shared her extensive experience in Human Resources and gave practical advice on how students can enhance

their employability. She emphasised the importance of developing soft skills, building a strong professional network, and continuously improving oneself to meet the demands of the job market.

Ms Basetsana, who co-founded Air-Tech, a company specialising in UPS systems, detailed her inspiring journey as a mechanical engineering student. Her presentation focused on the challenges and triumphs of starting a business with fellow students from CUT and how their innovative product contributes to sustainable energy solutions.

Ms Mohajane, Guardian of the Motheo TVET SAIEE Student Chapter, introduced the history of the SAIEE Student Chapter at Motheo TVET College, highlighting its official launch and its role in supporting engineering students.

Ms Lindiwe Tola, Deputy Treasurer of Motheo TVET SAIEE Student Chapter, discussed the SAIEE Student Chapter's goals and aims and provided detailed information on how students could join and benefit from the organisation. She encouraged attendees to visit the Motheo TVET SAIEE Student Chapter office at B32, where several students registered as members during the event.

Mr Sipho Mahlangu, Motheo TVET SAIEE Student Chapter Chairperson, highlighted Motheo TVET College's unique position as the first TVET institution in South Africa to establish a SAIEE Student Chapter. He encouraged students to leverage the opportunities provided by SAIEE for networking, professional development, and engineering excellence, urging them to align with a platform that supports future engineers. **Wn**



IIE MSA SAIEE Student Chapter public lecture by SAIEE CGC

-THE IMPORTANCE OF JOINING THE SAIEE STUDENT CHAPTER



The IIE MSA student chapter, in collaboration with SAIEE Central Gauteng Centre (CGC), hosted a public lecture during October 2024.

The purpose of the lecture was to mobilise engagement and create awareness of the importance of joining the SAIEE student chapter. The speakers on this topic were Ms Mantsie Hlakudi, SAIEE CGC Chairperson and Ms Thabiso Motau, Education and Training Portfolio lead, CGC.

The lecture started with the speakers fervently delving into the introduction to SAIEE, sharing insight into the mission, values, and resources offered and how the students can become SAIEE student members.

Additionally, they shared the benefits of being involved with SAIEE, which are:

Mentorship: Accessing the guidance and support from seasoned professionals within SAIEE and the broader industry, helping you navigate your academic and career path with confidence.

Networking: Expanding your professional network and fostering meaningful connections with industry leaders, peers, and potential employers. Industry Field Trips: Immersing yourself in the industry through hands-on experiences, site visits, and interactive learning opportunities.

Community Outreach: Making a positive impact by participating in community outreach projects, using your skills to benefit society and enhance your personal and professional development.

Committee: Taking on leadership roles and contributing to the planning and executing chapter activities,

gaining invaluable experience in event management and teamwork.

Webinars and Workshops: Attending informative lectures, workshops, and courses.

We had a question and answer session after the presentation, and we were impressed with the eagerness of the students to engage.

We look forward to more learners Joining the Student chapter to embark on a journey of discovery, growth, and impact with the IIE MSA SAIEE Student Chapter! **wn**



Ms Mantsie Hlakudi-SAIEE CGC Chairperson



Ms Thabiso Motau

-Education and Training Portfolio lead, CGC



SAIEE UKZN Student Chapter's Year-End Event



The SAIEE UKZN Student Chapter hosted their Year-End Event on October 25, 2024, at the Deck @ Unite Conference Centre, thanks to the generous sponsorship from Aberdare Cables.

This gathering was a wonderful celebration of students' hard work throughout the year and a chance for final-year electrical, electronic, and computer engineering students to unwind and connect with peers and faculty just weeks before their Final Design Project submissions.

The afternoon was filled with inspiring talks, beginning with Professor Glen Bright, Dean and Head of the School of Engineering, who set an encouraging tone for the event. Following his address, representatives from Aberdare Cables took the stage to share their insights and experiences from the industry.

Dr Ernest Bhero represented the EECE Discipline and encouraged students to cultivate an innovative mindset, while Professor Tahmid Quazi urged students to consider their postgraduate options.

Viroshnee Gounden, the chapter's Chairperson, shared her reflections on the chapter's successes over the past year and offered advice for the upcoming final design projects. Nombulelo Ngidi, the Secretary, delivered a heartfelt vote of thanks, and Dr. Mohamed Fayaz Khan, Vice Chair of the SAIEE KZN Center, kept the energy flowing as the event's MC.

To add a bit of fun, the students voted in a light-hearted "Most Likely to..." category. Busiswa Sibiya was recognized as "Most Likely to Become a Minister," Uphile Kubheka as "Most Likely to Become a Lecturer," and Kopanang Letlatsa as "Most Likely to Become the Next Elon Musk."

Overall, it was a fantastic afternoon filled with laughter, recognition, and new connections, leaving everyone excited for what lies ahead. **wn**



Pictured (from left): Yanga Tibe (Activities Co-Ordinator), Mihir Singh (Public Relations), Philasande Khumalo (Vice Chair), Dr Mohamed Khan (KZN Centre Vice Chair), Ntuthuko Zulu (Junior Vice Chair), Nombulelo Ngidi (Secretary), Viroshnee Gounden (Chair).

SAIEE UKZN Student Chapter and Standard Bank Celebrate Class of 2024



The SAIEE UKZN Student Chapter has proudly partnered with Standard Bank to create a unique collection of custom-designed hoodies for the graduating Class of 2024 in Electrical, Electronic, and Computer Engineering.

As part of this exciting initiative, final-year students were invited to participate in a creative design contest, showcasing their innovative skills and personal experiences.

The winning design now serves as a vivid representation of their collective journey at UKZN, capturing the essence of their hard work, challenges, and achievements throughout their studies.

This collaboration not only highlights the commitment of Standard Bank to support education and student development

but also emphasises their dedication to helping these future engineers transition smoothly into their professional careers.

We are sincerely thankful for this invaluable opportunity and the encouragement it provides as our students embark on the next chapter of their lives. **Wn**



SAIEE UNIZULU Chapter Official Launch



The University of Zululand has proudly inaugurated its South African Institute of Electrical Engineers (SAIEE) Student's chapter, heralding the start of a thrilling venture that promises to foster innovation, facilitate knowledge exchange, and bridge the gap between industry and academia.



Pictured (from left): Mkhwanazi Mngqobi (Vice Chair), Dr Oni (SAIEE rep), Mzulwini Ntombizethu (Secretary), Conjwa Khodani (Chair), Ntanzi Nqobile (Activities Coordinator), Khumalo Sphehile (Treasurer), and Mkwanazi Sabelo (Public Relations).

The launch event, which attracted a diverse audience of eager students, dedicated faculty members from the Engineering department, and distinguished representatives from Mondi Group, was a resounding success.

Among the highlights of the occasion was Dr. Oni, a prominent representative from SAIEE, who captivated the audience with an engaging presentation on the institute's mission and the myriad benefits it offers to aspiring engineers. The representatives from Mondi contributed their expertise by sharing invaluable insights into the transition from academic life to the professional realm. They provided practical guidance on crafting impactful CVs, mastering the art of job interviews, and navigating the complexities of entering the workforce.

This launch event served as an exceptional platform for students, enabling them to interact directly with seasoned industry professionals.

It not only encouraged meaningful connections but also opened doors to future collaborations. The event set an optimistic tone for the journey ahead, underscoring the importance of collaboration between educational institutions and the industry, while emphasizing opportunities for professional development, research initiatives, and extensive networking that will benefit all participants. **Wn**



Two South African Students advance to international round of a young researchers awards



Two Master's in Engineering students from Stellenbosch University, Yasmin de Raay and Chris Erasmus, have advanced to the international round of the 2025 Blue Sky Young Researchers and Innovation competition.

Their projects impressed the Paper Manufacturers Association of South Africa (PAMSA) for their originality and relevance to the forestry sector which play a key role in producing wood and paper.

Managed by the International Council of Forestry and Paper Associations (ICFPA), this competition seeks projects from researchers under 30 years of age who are working in forest-based science, products using wood, pulp or paper as a raw material, process improvements, or other innovations throughout the forest sector value chain.

As first and second place winners in the South African competition, Erasmus and De Raay, they were awarded R15,000 and R10,000 respectively.

Their projects will now be judged against those from the United States, Canada, Europe, and Australia. An international panel will select the top three global finalists who will then present their projects at the ICFPA CEO Global Roundtable in May 2025 in New York.

"As a sector that has for decades centred around the renewability of wood, both of these projects offer significant value for forestry companies by enhancing sustainable forest management and improving crop yields," says Jane Molony, PAMSA executive director. "This in turns supports the sustainable supply of wood into pulp, paper, and sawn timber industries."

INNOVATIVE SOLUTIONS IN AGRITECH AND FORESTRY

Both submissions focused on the monitoring of aspects of tree health which plays a critical role in tree resilience and resource optimisation by using technology to capture and analyse data continuously and remotely.

Erasmus, who is completing a Master's in Electrical and Electronic Engineering, has developed a wireless dendrometer and environmental sensing system tailored for the forestry industry. This solar-powered device tracks tree growth patterns, water dynamics, and environmental stressors such as temperature, humidity, and soil moisture with precision. It offers a cost-effective, low-maintenance solution, reducing the need for human intervention while ensuring consistent accuracy and reliability.

"Our dendrometer allows seamless, real-time monitoring of trees' daily growth variations, using advanced technology to overcome the limitations of traditional analogue systems, which are prone to noise and interference," notes Erasmus.

De Raay is pursuing a Master's degree in Industrial Engineering, specialising in agritech, with a strong focus on integrating technology and nature conservation. "My honours and master's theses both focus on agritech, and through my work in the open-air eucalyptus laboratory, I've had the opportunity to apply engineering to sustainable forestry," she explains.

Her project introduces a mini rhizotron system designed to remotely monitor root growth and dynamics in forestry plantations.

By using machine learning techniques and capturing microscopic images of roots, this system provides continuous, cost-effective access to vital root growth data, even in remote field settings, improving resource optimisation without sacrificing quality.

RECOGNISING INGENUITY IN FORESTRY INNOVATION

"We are excited by this ingenuity, which not only highlights South Africa's scientific talent but also has the potential to make a meaningful impact in our sector," says Molony. **wn**



Chris Erasmus



Yasmin de Raay



Universities in South Africa



It is only through education that people are able to improve themselves. One of the most important factors for escaping from poverty is education. The only way a society can continue to grow and prosper is through proper education at all levels.

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Corporate Partners

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

Corporate Partners receive:

- Access to 6000 engineering practitioners
- Rub shoulders with your industry peers
- Preferential rates on all SAIEE advertising platforms
- Access to the peer-reviewed Africa Research Journal
- Website Listing linking to your website
- Product Launch Platform
- Training Facilities
- Networking Opportunities
- Recruitment Administration
- Skills Development Courses
- Preferential CPD training course rates for your employees
- 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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Eco-Friendly Lighting Solutions in South Africa



Lighting has been at the forefront of many South Africans' minds over the past few months amid nationwide blackouts. However, load shedding may have its upside. The scramble for creative power solutions is driving green tech development that could offer significant sustainability gains in the long run.

Rechargeable lamps and power-saving gadgets could start a greater shift towards eco-friendly illumination.

Paired with other industry pressures, such as global sustainability demands and regulatory trends, the local lighting industry is on the brink of a major transformation.

5 LIGHTING INDUSTRY TRENDS THAT CHAMPION SUSTAINABILITY

LED LIGHT BULBS LEADING THE WAY

By now, it's well-known that LED lights are the most energy-efficient option. In 2022, MyBroadband tested the energy efficiency of different bulbs available in South Africa. LED bulbs were almost twice as efficient as CFLs and at least eight times more efficient than incandescent globes.

LED lighting is becoming more commonplace, a trend most noticeable in the automotive sector. Today, it's not uncommon to see bright white LED headlamps on the roads, especially on luxury vehicles.

LEDs use far less energy to produce much more light and last much longer, generating less lighting waste in the long run. This trend spilt over into domestic lighting, with the price of incandescent bulbs, CFLs, and fluorescent lights increasing on 1 April 2024. This development forms part of the government's new energy efficiency standards, which aim to phase out old lighting technologies in favour of LEDs.

AFFORDABLE SOLAR-POWERED LIGHTS

South Africa is on a solar-installation spree. Today, our country is responsible for almost 79% of all African solar power generation. During the first half of 2023, there was a massive influx of solar panel imports into the country, which created an oversupply towards the end of the year. Prices dropped 40 - 50% over 12 months, making rooftop solar more accessible than ever.

However, it is still considered an out-of-budget luxury for most South Africans. Those who can't afford to go completely off-grid are finding more creative alternatives. Over the past few months, we've seen a boom in solar-powered light bulbs designed for indoor use - an affordable, eco-friendly solution to load shedding.

SMART LIGHTING SYSTEMS

Smart lights contain electronic chips that allow you to control them from your phone. Users can typically adjust the brightness and colour temperature, switch lights on and off remotely, and monitor their energy usage from a smartphone app. In South Africa, consumers can buy smart lights for domestic use from brands such as Philips, Tp-Link, and Bneta.

Smart lighting is part of a greater global interest in smart homes and cities. The Lanseria Smart City initiative, which President Cyril Ramaphosa announced in 2020, may implement smart lighting solutions on a large scale. These systems

are far more eco-friendly thanks to their reliance on LEDs and ability to precisely control energy consumption.

IMPROVED LIGHT BULB RECYCLING REGULATIONS

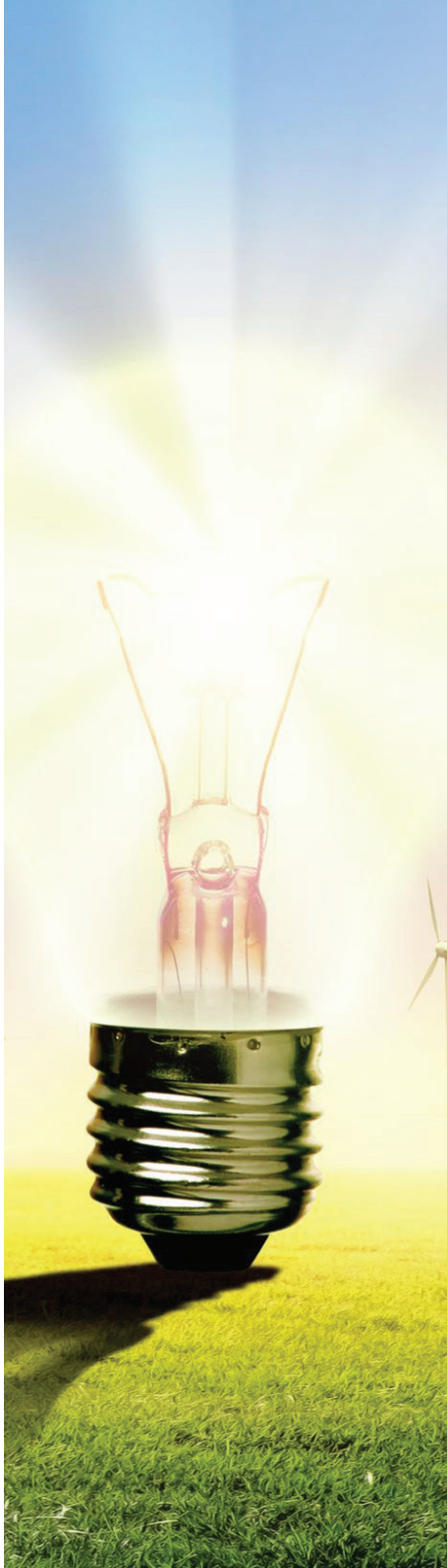
Light bulb recycling has been globally mandated for decades, but thousands of broken bulbs remain in municipal landfills yearly. Unfortunately, restricting lighting from domestic waste streams and educating consumers on better disposal methods has proven challenging. Now, many governments are taking a new approach to raising recycling rates.

Extended producer responsibility (EPR) involves the private sector. In 2021, South Africa introduced EPR regulations for the lighting industry. This regulation underpins the many voluntary take-back schemes for light bulbs, batteries, and other hazardous waste already in action. Diverting lighting waste from landfills is crucial to raw material recovery.

RECYCLED MATERIALS AND UPCYCLED FIXTURES

True green lighting solutions must consider more than the bulb itself. Today, we see more lampshades, pendants, and chandeliers made from recycled or upcycled materials. For example, luxury South African lighting company Elevenpast now offers a 3D-printed pendant light range made from recycled plastic.

This trend highlights a shift in how people perceive recycled or reclaimed



materials. The idea that they are less valuable or functional is fading. Consumers now gravitate towards materials with interesting origins for their trendy appeal and unique aesthetic.

Suddenly, lamps made from reclaimed wood, glass bottles, or found objects can fetch a much higher price.

IMPLICATIONS FOR THE BUSINESSES

Implementing green lighting offers many additional benefits above the obvious environmental wins. These benefits apply to public and private sector organisations. Here are some advantages of switching to energy-efficient lighting (LEDs, solar, or smart lights):

- Cost-savings - they are generally cheaper to run.
- Generate less heat for a more comfortable workplace.
- Reduce pressure on the national power grid.
- Longer-lasting bulbs require fewer replacements.

Energy efficiency is only one piece of the green lighting puzzle. Sustainable end-of-life solutions and introducing recycled or upcycled materials into the sector are just as important. Here are some advantages of investing in better lighting waste management:

- Creates new markets for recycled materials.
- Supports local recyclers, waste pickers, and other micro-enterprises.
- Reduces our reliance on raw material imports.
- Makes green tech more accessible to the general population.

As you can see, green lighting is about more than environmental preservation. It can also stimulate the economy and drive growth in adjacent industries. In some cases, making the switch may require significant capital; in others, it's as simple as separating your recycling. **Wn**

Using LEDs With Onboard Thermistors

CALIBRATING SYSTEMS WITH A THERMAL FEEDBACK MECHANISM



Luminus offers a range of high-power LED packages that come with built-in thermistors, which act as temperature sensors within the package. These thermistors are crucial for providing feedback to control the power delivered to the LED and thus preventing the junction from overheating.

By Paul Sims

This power supply control approach is called thermal foldback [1]. An example of a Luminus component with an integrated thermistor is shown in Figure 1. Additionally, an LED system designer can incorporate a thermal sensing element in any system by placing one on the PCB (printed circuit board). This White Paper discusses how to design, select materials for, test, and calibrate systems with temperature feedback elements to achieve the desired product performance and lifetime.

The two key parameters of interest are the LED thermal resistance (R_{th-jc}) and the LED-to-thermistor characterization parameter ($R_{th-jref}$). While these parameters have the same units and are used similarly, there are fundamental differences in the measurements and physics involved. The values of R_{th-jc} and $R_{th-jref}$ can be used to determine temperatures (Figure 2) in LED design and in active thermal control. The value of R_{th-jc} is an invariant measure of the LED component, while the value of $R_{th-jref}$ depends on the design of the cooling system on which the LED is mounted. This value changes if cooling components are modified, thus understanding how to calibrate for new values of $R_{th-jref}$ is needed.

1.0 THERMAL CONCEPTS

THERMAL RESISTANCE DEFINITIONS

Thermal analysis literature uses a wide variety of symbols and subscripts such

as [3] and [4]. The symbols defined below are used in this paper for the main concepts discussed.

- **Thermal Resistance, R_{th-jc}** , measured in °C/W – single path heat flow from the junction to the solder point (case temperature) of an LED.
- **Thermal Characterization Parameter, $R_{th-jref}$** , °C/W – thermal resistance for multi-path heat flow between two arbitrary points. In this case, the LED junction and a reference point. Some of these heat flow paths do not go through the reference point.

Thermal resistance measures the temperature difference between two isothermal surfaces as a function of the rate of heat flow between them. This concept assumes that the same amount of heat passing through the first surface also goes through the second without any heat being stored or “leaking” to other elements. Thermal resistance for a component is defined as:

$$R_{th-jc} = \frac{T_j - T_c}{P}; T_j = R_{th-jc} \cdot P + T_c$$

$$P = I_f \cdot V_f$$

where T_j is the LED junction temperature, T_c is the case temperature (cooler surface at the LED solder point), and P is the applied power. LED applications distinguish between two types of thermal resistance: electronic and real [5].

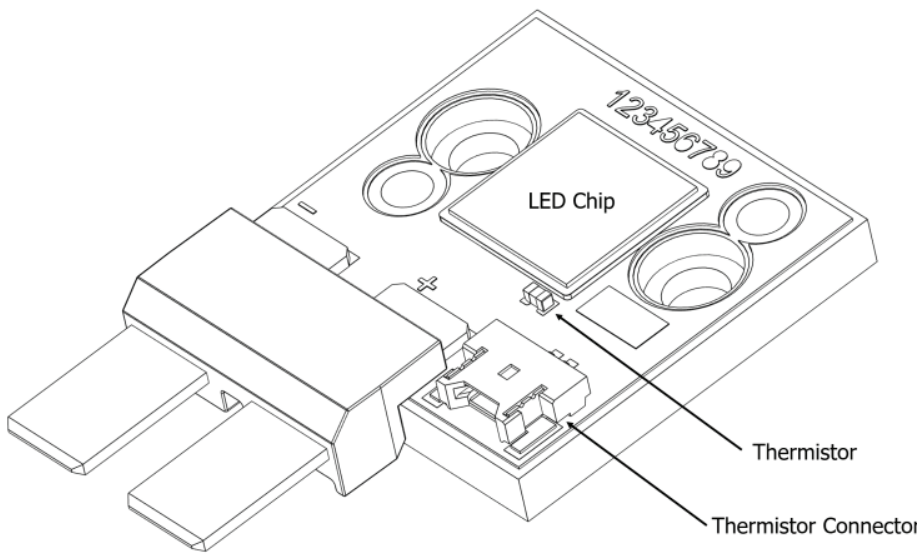


Figure 1. Typical Luminus coreboard layout illustrating the placement of the LED chip, the thermistor, and the thermistor connector.

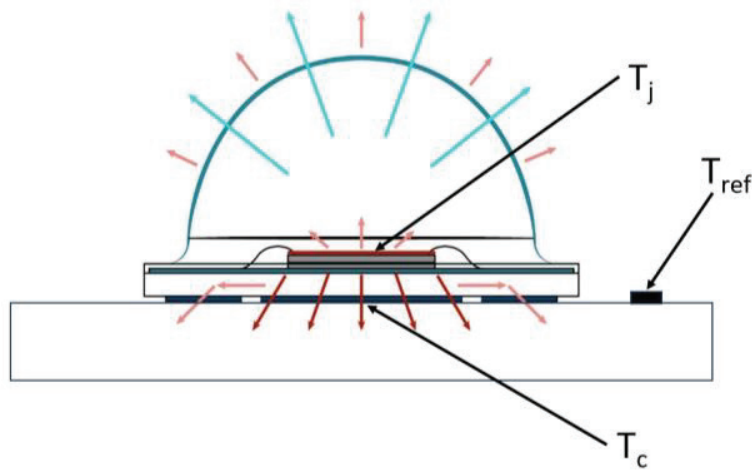


Figure 2. Temperature labeling conventions used in this document following JESD-51-14 [2]. The thermal resistance between T_j and T_c (the LED solder point or bottom of a coreboard) are characterized by the LED R_{th-jc} value. The thermal characterization parameter, $R_{th-jref}$ is based on the temperature difference between T_j and the particular point where T_{ref} is measured in the cooling system.

1. Electronic Thermal Resistance

$R_{th-elec}$: This considers the electrical input power, which is the voltage multiplied by the current supplied to the LED.

2. Real Thermal Resistance $R_{th-real}$: This considers the thermal input power, which is the voltage multiplied by the current supplied to the LED excluding the light power emitted.

The relationship is given by:

$$R_{th-real} = \frac{R_{th-electrical}}{1 - \eta}$$

where η is the efficiency of the LED. The $R_{th-real}$ value is based on the thermal power input with the optical power removed so is solely based on the LED package materials and geometry.

A “K-factor technique” can be used to calculate T_j from measured LED voltages. The thermal measurement employed for LED systems involves experimentally determining the LED K factor (dT/dV) at different temperatures and injection currents. Empirical K-factor functions can be used to determine $T_j = f(V_f)$ for specific drive currents. This will be discussed further in Section 4.

THERMAL RESISTANCE PARAMETERS

In LED systems, there are only two true thermal resistances that can be modeled as a two-node thermal element. These

are the R_{th-jc} of the LED and the R_{th-jA} for the junction to ambient temperature. For these, all heat leaving the junction, the first point, eventually arrives at or passes through the other point—either ambient or LED case point, respectively.

Measuring LED R_{th-jc} values uses a well-established technique, the “Transient Dual Interface Measurement” (TDIM) method, as per JESD51-14 [2]. Luminus uses a T3Ster® Thermal Transient Tester to measure LED thermal resistance.

THERMAL CHARACTERIZATION PARAMETERS

Thermal characterization parameters differ from thermal resistance parameters because the heat is not simply flowing between two temperature nodes. For the $R_{th-jref}$ parameter, there is heat flow through the reference point position that results in a temperature difference between T_j and T_{ref} . This (T_{ref}) is an intermediate point, and heat continues to flow with multiple paths towards the ambient. The heat flow in the rest of the thermal system affects T_{ref} by changing the amount of heat going through the reference node. Heat starts at the LED junction and follows a 3D path. This

means the thermal characterization parameter ($R_{th-jref}$) is dependent on the specific cooling system design, which affects the 3D heat flow path. Not all of the heat flows through the reference point so a two-node thermal resistance model is not applicable.

Since it is an intermediate point, the junction-to-reference thermal characterization parameter is influenced by multiple factors that can change the thermal path as it goes through the reference point, including:

- Diffusion from nearby heated components
- Proximity to different materials
- Design and size of the test setup
- Power levels and airflow
- Component placement
- The thermal characteristics of balance of system (BOS) components such as a PCB, a thermal interface material (TIM), and the heatsink.

Due to these variables, components tested under different cooling conditions and thermal stack configurations will have a range of thermal characterization parameters. Figure 3 shows this

conceptually and Figure 4 shows an example of a system level thermal circuit with three BOS layers considered.

LEDs are designed to have good vertical heat extraction and the R_{th-jc} values are known from thermal characterization tests. The vertical thermal extraction of the balance of the system elements depend on individual $R_{th-layer}$ values for each layer. Systems with poor vertical heat extraction exhibit more horizontal heat flow.

Figure 4 illustrates a thermal circuit in a thermal system, highlighting distributed horizontal and vertical thermal resistances. This is a two-dimensional representation, but it is really three dimensional. The actual values of the discretized thermal resistances are not necessarily the same for each element shown; they depend on geometry and materials.

The measured temperature difference between the LED junction and a reference point is used to calculate $R_{th-jref}$. R_{th-jc} is known from device characterization.

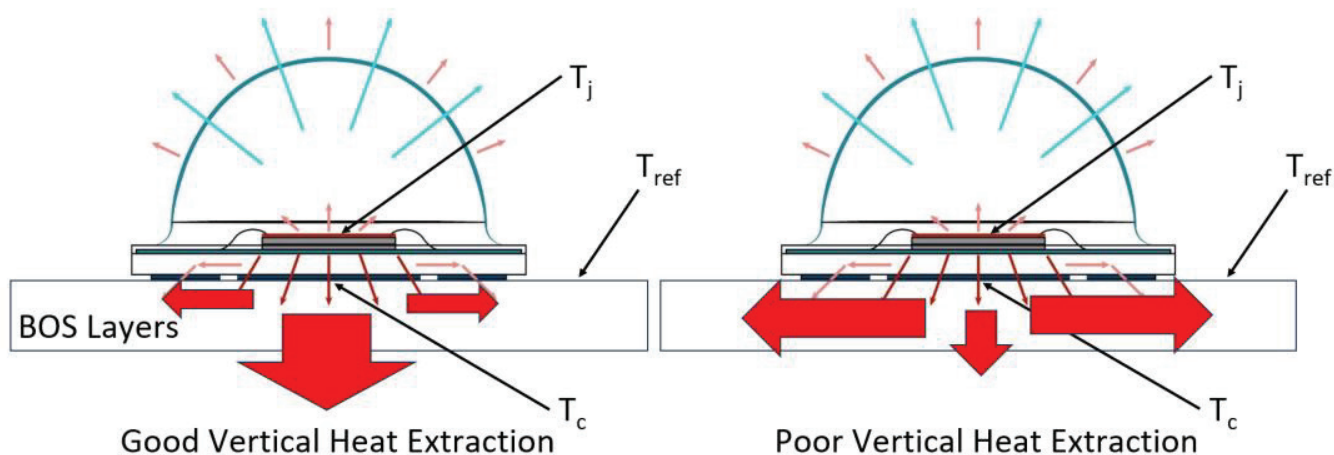


Figure 3. Visualization of differences between a thermal system with good vertical heat extraction compared to one with poor vertical heat extraction. In the poor case, the heat spreads more before going down towards the ambient. In the poor case, the temperatures of T_j and T_{ref} are both higher for the same input power due to thermal choking in the balance of system (BOS) layers.

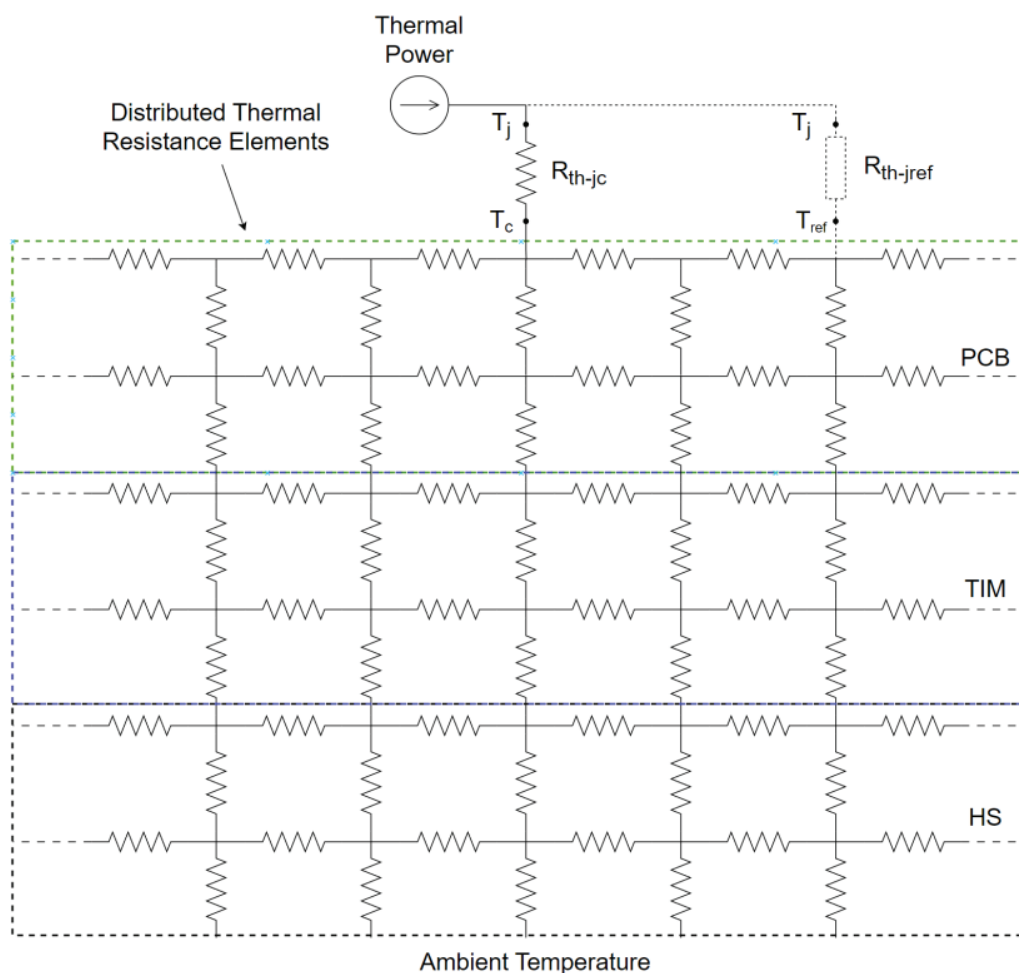


Figure 4. Distributed net visualization of a thermal system showing vertical and horizontal elements.

2.0 LED CALIBRATION PROCEDURE TO DETERMINE $R_{TH-JREF}$

To accurately determine the junction temperature of an LED under normal operation, the recommended approach is to measure forward voltage in-situ following an oven-based K-factor calibration process. The equipment for the K-factor calibration procedure includes a power supply with pulsing capability, and an oven that can maintain a consistent isothermal environment. Empirical K-factor functions can be derived to determine $T_j = f(V_f)$ for specific drive currents. This requires different strategies depending on the

size and form factor of the test article. Small single LEDs are relatively simple to calibrate but larger multi-LED systems may require special designs.

The calibration process is as follows:

- 1. Setup:** Mount the LED onto the designated PCB and a thermal mass. The thermal mass could be a passive heatsink or simply an aluminum block. The purpose is to stabilize the temperature during the test. This assembly is referred to as the Device Under Test (DUT).
- 2. Temperature Stabilization:** Place the DUT inside an oven and set the test temperature to the initial

expected junction temperature. Allow the temperature within the oven to stabilize so that everything is isothermal.

- 3. K-factor Measurements:** Use a programmable power supply to pulse the DUT at different current levels and measure the voltage for each current. Adjust the oven to the next test temperature and repeat the current-voltage measurements. At the end of this process you will have a set of T-V curves for each current that can be correlated to the junction temperature of the DUT.
- 4. Data Analysis:** Plot the measured values and verify that the results

display a reasonably smooth relationship with temperature at each current setting. Figure 5 shows a good result. Use these datasets to derive the K-factor equations for each current level. These are generally linear but might be quadratic if a large temperature range is measured.

5. Real-World Application: Install the calibrated LED(s) in your light fixture and operate using the design intent power supply. For a single LED such as a coreboard, it is relatively simple to monitor the voltage. For more complex PCBs with multiple LEDs, special test pads may be needed. In a multiple LED system, calibrating the entire string voltage may be easier than monitoring a single LED.

6. Final Measurements: Once the light fixture temperature has stabilized, measure the calibrated LED voltage and the thermistor resistance. Use the thermistor datasheet (Section 5) to ascertain the thermistor's temperature and the relevant K-factor equation from step 4 to determine the junction temperature.

7. Thermal Characterization Parameter Calculation: Calculate $R_{th-jref}$ using the formula:

$$R_{th-jref} = \frac{T_j - T_{ref}}{P}$$

where P is the power applied to the LED, T_j is the junction temperature determined by the calibration curves developed in step 4, and T_{ref} is the reference temperature measured by the thermistor.

8. Verification: The T_{j-ref} value should be applicable for the same DUT setup for similar operating current and temperature conditions. Verify within a range of expected conditions

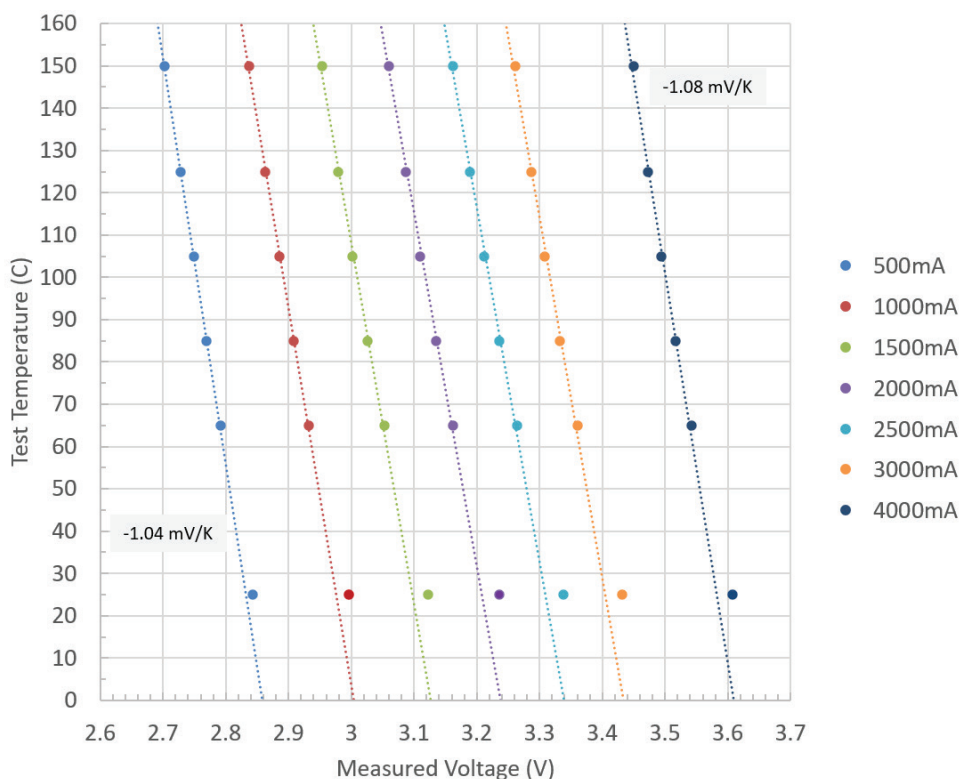


Figure 5. Example of a K factor plot for measured data for a 1 mm² Luminus blue LED, showing excellent linearity between 65 °C and 150 °C. Nonlinear behavior at lower temperatures is typical (discussed in Section 4).

to ensure accuracy. Fan-cooled heatsinks and water-cooled systems are expected to be more constant, while passive heatsinks will vary more due to nonlinearities in convective heat extraction at different power levels.

This structured approach ensures precise calibration and measurement of the LED's thermal characteristics under operational conditions.

3.0 DATA FROM THE LUMINUS TEST LAB

Luminus includes the value of $R_{th-jref}$ in the datasheet for components that have onboard thermistors. It is crucial to understand that this value is based on specific thermal design and test conditions outlined in the datasheet and may vary with significant changes

in the real-world fixture thermal design. In such instances, it becomes necessary to determine the $R_{th-jref}$ value experimentally to ensure accurate thermal management.

In Figure 6, the experimental setup to determine $R_{th-jref}$ for a Luminus coreboard product is shown. In Table 1, the results for a measurement using three different TIMs are shown.

Luminus Labs ran an experiment with three different TIM's to illustrate their impact on R_{th-ref} .

These TIMs are:

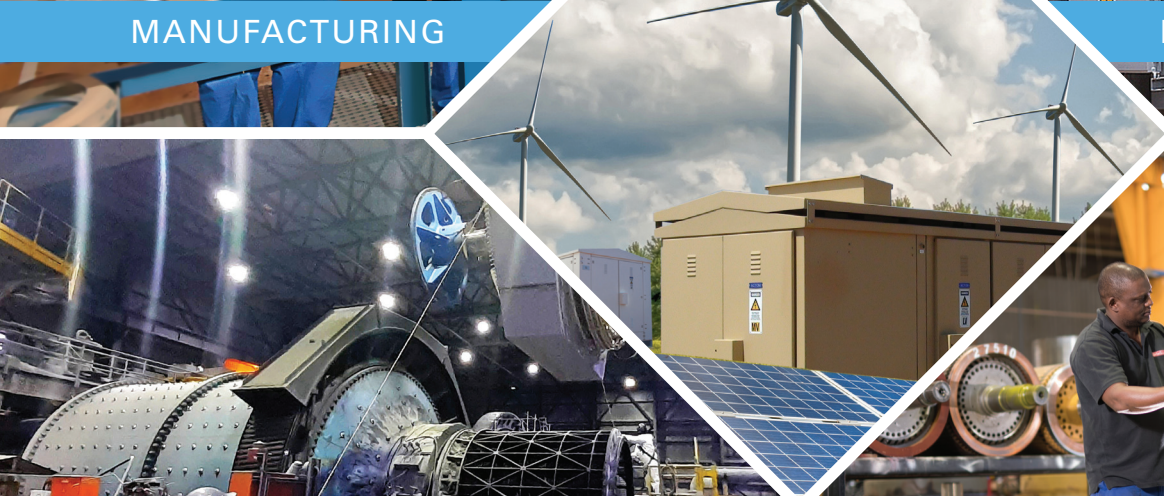
- BT – Double sided thermal tape, which is a relatively poor heat conductor.
- EG - eGRAF 1205 – This is the standard material Luminus uses



MANUFACTURING



PROJECTS



SERVICE AND REPAIRS



MAINTENANCE

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

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Distribution
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Sugar
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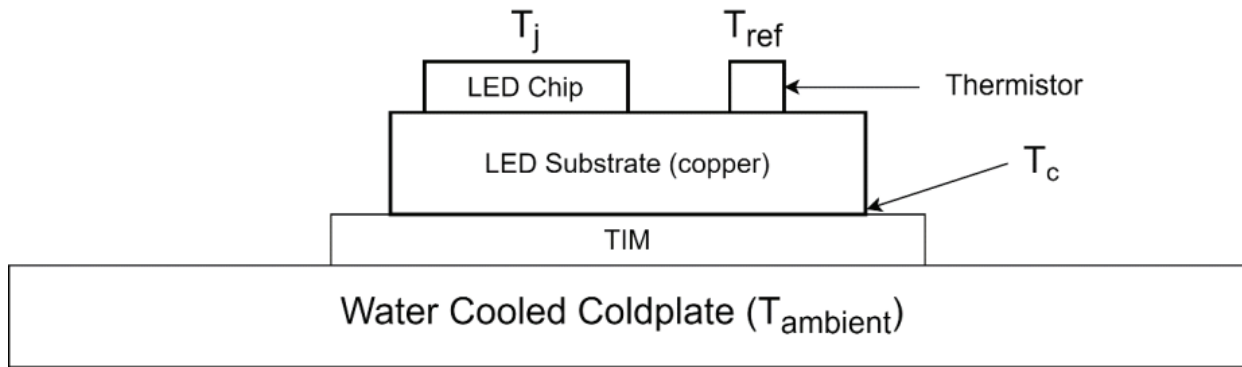


Figure 6. Schematic of the experimental configuration to determine $R_{th-jref}$. In the Luminus Lab test fixture, T_j is measured using the K-factor technique and T_{ref} is determined by measuring the resistance of the thermistor and calculating the temperature according to the thermistor datasheet (Section 5).

for thermal testing (a good thermal conductor).

- SC – Thermal grease (another good thermal conductor).

This LED has been characterized using the TDIM technique and the component R_{th-jc} real value was determined to be 0.71°C/W . This value is used to calculate T_c in the table below.

The temperatures for the BT TIM case are higher and, in this case, the $R_{th-jref}$ values are also higher. We always expect higher temperatures for systems that contain layers with poor thermal conductivity but the calculated value of $R_{th-jref}$ depends on geometry as well, so this result is less certain.

4.0 K FACTOR DETERMINATION

Semiconductor devices like LEDs usually show a linear or near-linear relationship between forward voltage and temperature across varying current levels. This method, often known as the “diode- forward-drop” method, typically uses the forward voltage drop across a junction as the temperature-sensitive parameter (TSP). The calibration process involves calculating the K factor ($^\circ\text{C/V}$) for each device, as illustrated in Figure 7. This technique is elaborated in EIA/JEDEC Standard No. 51-1 [6] and has been discussed in more detail in Section 2. It is also beneficial to compute the inverse of the K factor in $\text{mV}/^\circ\text{C}$. This value should be a few $\text{mV}/^\circ\text{C}$ for a single junction measurement.

Both TDIM and system level junction temperatures can be determined by using dT/dV , the K factor. The temperature difference equation is given by

$$\Delta T_j(\Delta V_f) = K \cdot \Delta V_f$$

where K is the dT/dV slope of collected data. If a regression line is calculated, the y-intercept is available to do absolute T_j calculations. This equation is shown in Figure 7 for a linear regression which can be used to directly calculate the junction temperature of this LED.

In the TDIM method used to measure LED components [2], the current of a temperature stabilized LED is dropped

Parameter	BT	EG	SC
T_j ($^\circ\text{C}$)	121.2	66.0	61.9
T_c ($^\circ\text{C}$)	92.7	39.4	34.7
T_{ref} ($^\circ\text{C}$)	72.7	34.8	32.8
T_{amb} ($^\circ\text{C}$)	25.0	25.0	25.0
P (W)	57.0	57.0	57.0
WPE (%)	30.3	34.4	34.4
$R_{th-jref,electrical}$ ($^\circ\text{C/W}$)	0.85	0.55	0.50
$R_{th-jref,real}$ ($^\circ\text{C/W}$)	1.22	0.83	0.76
$R_{th-jambient}$ ($^\circ\text{C/W}$)	1.68	0.72	0.63

Table 1. Test Data and Calculated $R_{th-jref}$ for Three Different TIMs

Wireless Africa 2025

In alliance with SAIEE and Sentech Research & Innovation Collaboration Network

The third IEEE Wireless Africa Conference (WAC) 2025, sponsored by the Vehicular Technology Society (VTS) and hosted by the VTS South African chapter, will be held in Pretoria, South Africa. The conference focuses on wireless technologies and aims to provide a platform for wireless researchers to share their results, solicit comments and collaborations, and exchange innovative ideas for leading-edge research in wireless technologies.



IMPORTANT CALL DATES

Papers

Peer-reviewed paper submission deadline - 18 November 2024
Notification of Acceptance - 20 January 2025
Camera-ready paper (Final paper/production ready) - 3 February 2025

Panel Discussion

Panel proposal submission deadline - 30 November 2024
Notification of Acceptance - 6 December 2024

Workshop Proposal

Workshop proposal submission deadline - 11 November 2024
Notification of Acceptance - 18 November 2024



WHEN?

24 - 25 February 2025



WHERE

University of Pretoria
Hillcrest Campus



VISIT

<https://events.vtsociety.org/wirelessafrica2025/>

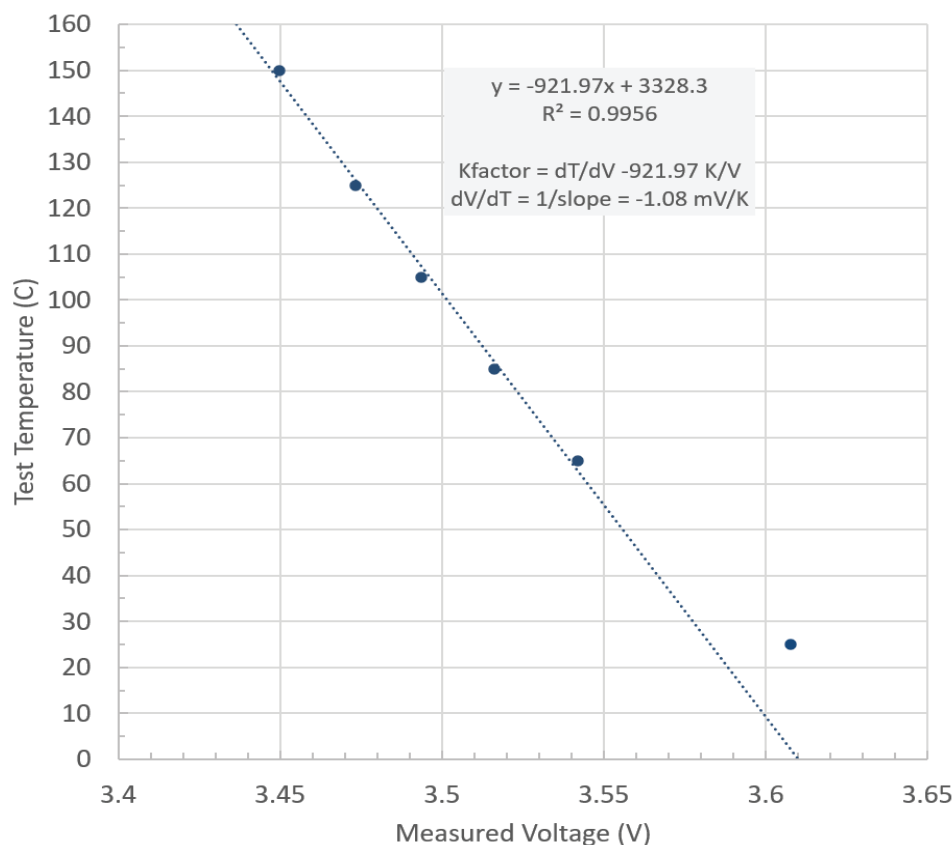


Figure 7. Illustration of K-factor calculation for a 1 mm² Luminus blue LED.

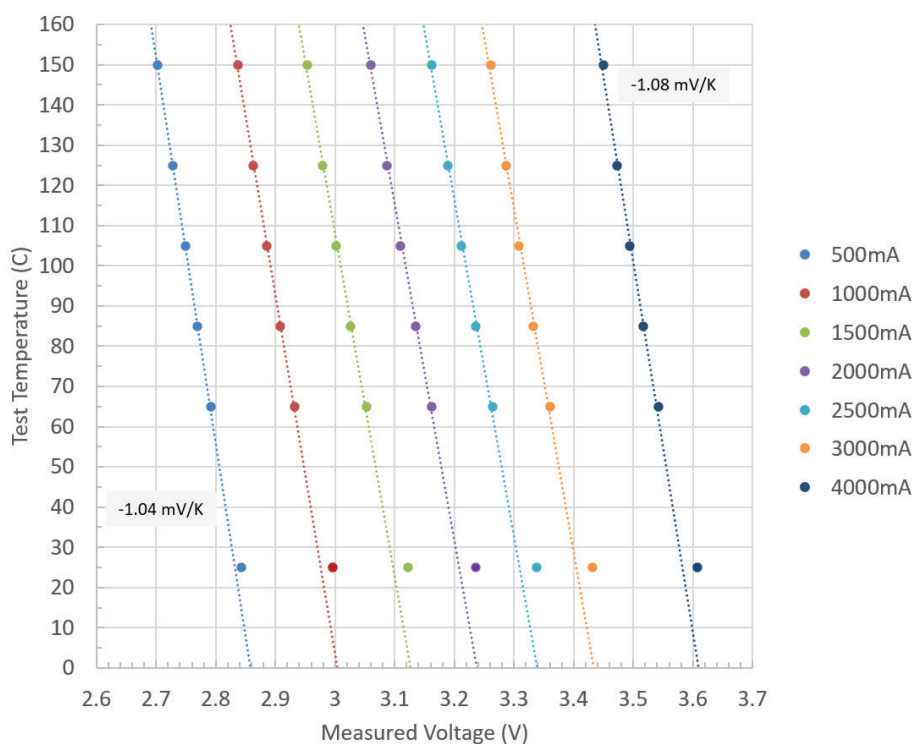


Figure 8. K factor plot (previously shown in Figure 5) for measured data for a 1 mm² Luminus blue LED, showing excellent linearity between 65 °C and 150 °C. Nonlinear behavior at lower temperatures is typical and this regression is from 65 °C to 150 °C.

to a low value that does not appreciably heat the LED junction while the change in voltage with the cooling rate is observed with high-speed electronics in the T3ster apparatus. For system level measurements, the pulse method discussed in Section 3 is recommended for the calibration data collection so that a constant current at real-world levels can be used after calibration.

LINEAR VS. NON-LINEAR BEHAVIOR

Ideally, a K-factor result plot will have a wide range of linear behavior for the temperatures and currents of interest such as the example shown in Figure 8. Linearity does not always occur and we will briefly discuss some symptoms and causes of non-linear results. These results can be either due to device physics or due to measurement equipment constraints.

NON-LINEARITIES DUE TO LED DEVICE PHYSICS

The 25°C points are excluded from the linear fit in Figure 7 and Figure 8 because these data points are subject to the onset of typical low-temperature nonlinear behavior.

See Figure 9 for an example of low-temperature curvature for a red LED. Other types of LEDs have similar low-temperature nonlinearities [1]. Nonlinear behavior is expected at lower temperatures and if one wants to characterize a wide temperature range, higher order polynomials are needed to fit the data.

Another nonlinearity due to device physics is observed at low currents. For example, the TDIM method uses a DC sense current for K-factor calibration rather than a pulse. The current level is selected to be low and not heat up the junction appreciably but needs to be

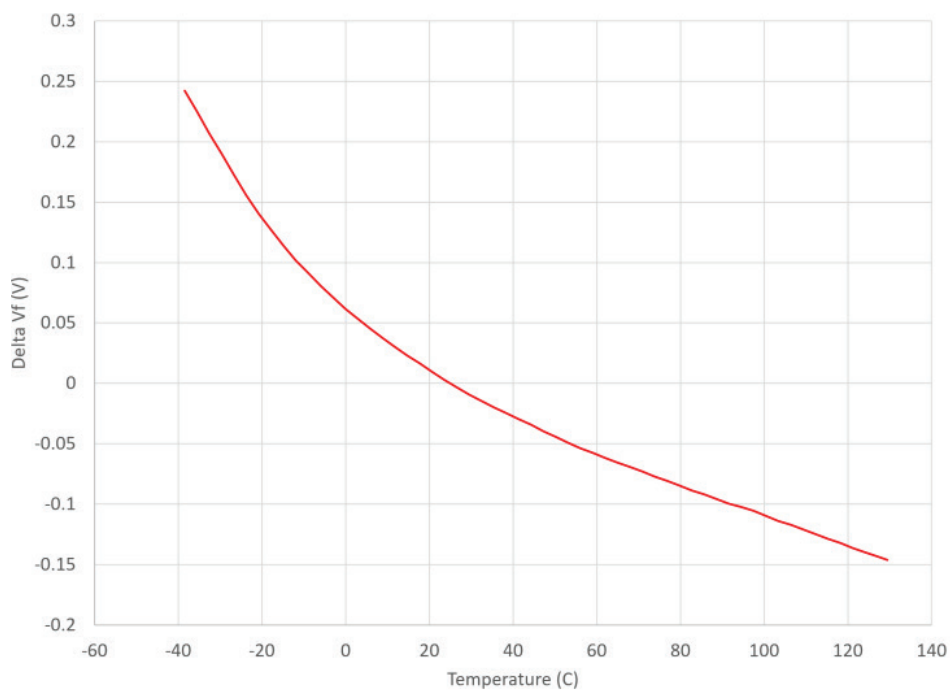


Figure 9. Red LED relative forward voltage vs junction temperature over a wide range of temperatures. The normal operating junction temperature is in the linear range but 25 °C is near the onset of the low-temperature curvature region.

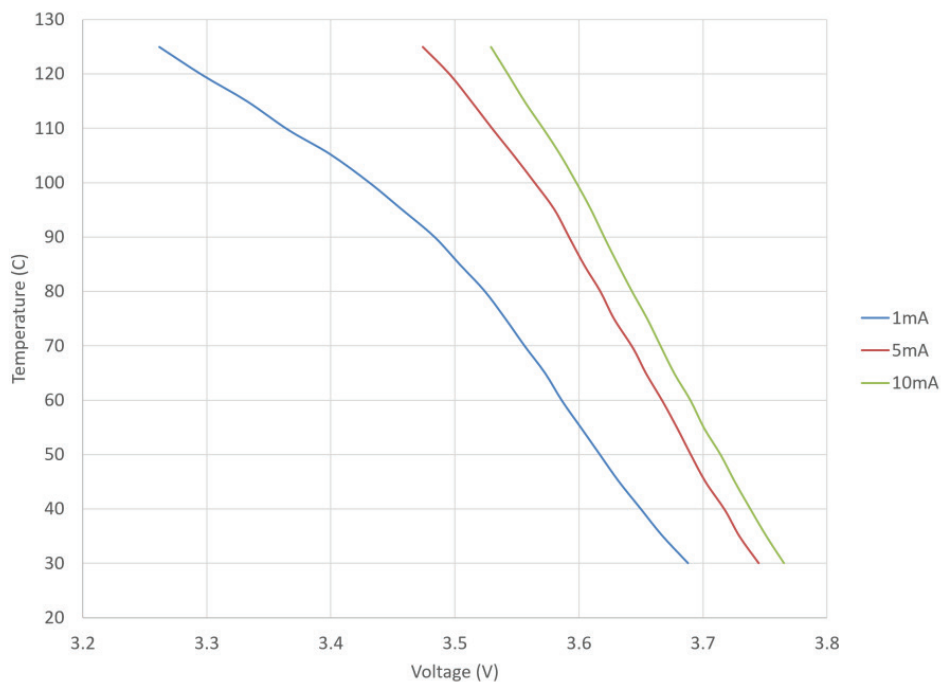


Figure 10. Example of high-temperature nonlinearity due to low sense current levels in a TDIM calibration [7]. JESD-51 attributes this effect to temperature dependent low current device leakage.

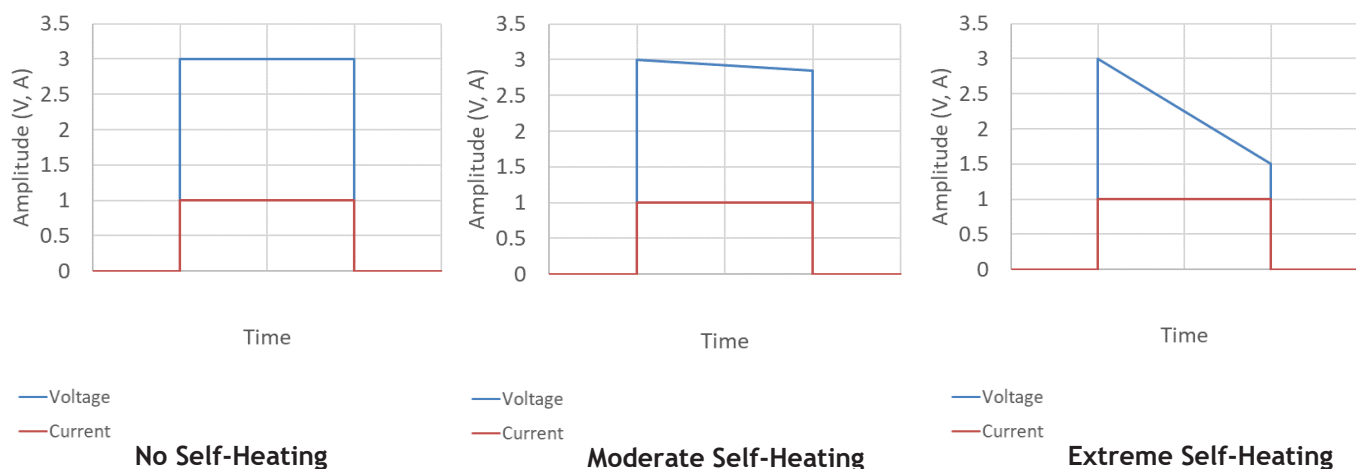


Figure 11. Representation of the effect of self-heating on the measured voltage showing drops due to moderate (center) and extreme (right) self-heating.

high enough that the measurements are reasonably linear. Figure 10 shows data for LEDs calibrated at varying low DC sense currents (1, 5, and 10 mA). Due to temperature dependent device leakage effects, lower currents are less linear.

NON-LINEARITIES DUE TO THE PULSE PROCESS

To mitigate inaccurate V_f measurements due to self-heating effects, it is advisable to use fast pulses. You can monitor the LED voltage using an oscilloscope to check for voltage changes over time during the pulse period due to self-heating; a voltage drop during pulsing indicates self-heating (Figure 11). In such instances using a faster pulse is advised.

In the case of extreme self-heating during a pulse when the power supply measures the voltage near the end of the pulse, the voltage value tends to be more influenced by the current-induced junction heating rather than the ambient temperature. Figure 12 shows the deterioration of the data quality as self-heating starts to dominate the measurement. In this data set, the data is good up to 6 A, but self-heating effects show up at currents above 6 A.

The curves for 1, 3, and 6 A have a normal response. The oven test temperature and the junction temperature can be considered to be equivalent. The curves for 8, 10, and 12 A show increasing self-heating effects on the voltage measurement. When this happens, the oven setpoint temperature has less relationship with the junction temperature since there is also heating due to the injected current. In extreme cases, the device junction temperature (test temperature) is almost purely a function of heating due to the current. The onset of self-heating level in this plot is where the V_f -T slope starts to change significantly, in this case at 8 A where the slope changes from -2.2 mV/K to -1.4 mV/K.

Another regression analysis problem can arise when the slope of the regression line is extremely steep. This is illustrated in the 10 A curve in Figure 12. Since the data is very nearly vertical the regression algorithm fails due to “perfect multicollinearity”.

When using an oscilloscope or scope card to monitor voltages, electrical ringing due to circuit inductance on the

pulse waveforms must be discounted (Figure 13). Electrical ringing has nothing to do with junction temperature and an appropriate sampling window should be used to measure voltage in a timeframe that corresponds to junction temperature.

5.0 CONCLUSION

With an understanding of how to calibrate LEDs with thermistors, engineers can ensure that the design, materials, and configuration of devices support appropriate thermal management and performance.

This can be done by considering LED thermal resistance (R_{th-jc}) and the LED-to-thermistor characterization parameter ($R_{th-jref}$), using the K-factor (the measured dT/dV slope), and using the methods explained and demonstrated in this White Paper. **Wn**

[Click here](#) to download the complete paper.



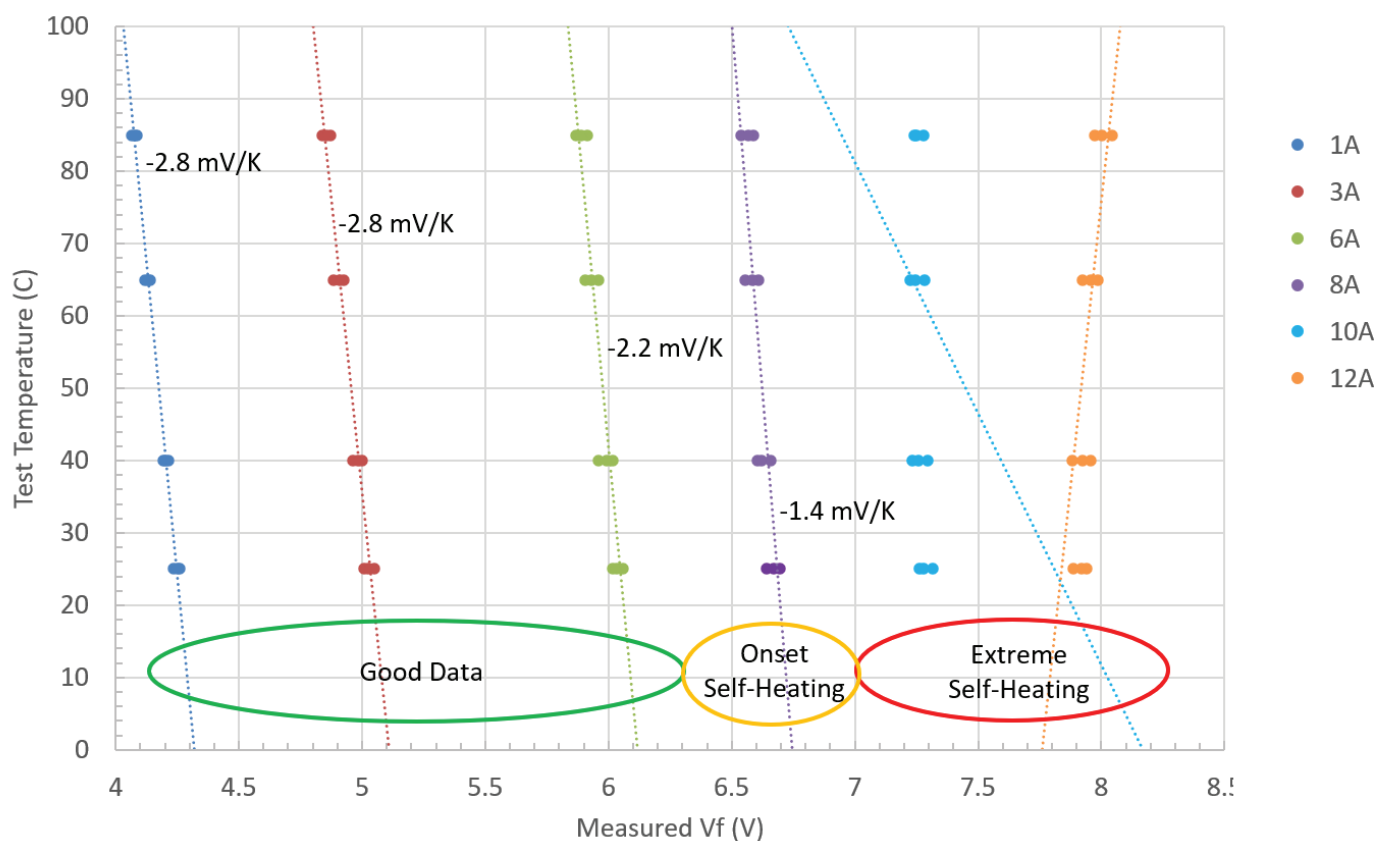


Figure 12. Example of self-heating effects at high current levels.

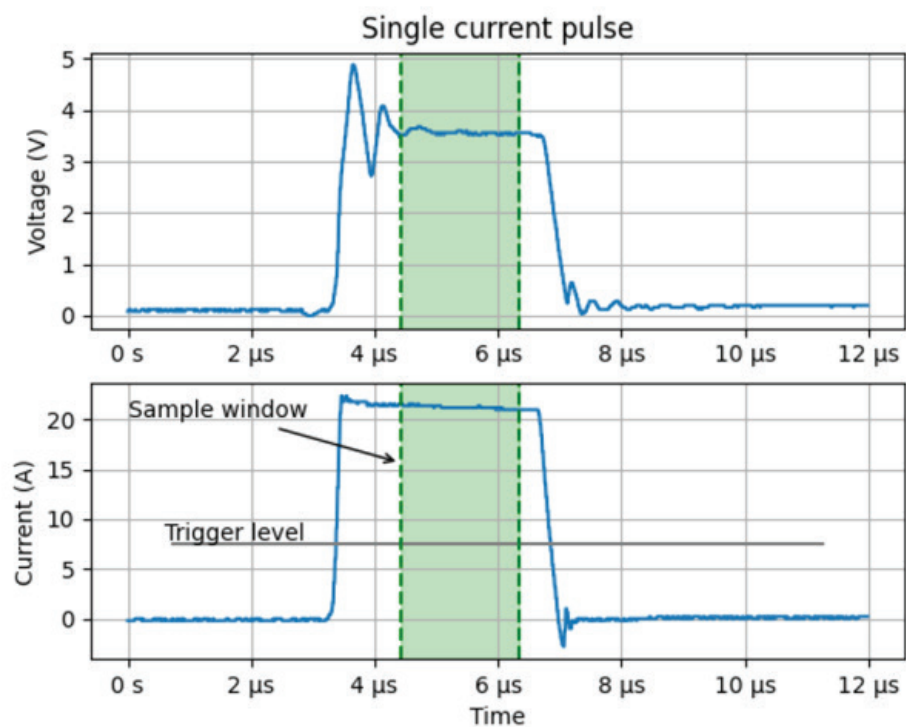


Figure 13. Example of LRC electrical ringing measured in an LED component subjected to a 20 A electrical pulse.

The SAIEE Load Research Chapter

- PAST AND FUTURE



The SAIEE Load Research Chapter (LRC) was established to promote the art of Load Research, broadcast Load Research knowledge, expertise, and information, and apply that information in the Electricity Service Industry (ESI).

By: Marcus Dekenah

Chairman: SAIEE LRC

Lloyd Setlhogo

Co-Chair: SAIEE LRC

Wayne Kitching

Social media: SAIEE LRC

Karen Vosloo

Multimedia & web: SAIEE LRC



This article overviews its activities since inception and discusses future plans.

Electrical Load Research involves overlapping skills in gathering load and other field data through filtering, analysing, and modelling. This results in information for applications that address industry needs and requirements.

The emerging context in South Africa (and probably globally) is that customer load behaviour is being 'disrupted' from what it used to be by drivers of change, who are expected to modify it.

SOME DRIVERS OF THIS CHANGE IN SA ARE:

- Recent history of load shedding with supplier and user measures to mitigate (i.e. DR (Demand Response) and DG (Distributed Generation), comprising renewables and/or storage and/or export. 'Storage' includes the 'EV (Electric Vehicle) travelling battery' phenomenon as EV adoption rises).
- Rise in administered electricity price/s, along with supplier & user mitigations (i.e. Regulation, Energy efficiency, price elasticity responses).
- Regulatory changes to ESI enable DER (Distributed Energy Resources), wheeling, and trading.
- Technological advancements like inverters and LED lighting impact power factor (PF) parameters.

Due to these rapid changes, ESI faces challenges keeping track of changes in the shape and scale of basic customer load behaviour.

With the growth of behind-the-meter generation, load models for network design (i.e., Net customer load models) are certainly diverging from models of typical customer demand (behind-meter customer load models).

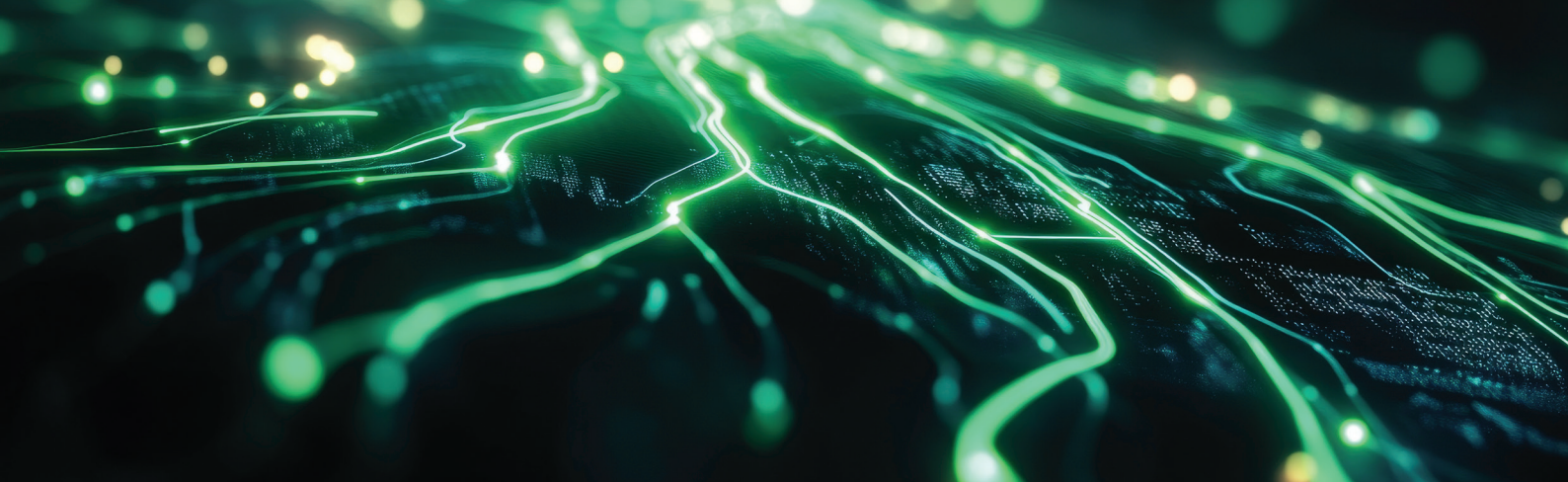
The risks of errors around load/energy information and its definition are growing.

This means that the quality of demand/energy intelligence currently available to authorities may undermine future forecasts if it is not improved to include changes in load behaviour.

SHARING KNOWLEDGE TO GROW SKILLS

The SAIEE Load Research Chapter (LRC) provides an information-sharing platform for load researchers and applicators to share, interrogate, learn, and reference their knowledge, ultimately improving load modelling and application industry-wide.

The scope of the LRC includes exposing historical developments, assessing the relevance of current load models, and developing future load models that are mainly dictated by technological developments on both the customer and power system sides.



Since its inception in April 2019, the Load Research Chapter has grown from strength to strength.

There are currently more than 60 members, including Load researchers, Academics & Students, Data scientists, planners/forecasters, Consultants and Tx/Dx/Electrification network engineers. Some LRC members are also contributing to SA National standards.

BUILDING REFERENCEABLE LOAD RESEARCH IP WITH A LONG SHELF-LIFE

At inception, LRC resolved to explore nominated topics through presentations from Industry Subject matter Experts and record the results as persistent searchable/findable multi-media for public access on SAIEE's platform.

LRC typically meets monthly (primarily online) and includes a relevant presentation from a subject matter expert followed by a Q&A. In addition, we hold roundtable discussions and planned webinars (typically evening events) throughout the year.

The presentations' content is produced into a referenceable video with accompanying event metadata and professional sound and placed in LRC's playlist on the SAIEE YouTube channel. Additionally, a Table of Content with links to the video and supplementary Pdf's is maintained on the LRC page of the SAIEE website [here](#).

REVIEW OF OVERALL LRC PROGRESS COVERING THE KNOWLEDGE AREA

At the inception of the Load research chapter, members were polled on their interests.

A list of 71 knowledge areas (topics) were collated. About 30% of these were related to 'the science' of electrical load research (data collection, analysis, modelling, broadcast), and 70% were related to applications of load research (i.e., network design).

On the way, developments in the industry exposed 19 additional topics (Load changes during COVID, for example).

Table 1 summarises our major knowledge area headings and progress to date.

In the 11 functional areas, LRC has covered 61 topics so far. One must bear in mind that a single 'topic' may be a seminar of 6 subject matter experts covering a focus area, with guided discussion and audience interaction.

It seems our wish list of topics grows as fast as we can table them—such is the pace of change in SA's ESI.

THE GOOD, THE BAD AND THE INTERESTING

The Load Research Chapter was inaugurated at a physical meeting in April 2019 at the SAIEE House in Johannesburg.

THE GOOD:

The 2020 year started with the horror of COVID-19 unfolding and everyone learning to adapt. LRC cancelled all contact events and took activities online, with great support from SAIEE's staff.

This was a time of great learning for all. We tested the most common online meeting platforms (MS Team, Skype, WebinarJam, GoTo webinar, Zoom meeting, and webinar). Much was learnt, and we subsequently shared and supported others at SAIEE on the same journey. Members appreciated this and reduced overhead from online events.

With the advent of COVID-19 and the lockdowns, much of SA "went home" (a human tidal change).

This was perhaps the largest experiment in human behaviour of the century. LRC hosted discussions on the load/consumption impact at domestic and non-domestic levels as it unfolded.

Load shedding has stopped, for now, so adjustments to demand/consumption will follow. Electricity drives our economy rather predictably, so any uptick in market conditions will lead to demand growth.

THE BAD:

Administered prices are rising, putting pressure on consumers. The extent of behaviour change is largely unknown.

MAJOR SUBJECT AREA	SUB-AREA/S	IDENTIFIED SYLLABUS TOPICS (N)	SYLLABUS TOPICS COMPLETED (%)
LR Research design & implementation	Process design, databases, collection load and other data.	7	29
Data analytics and visualisation	Stats, analysis tools, Data visualisation, Data science, GIS & Spatial analytics	5	40
Load modelling for Dx and electrification planning	Domestic & non-domestic load modelling, Data cadence, Interday variances, end-uses, Latest research findings.	9	67
Broadcasting/publishing to ESI	Data sharing, POPIA Act, Standards, Estimator tools.	6	33
National/international resource planning	MILP solvers, planning under climate change.	2	0
Applications of Dx load models	Masterplanning, Geo-based load forecast, Electrification planning, Probabilistics, Tariffs, Renewables	8	50
Tx Energy and demand forecasting	'Classic' Tx forecasting, Human behaviours, Probabilistic methods, Overview of SA IEP	9	33
Renewables and the future	Estimating impact of DG/ PV/RE, microgrids, E-taxis, Growth of residential solar. International experiences. Utility-Scale Battery.	10	70
Managing and mitigating the load	EE, DSM, DR, System-wide and sectoral Demand flexibility, Benchmarking.	9	67
Optimal power flow and resilience	Network resilience, optimisation, AI, operational challenges.	5	40
Other	Demographics, remote sensing, EPRI research, POPIA, GIS visualisation, Dx & Tx Covid load impact, Buildings, EPC legislation, microgrids, EV's...	24	100

Table 1: Summary of identified Load Research subject areas

There is no shortage of private capital for consumers “going green”, and the negative impact on Eskom and municipal revenue is becoming apparent.

THE INTERESTING:

The installed capacity of rooftop PV has more than doubled since 2022 and is still climbing steeply. The rate of adoption is linked to the avoidance of load shedding and news of accelerating administered prices. See Table 2.

Network engineers are often confronted with questions about the expected impact of renewables. The LRC is concerned with how existing planning load models may change as renewables (SSEG, DER, and IPPs) are installed in power networks. What factors, standards, and local policy influence the expected loads, what penetrations should be expected, and what approach should planners take?

The LRC convened a half-day seminar on “Planning for Renewables” in August 2020 to shed light on this topic. Various speakers from Eskom, CSIR, Municipalities, and Universities were invited, and over 300 attended the event. Thus, it was clear that the event was well-publicised and attracted interest and appreciation.

2025 EVENTS PLAN

In order to maintain consistency in sharing knowledge and provide a platform for peers to interact with each other, the 2025 plan mapped out a syllabus in consultation with the LRC members while leaving flexibility to include “topical topics” as deemed necessary by the circumstances and environment in which LRC operates. The 2025 syllabus is summarised in Table 3. The challenges associated with “the

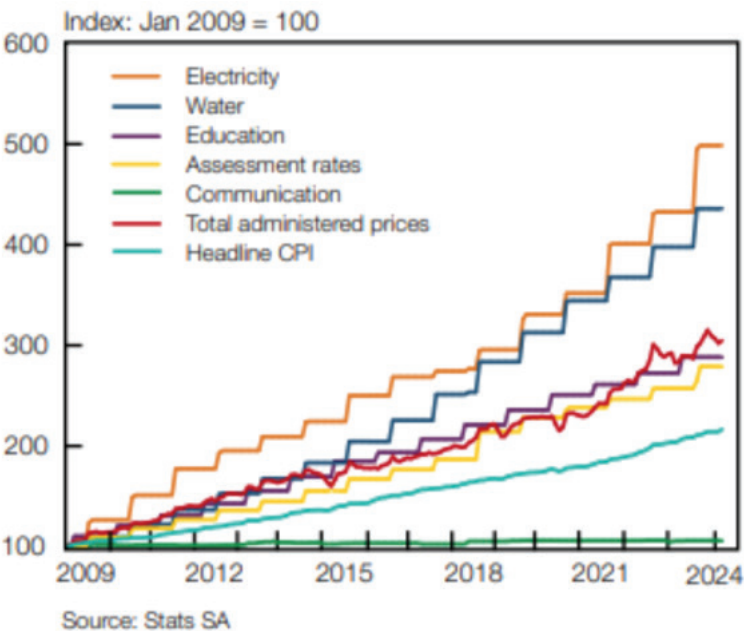


Figure 1: Administered prices in SA (2009-2024)¹

MONTH/YEAR	MAXIMUM INSTALLED PV (MW)	SIDE EFFECTS
Jul 2022	2 264 MW	National peak demand dropped 5.8% Y/Y. This is possibly caused by Households using backup battery power during peak periods, warmer-than-usual weather, higher electricity prices, more energy-efficient appliances and lighting, alternative energy sources, including gas for cooking and solar for heating water, and use of alternate fuels for space heating.
July 2023	4 740 MW	
March 2024	5 439 MW	

Table 2: Estimated growth of rooftop solar in SA (2022-2024)

ITEM ID	FOCUS AREA
1	Tariffs & in-feeds
2	Trading
3	Wheeling
4	Demand response
5	Use of MI/AI in power systems
6	Advances in current research
7	Data-sharing
8	Sampling & sample design
9	Distributed generation

Table 3: Proposed Focus Areas for 2025

1. Administered prices exceed CPI “Government to blame for high interest rates, S Jacobs, Daily Investor, 2024/5/13.

future customer,' and the application of load research in emerging fields of interest, such as energy storage, microgrids and smart grids, will be explored.

CONCLUSION

Given that the COVID lockdown period was so challenging, LRC showed resilience and managed to adapt and overcome. The success was manifested by new members expressing interest and key role players benefiting from shared information.

LRC is creating IP with a long shelf life in a findable SA library. This may be used to educate and inform Engineers in the profession in general and in training. We welcome new members and contributions. Anyone wishing to join LRC should please [click here](#).

ACKNOWLEDGEMENTS

The LRC committee would like to thank SAIEE's support staff, particularly Douglas Millar (Web admin) and Minx Avrabos, for their help in advertising, running, and archiving our events on SAIEE's website.

In addition, we appreciate the direct and indirect help at events from Eskom, CSIR, Municipalities, universities, and our international participants.

We also owe great appreciation to our presenters, who have willingly shared their knowledge with our members and the wider community.

Last but not least, we would like to thank our members for their mentorship, enthusiasm, and participation, for "spreading the word" about new and interesting LRC events to the engineering fraternity and SAIEE membership in particular.

AUTHOR'S BIOGRAPHIES

MARCUS DEKENAH

Marcus is a research consultant passionate about understanding the behaviour of electricity consumers. He was the technical lead of the NRS 034 Domestic load research project for 19 years and led non-domestic load research in support of Eskom's Geo-based Load forecast tool for many years. Marcus has conducted contract load research (domestic and non-domestic) both inside and outside South Africa with multi-disciplinary teams of specialists from the industry, private, and academic sectors. He has authored and co-authored over 40 international and local journals, conference papers and articles. Marcus has contributed to several standards through his work, winning awards for project work and publications. Marcus is currently Chair of the SAIEE Load Research Chapter.

LLOYD SETLHOGO

Lloyd Setlhogo holds an ND Elec Eng. HC (TUT), B. Tech Power Eng. (UNISA), M. Eng. Electrical Engineering (North-West University). He started his career as a Senior Technician in 2000 at Eskom and has progressed through the ranks over the last 20 years to Load Research Project Leader and onto Senior Advisor Engineering. He has been involved in ALT testing and has managed projects such as Standby Power Losses. He manages Eskom's Domestic Load Research and Critical Peak Day Pricing Project. Lloyd is currently Co-Chair of the SAIEE Load Research Chapter.

WAYNE KITCHING

Wayne Kitching graduated with a B.Eng. (Electrical and Electronics) from Stellenbosch University in 2001 and joined the Nelson Mandela Bay Metropolitan Municipality (NMBM).

He assisted the NRS034 load research project with data gathering and worked on a very large DSM project. Subsequently, Wayne worked at various consulting engineering firms and, among other things, on grid integration studies for the Eskom and DMRE IPP programmes. Wayne gained valuable site experience as the Owner's Lead Electrical Engineer for the Kathu Solar Park CSP plant.

Wayne is currently a Senior Engineer Specialist Studies at Proconics, where he performs grid code compliance, protection grading studies and other electrical and techno-economic studies for renewable energy and microgrid projects in South Africa and the rest of Africa. He is registered as a Professional Engineer and a senior SAIEE member.

KAREN VOSLOO

Karen Vosloo has a BSc Eng (Elec) from the University of Pretoria (TUKS). She is registered as a Professional Engineer and a senior member of the SAIEE. She retired from Eskom at the end of March 2020 with almost 40 years of experience in electrical engineering, focusing on Sub-Transmission Network Development and Master Planning. Proper planning requires careful consideration of various factors, including expected load growth, network load flows, thermal and voltage constraints, etc. The Planner also needs to understand various elements such as protection limitations, substation layout and equipment, and line designs, as well as have knowledge of aspects such as electronic network equipment modelling and financial influences affecting capital investment decisions. The proliferation of Distributed Generation is adding many new challenges, ensuring that this remains a most interesting specialised field. **wn**

A single flaw can break an entire system

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Engineering in the age of POPIA

- SAFEGUARDING PERSONAL INFORMATION IN INNOVATION



The purpose of the Protection of Personal Information Act 4 of 2013 (POPIA) is to give effect to section 14 – the constitutional right to privacy.

*By: Jodi Poswelle and
Keitumetse Khutsoane
[Fairbridges Wertheim Becker](#)*

POPIA ensures the safeguarding of personal information when processed by a responsible party, who determines the purpose and means for processing such data and carries out that processing, subject to justifiable limitations.

These justifiable limitations allow for balancing the right to privacy against other rights, such as the right to access information.

SOME EXAMPLES OF PERSONAL INFORMATION: POPIA AND WHY POPIA MATTERS TO ENGINEERS?

Engineers often handle personal information, whether client data, employee records, or project stakeholders' details. Under POPIA, personal information includes data identifying a living person or organisation. This could include:

- Contact details (name, email, phone number)
- Biometric data or health information
- Identification numbers
- Sensitive information such as race, gender, or marital status.

In the engineering industry, personal information could relate to project management, employee information, or working with contractors and third-party service providers.

Whether storing design specifications for a personal data situation or managing client databases, POPIA requires that personal information be collected, processed, and protected correctly.

THE 8 CONDITIONS FOR LAWFUL PROCESSING

POPIA outlines eight key conditions for the lawful processing of personal information, which engineers need to follow:

- **Accountability** – The organisation must ensure personal information is handled responsibly.
- **Processing Limitation** – Personal information should only be used for legitimate, specific purposes.
- **Purpose Specification** – Personal Information should only be collected for a defined reason.
- **Further Processing Limitation** – Personal Information should not be used beyond its original purpose.
- **Information Quality** – Personal information collected must be accurate and up-to-date.
- **Openness** – Individuals should be aware of how their personal information is utilised.
- **Security Safeguards** – Strong security measures must be implemented to protect data breaches.
- **Data Subject Participation** – Individuals should have access to their data and control over its use.

POPIA IN ENGINEERING PROJECTS

In daily engineering tasks, you deal with personal information in various forms, such as project records, communications, or sensitive employee details.



Common compliance challenges include:

- **Lack of an Information Officer** - Many companies fail to appoint a person responsible for overseeing compliance and registering it with the Information Regulator.
- **Insufficient Data Protection Training** - Employees, including engineers, must be trained on data privacy responsibilities and train their staff.
- **Data Breaches** - Failing to secure data systems can result in data breaches, which are violations of POPIA and can result in administrative fines and penalties in terms of POPIA.
- **Missing Policies** - Companies often overlook essential policies like privacy policies (how your organisation processes personal information), breach response plans, or access control procedures.

As engineers, you interact with systems that process personal information.

Following POPIA guidelines in every step of your work is crucial to avoid compliance issues, whether handling client files or securing sensitive project personal information.

CONSEQUENCES OF NON-COMPLIANCE

Non-compliance with POPIA could lead to significant penalties, ranging from fines of R1 million to R10 million or imprisonment of up to 10 years for company directors.

Noteworthy breaches in organisations such as the Department of Basic Education, the Department of Justice and Constitutional Development, and Dischem illustrate that the Information Regulator is serious about enforcing POPIA.

ENSURING COMPLIANCE: PRACTICAL STEPS FOR ENGINEERS

To maintain compliance, engineers should be proactive by:

- Appointing a dedicated Information Officer;
- Implementing strong data security measures;
- Providing POPIA awareness and training for employees on the purpose of POPIA and the collection, processing and storage of personal information. The Do's and Don'ts in POPIA.
- Developing and enforcing data protection policies, including breach protocols and data protection insurance. Organisations struggling with POPIA compliance should seek expert assistance in Data Risk Assessments and remediation, POPIA policy creation and enforcement, and POPIA staff training to ensure full compliance with POPIA. **wn**

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Cybersecurity in South Africa

- BRIDGING THE GAP BETWEEN RISK AND AWARENESS



Like the rest of the world, South Africa grapples with challenges from a digital landscape fraught with escalating cyber threats that pose significant risks to businesses and other organisations.

By: Ryan Boyes, Governance, Risk and Compliance Officer, Galix

However, what makes the local threat landscape unique is that South African organisations have historically placed less emphasis on security than their international counterparts. This oversight has made the country a slightly bigger target for cybercriminals.

CULTIVATING A PARTNERSHIP WITH EXPERTS

Implementing effective risk management strategies has become essential in light of these challenges. Cultivating partnerships with expert third-party providers can significantly enhance an organisation's cybersecurity posture.

These providers typically offer extensive experience and resourcing, ensuring that companies benefit not only from their deep understanding of information security but also from technological and regulatory perspectives.

Moreover, these specialist partners bring invaluable "admin knowledge," encompassing a thorough understanding of compliance and documentation related to cybersecurity frameworks. The financial implications of these partnerships are also noteworthy; building an in-house team can be prohibitively expensive, especially for small to medium-sized enterprises (SMEs), which often lack the necessary resources and tools.

IDENTIFYING VULNERABILITIES

Expert partnerships are crucial for conducting comprehensive risk assessments, identifying vulnerabilities,

and prioritising threats specific to a company's industry. Regular assessments and gap analyses should be standard for all organisations in the rapidly evolving information security sector. An expert partner can provide an unbiased perspective on security assessments, enriched by a wealth of experience and knowledge.

Equally important is fostering a culture of cybersecurity awareness and proactive risk management throughout the organisation. This cultural shift must be driven from the top, and management plays a critical role in instilling a genuine commitment to protecting information rather than merely ticking boxes for compliance.

Unfortunately, many companies adopt a superficial approach to cybersecurity awareness, treating it as a mere formality rather than an essential mindset. Organisations must cultivate a desire to safeguard their information, ensuring employees embrace a culture focused on information security.

This mindset should originate from executive leadership and permeate throughout the organisation, fostering collaboration and shared responsibility. This cultural shift will enable organisations to anticipate potential threats and respond effectively, thus minimising potential damage.

BUILDING AN AWARENESS CULTURE

Once companies secure buy-in from all stakeholders to develop an awareness

culture alongside proactive risk management, they can leverage expert providers to address both technical and compliance aspects of their risk management strategy. While neither aspect is inherently more important than the other, they must be developed concurrently.

Subsequently, organisations should identify a framework that aligns best with their specific needs and objectives. However, implementing these systems is just the beginning; ongoing maintenance is crucial.

A robust risk management strategy should encompass risk assessment and regular test scenarios to ensure that all components function effectively. Again, a third-party perspective can serve as an unbiased reporting mechanism, ensuring these systems remain operationally sound.

As South African organisations continue to confront escalating cyber threats, enhancing cybersecurity measures through expert partnerships and

cultivating an organisational culture centred on proactive risk management will be vital.

By prioritising these strategies, businesses can better navigate the complexities of today's digital landscape and minimise potential damage from cyber incidents. **wn**



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Rapid 5G adoption

-TRANSFORMING INDUSTRIES AND GIVING RISE TO THE NEED FOR SOPHISTICATED DATA MANAGEMENT



The future of 5G technology has great potential to transform industries by improving connectivity, speed and capacity, especially as this standard for cellular networks is seeing such rapid adoption that it is set to outpace previous mobile generations due to the demand for faster, more reliable connections.

*By Vikash Tuli
Senior Sales Engineer at, Commvault*

Since its rollout in 2019, 5G networks have seen rapid expansion, with predictions that global subscriptions could reach 5.3 billion by 2029. At this rate, the rollout of 5G technology promises a tremendous increase in data generated by connected devices, Internet of Things (IoT) applications and real-time analytics.

Many industries stand to gain immensely from 5G integration. For instance, it will facilitate real-time patient monitoring, remote surgeries, and enhanced telemedicine services in healthcare. In manufacturing, 5G enhances automation and smart factory initiatives by enabling instant communication between machines and predictive maintenance. Smart cities will also benefit from 5G through improved traffic management, energy consumption, and public safety via connected devices.

This technology is expected to be the foundation for advancements in Artificial Intelligence (AI), machine learning and IoT, offering real-time data processing capabilities. Edge computing, which processes data closer to the source, will complement 5G by further reducing latency.

However, while 5G technology continues to revolutionise industries with unprecedented speed, connectivity and data generation capacities, the challenge of safeguarding these vast datasets is fast becoming paramount.

DATA PROTECTION FRAMEWORKS

Organisations across virtually all industries must rely on comprehensive data protection frameworks designed to handle this exponential data growth through scalable and automated backup solutions. By leveraging advanced deduplication and compression techniques, data management experts can ensure efficient data storage management, reduce storage overhead costs, and enhance data retrieval speed in critical scenarios.

Organisations can scale out their compute and storage solutions by deploying generic hardware from technology vendors of their choice. At the same time, those facing scalability challenges in deployment and management can move to a Software-as-a-Service (SaaS) provider.

Additionally, in a 5G-enabled world, business operations rely heavily on data's continuous availability. This underscores the need for sophisticated recovery solutions that allow organisations to restore critical data rapidly, minimising downtime and ensuring business continuity.

Features like instant data access, snapshot management and application-consistent recovery points will empower businesses to react promptly, maintaining operational integrity even amid disruptions. This will ensure swift recovery and business continuity.



However, the increased connectivity of devices in the 5G ecosystem also broadens the attack surface for cyber threats. Data protection experts need to integrate robust cybersecurity measures within their data management solutions, including encryption, multi-factor authentication, and AI-driven threat detection. These features work in concert to prevent unauthorised access, swiftly identify anomalies and facilitate a proactive stance against potential cyber intrusions, safeguarding sensitive data assets.

As end users gain more ability to use, manipulate and generate data, the risk of cyber threats increases. It is not a matter of if but when an attack or breach will occur, as zero-day exploits leveraging AI and ML are becoming more common.

To counter these threats, businesses need AI and ML security technologies that enhance their environment's cyber resilience, which is the ability to recover faster from attacks.

STRINGENT DATA REGULATIONS

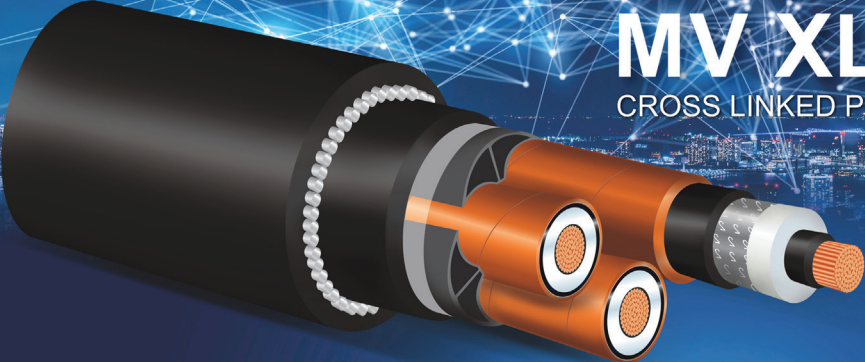
In a landscape where data regulations are increasingly stringent, sophisticated data management solutions bring capabilities that offer comprehensive compliance support through enhanced data governance and efficient information retrieval. These features enable detailed analytics, reporting, and audit trails that simplify compliance management.

The ability to scan and locate sensitive data ensures its protection and compliance with the Protection of Personal Information Act (POPIA). It is essential to manage where this data resides, addressing the right to privacy by retaining data only for the required policy period. A data management solution can automate this process. Additionally, such the right solution should offer legal validation of audit trails. A comprehensive tool can simplify data management, reduce complexity, and ease administrative burdens.

By deploying such solutions, organisations can quickly locate and secure relevant data to meet legal and regulatory requirements. This allows them to focus on leveraging 5G technologies for innovation without the burden of complex regulatory challenges. A data management partner can confidently empower businesses to experiment and develop new products and services, ensuring data integrity and compliance are consistently maintained.

With the rapid adoption of 5G technology, organisations specialising in data management and security will play an increasingly pivotal role in supporting this transformation, offering solutions that ensure the secure handling and processing of the massive volumes of data generated by 5G-powered devices.

Ultimately, expertise from these organisations will be essential in helping businesses leverage 5 G's full potential while addressing critical challenges like infrastructure development and cybersecurity concerns. **wn**



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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
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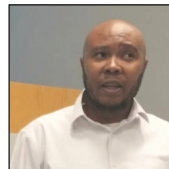




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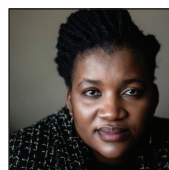
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Free State Centre

Chairman | Lucky Mokalusi

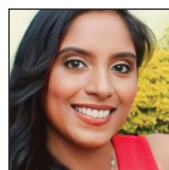
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FEBRUARY 2025

CALENDAR

05/11/2025	WW1: The potential of Small Wind Turbines
10/02/2025	The Role of IoT in Building Smart Cities
11/02/2025	Power Transformers: Fundamentals and Life Cycle Management Principles
11/02/2025	Project Management for Engineers
12/02/2025	Fundamentals of Power Distribution
12/02/2025	Debunking Nuclear Myths
18/02/2025	Lightning Protection of Structures, Low Voltage and Signal Systems
19/02/2025	LV/MV/HV Switch gear Operation, Safety, Maintenance and Management
24/02/2025	2025 Wireless Africa Conference Conference
25/02/2025	The New Engineering & Construction Contract (NEC)
26/02/2025	Incident Investigation and Management (Root Cause Analysis)

MARCH 2025

03/03/2025	Fundamentals of Medium Voltage Protection
05/03/2025	Fundamentals Of Practical Lighting Design for Commercial and Industrial Application
05/03/2025	WW 2: Profitable Small Wind Turbines
12/03/2025	Design Thinking and Innovation for Engineering Professiona
14/03/2025	2024 SAIEE Annual Awards, in conjunction with Revive Electrical Transformers
19/03/2025	FIDIC Tendering and Contracts for Engineers
20/03/2025	SAIEE Financial Chapter launch
25/03/2025	Finance Essentials for Engineers
26/03/2025	Photovoltaic Solar System
27/03/2025	SAIEE AGM



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SAIEE Academy Online Training

SAIEE Academy Classroom Training

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